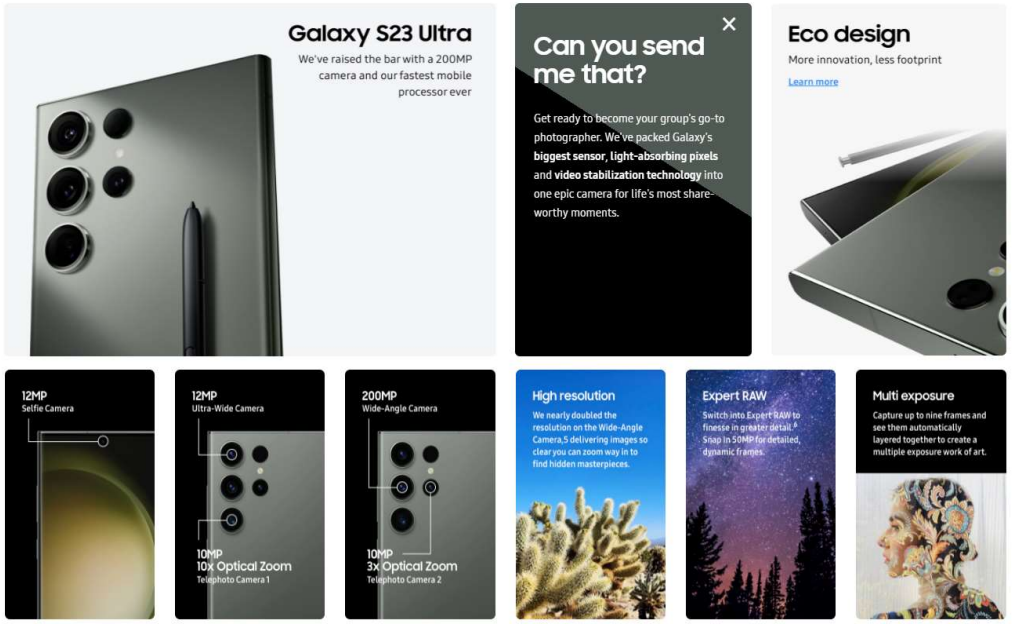
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

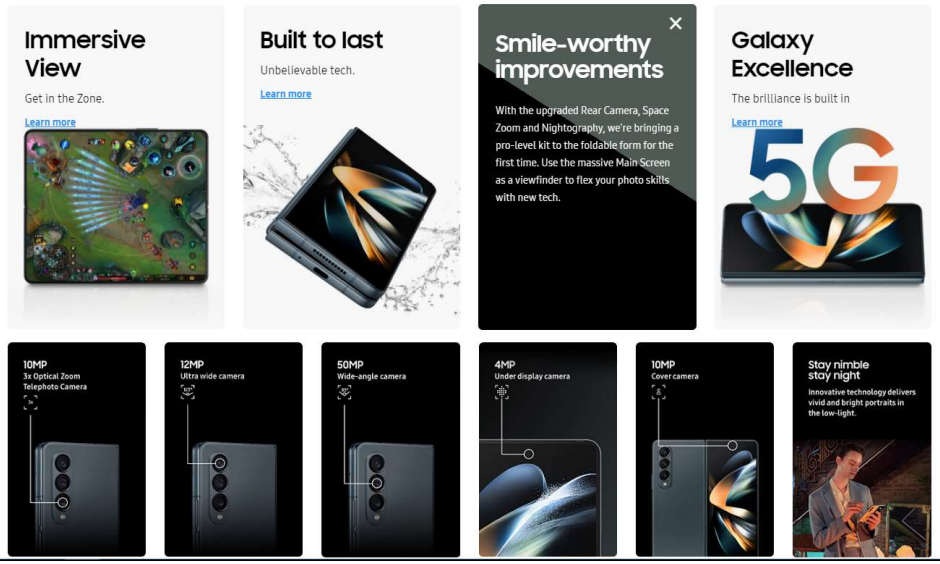
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[1.preamble] A video processing apparatus, comprising:	To the extent the preamble is construed as a limitation, each of the Accused Samsung '590 Products[1] is a video processing apparatus. For example, the Accused Samsung '590 Products include front and back cameras for recording video, a display for displaying video, and one or more processors (*e.g.*, a CPU, ISP, and/or DSP) with image and video processing capability: 

[1] The Accused Samsung '590 Products include the Galaxy A04s, Galaxy A13, Galaxy A14, Galaxy A14 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A33 5G, Galaxy A34, Galaxy A53 5G, Galaxy A54 5G, Galaxy A73 5G, Galaxy S21 FE 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S23 FE, Galaxy S24, Galaxy S24+, Galaxy S24 Ultra, Galaxy XCover6 Pro, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold4, and Galaxy Z Fold5.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Quad	200 MP, f/1.7, 24mm (wide), 1/1.3", 0.6µm, multi-directional PDAF, Laser AF, OIS
		10 MP, f/4.9, 230mm (periscope telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 10x optical zoom
		10 MP, f/2.4, 70mm (telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55", 1.4µm, Dual Pixel PDAF, Super Steady video
	Features	LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/240fps, 1080p@960fps, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), Dual Pixel PDAF
	Features	Dual video call, Auto-HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

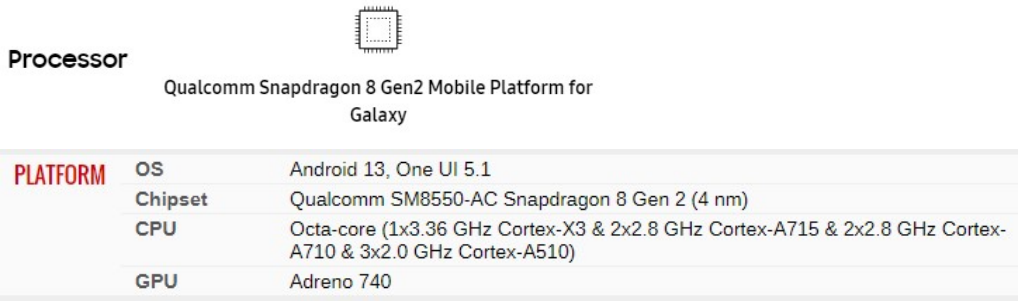
MAIN CAMERA	Triple	50 MP, f/1.8, 23mm (wide), 1.0µm, Dual Pixel PDAF, OIS
		10 MP, f/2.4, 66mm (telephoto), 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 123˚, 12mm (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	8K@24fps, 4K@60fps, 1080p@60/240fps (gyro-EIS), 720p@960fps (gyro-EIS), HDR10+
SELFIE CAMERA	Single	4 MP, f/1.8, 26mm (wide), 2.0µm, under display
		Cover camera:
		10 MP, f/2.2, 24mm (wide), 1/3", 1.22µm
	Features	HDR
	Video	4K@30/60fps, 1080p@30/60fps, gyro-EIS

Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

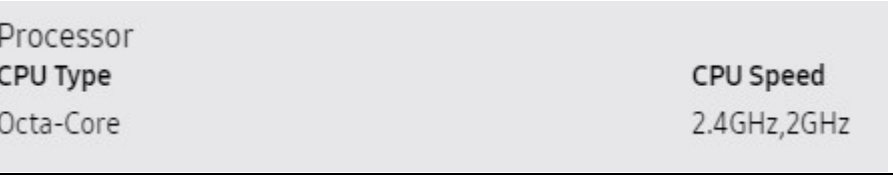
MAIN CAMERA	Dual	12 MP, f/1.8, 24mm (wide), 1/1.76", 1.8µm, Dual Pixel PDAF, OIS
		12 MP, f/2.2, 123˚ (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	4K@30/60fps, 1080p@60/240fps, 720p@960fps, HDR10+
SELFIE CAMERA	Single	10 MP, f/2.4, 26mm (wide), 1.22µm
	Features	HDR
	Video	4K@30fps

Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Capture your Awesome moments with a multi-lens camera  MAIN CAMERA — Triple: 50 MP, f/1.8, (wide), 1/1.56", 1.0µm, PDAF, OIS; 12 MP, f/2.2, 123° (ultrawide), 1.12µm; 5 MP, f/2.4, (macro) MAIN CAMERA — Features: LED flash, panorama, HDR MAIN CAMERA — Video: 4K@30fps, 1080p@30/60fps, 720p@480fps SELFIE CAMERA — Single: 32 MP, f/2.2, 26mm (wide), 1/2.8", 0.8µm SELFIE CAMERA — Video: 4K@30fps, 1080p@30/60fps Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

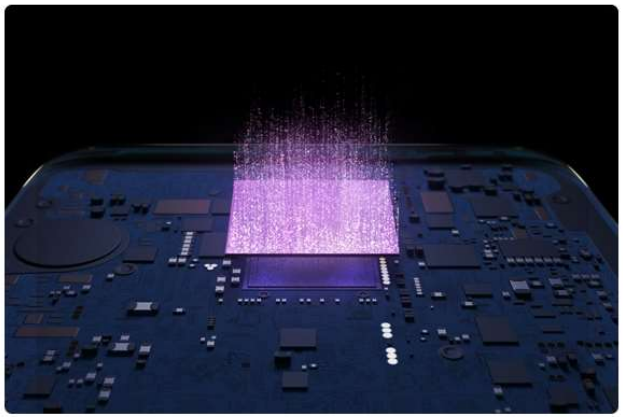
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Performance



Impressive speed. Powerful processor

The powerful Octa-core processor opens up a new range of possibilities with heightened performance and capacity.

PLATFORM	OS	Android 13, One UI 5.1
	Chipset	Exynos 1380 (5 nm)
	CPU	Octa-core (4x2.4 GHz Cortex-A78 & 4x2.0 GHz Cortex-A55)
	GPU	Mali-G68 MP5

Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

In addition, the AIDA64 Reports show that each of the Accused Samsung '590 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (*e.g.*, CPU, ISP, or DSP) processes video.

Product	**AIDA 64 Report- Camera**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy S23 Ultra	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 6.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 3.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 2.20 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy Z Fold4	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.40 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
		Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.30 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.74 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy Z Flip4	<< Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 5.00 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.17 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.70 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy A54 5G	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.54 mm Focus Modes: infinity, auto, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 8.0 MP (3264 × 2448) Focal Length: 3.72 mm

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Focus Modes: fixed, infinity Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.74 mm Focus Modes: fixed, infinity Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Front-Facing Camera >> Resolution: 5.7 MP (2880 × 1980) Focal Length: 3.72 mm Focus Modes: fixed, infinity Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported

The AIDA64 Reports and tech specs show that the Accused Samsung '590 Products contain one or more processors.

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include front and back cameras for recording video, a display for displaying video, and one or more processors (*e.g.*, a CPU, ISP, and/or DSP) with image and video processing capability. *See* https://www.samsung.com/us/support/answer/ANS00089063/.
[1.a] a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band;	Each of the Accused Samsung '590 Products includes a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band. **First Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the Wi-Fi communication chip capable of transmitting video information via Wi-Fi communications (e.g., Quick Share) using the first transmission frequency band.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

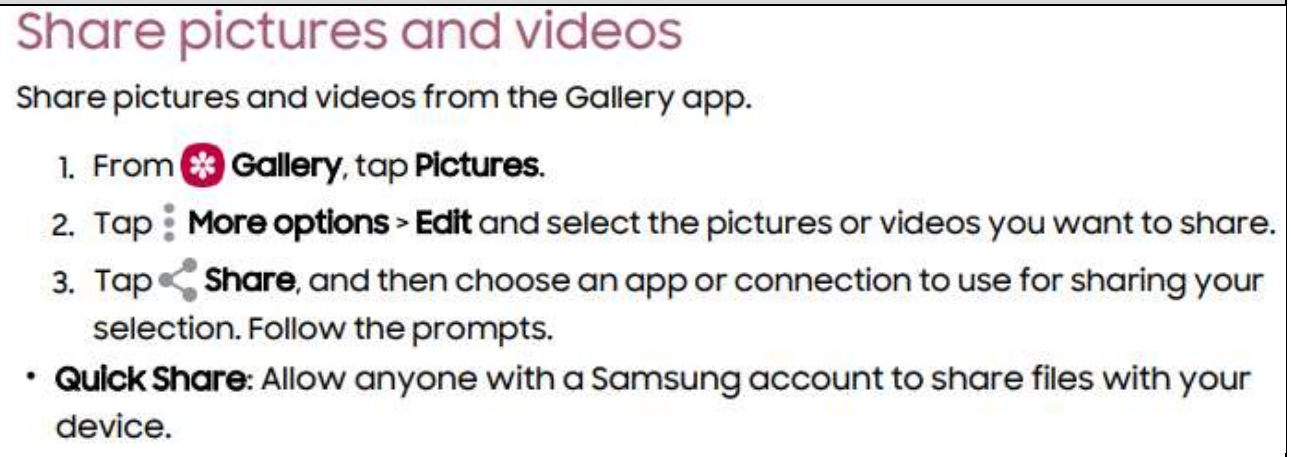
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Sharing content Share content by using various sharing options. The following actions are an example of sharing images. 1 Open the **Gallery** app and select an image. 2 Tap and select a sharing method you want. You may incur additional charges when sharing files through the mobile network. **Quick Share** Sharing content with nearby devices Share content with nearby devices through Wi-Fi Direct or Bluetooth, or with some SmartThings supported devices. 1 Open the **Gallery** app and select an image. 2 On the other device, open the notification panel, swipe downwards, and then tap (**Quick Share**) to turn it on. If you cannot find (**Quick Share**) on the quick panel, tap and drag the button over to add it.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3 Tap → **Quick Share** and select a device to receive the image. 4 Accept the file transfer request on the other device. This feature does not support sharing videos with TVs or SmartThings supported devices. To watch videos on TV, use the Smart View feature. **Setting who can find your phone** Set who is allowed to find and send content to your phone. 1 Open the notification panel, swipe downwards, and then tap (**Quick Share**). 2 Select an option. • **No one**: Do not allow others to find your phone. • **Contacts only**: Only allow Samsung users in your contacts to share with your phone. • **Anyone nearby**: Allow any nearby devices to share with your phone. **Sharing through Web link** Upload large files to the Samsung storage server and share them with others through Web link. 1 Open the **Gallery** app and select an image. 2 Tap → **Quick Share** and select an option you want under **Share to any device**. • **Copy link**: Share the link copied to the clipboard. • **Share link using app**: Share the link by selecting an app. • **Share using QR code**: Share the link with the created QR code. Galaxy S23 Series User Guide at pg. 111-112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

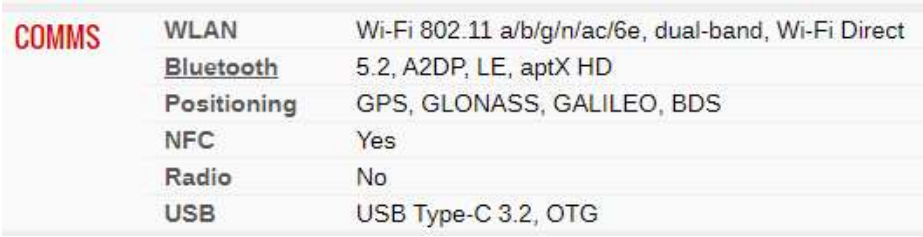
Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

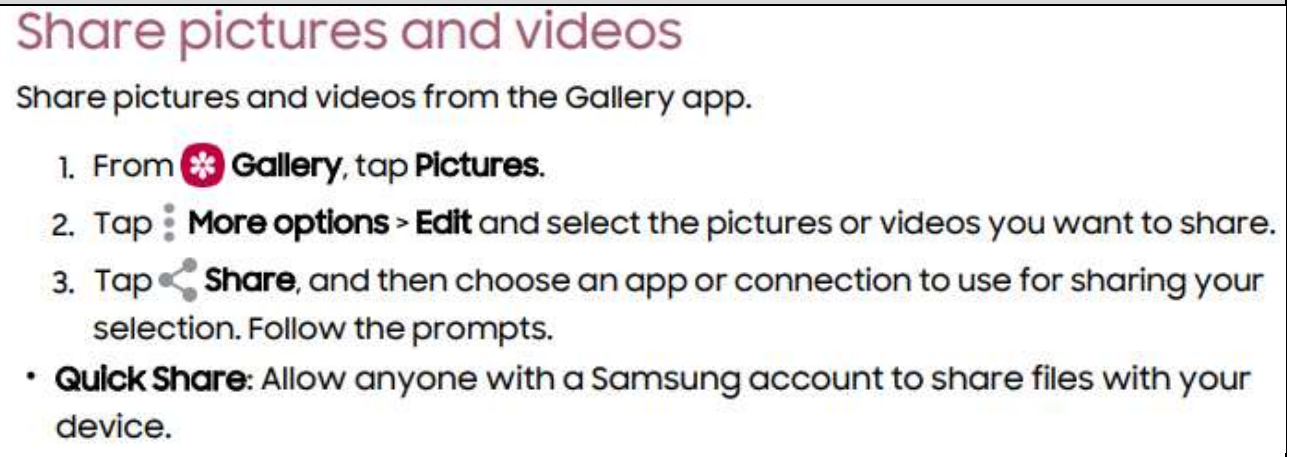
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

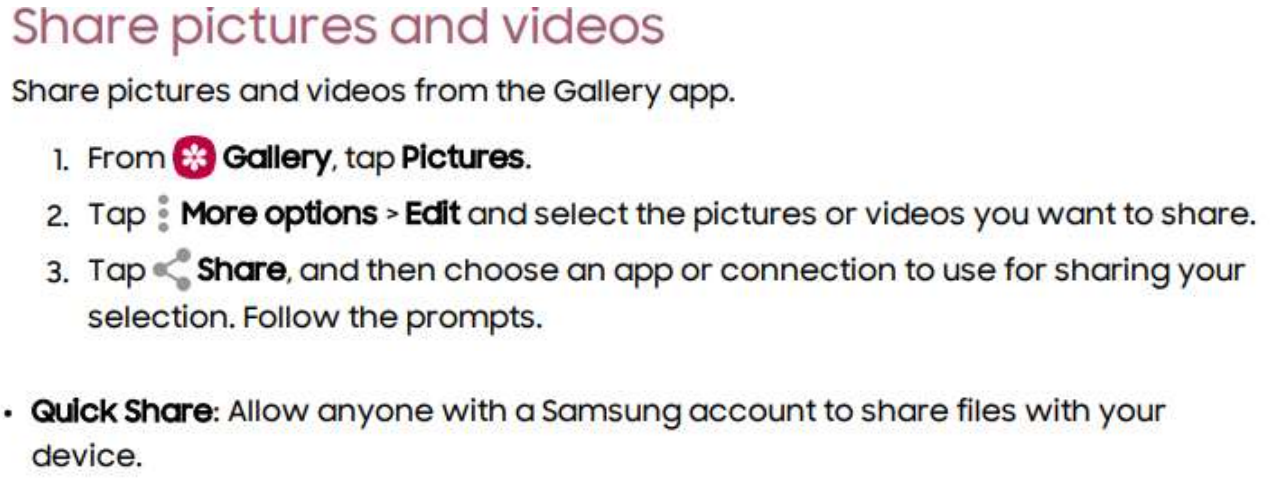
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE, aptX HD Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
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NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
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U-NII-1	Voice/Data	5180 - 5240 MHz
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U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes (market/region dependent) Radio: No USB: USB Type-C 2.0, OTG Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 49, 112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

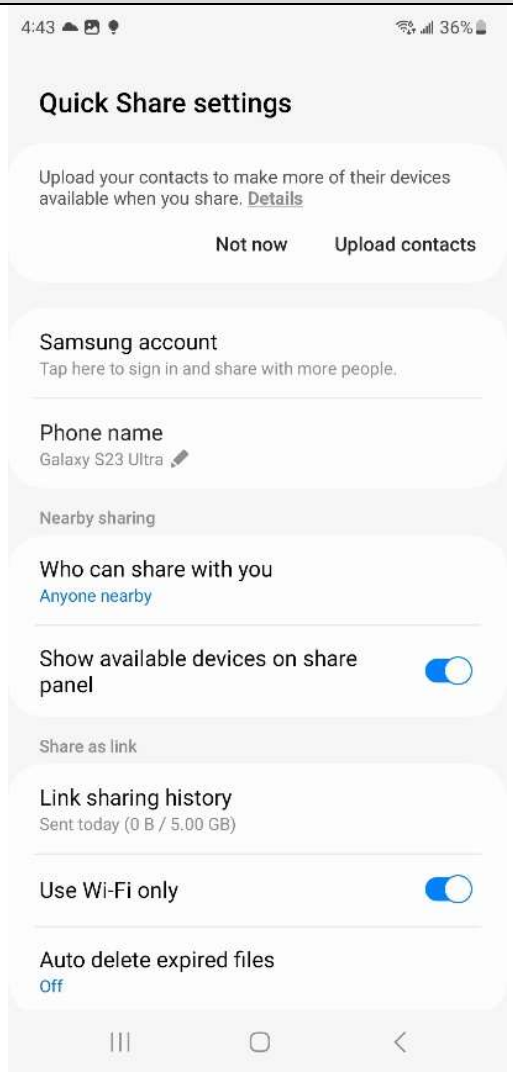
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

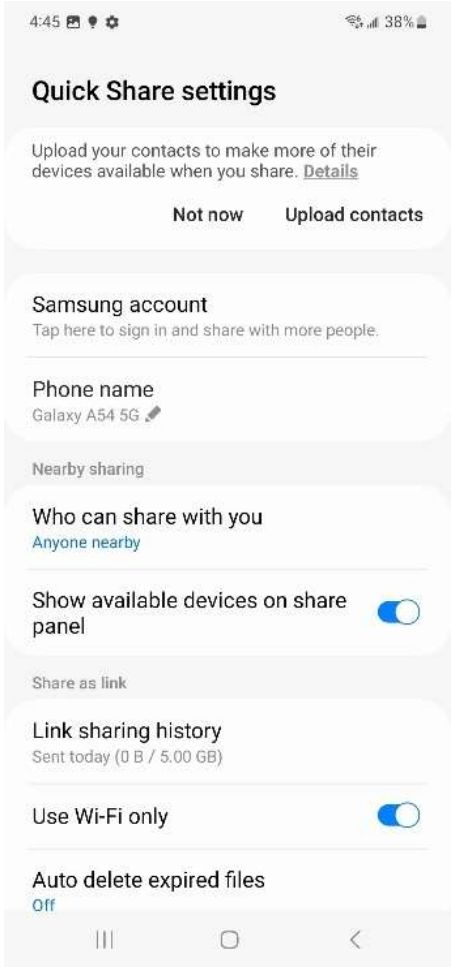
	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

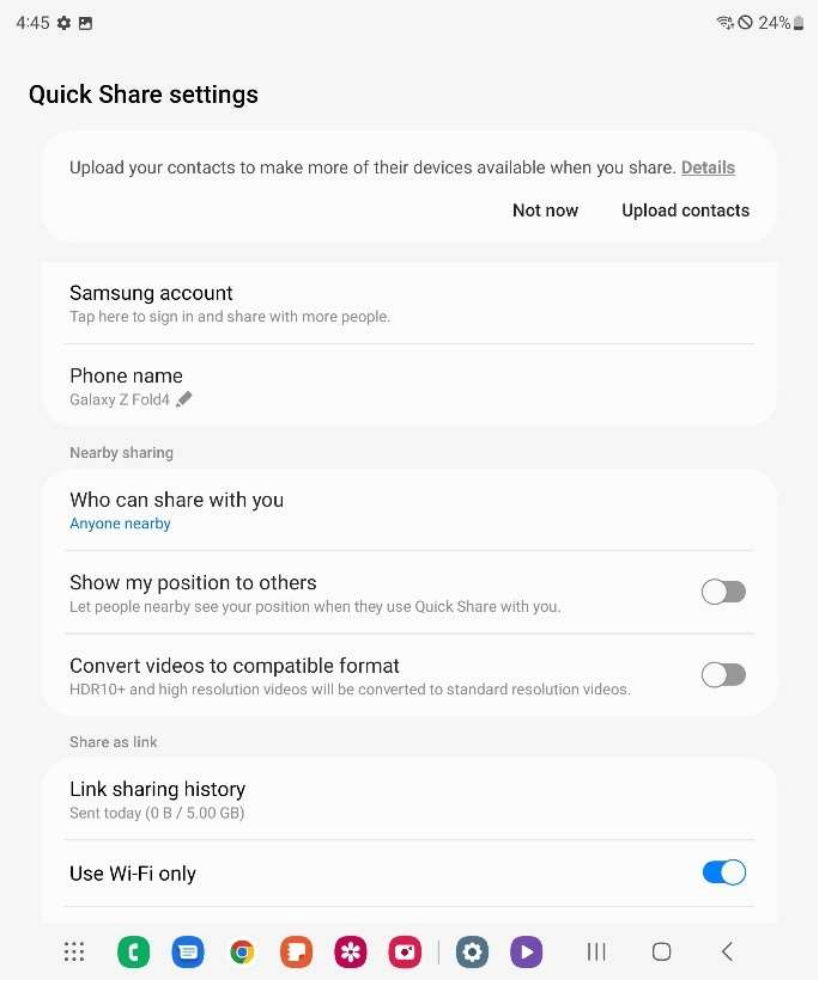
See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

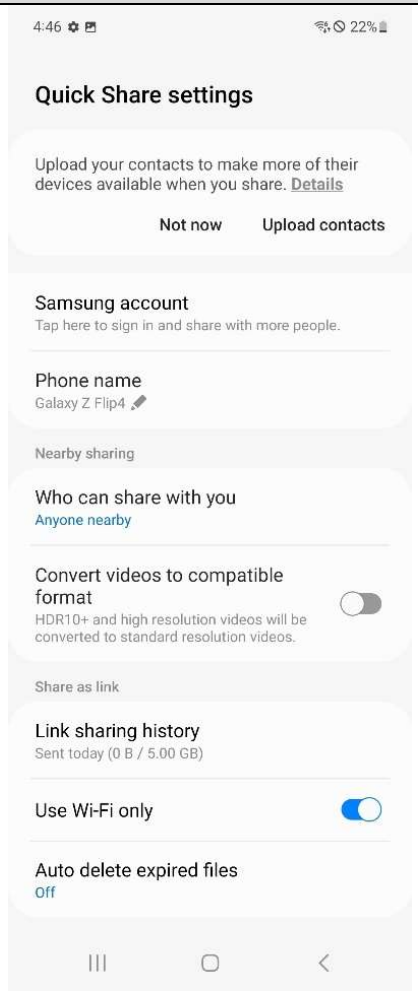
For example, the following screenshots show exemplary Accused Samsung '590 Products using a Wi-Fi communication chip to transmit video information by using Quick Share app:

Samsung Galaxy 23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

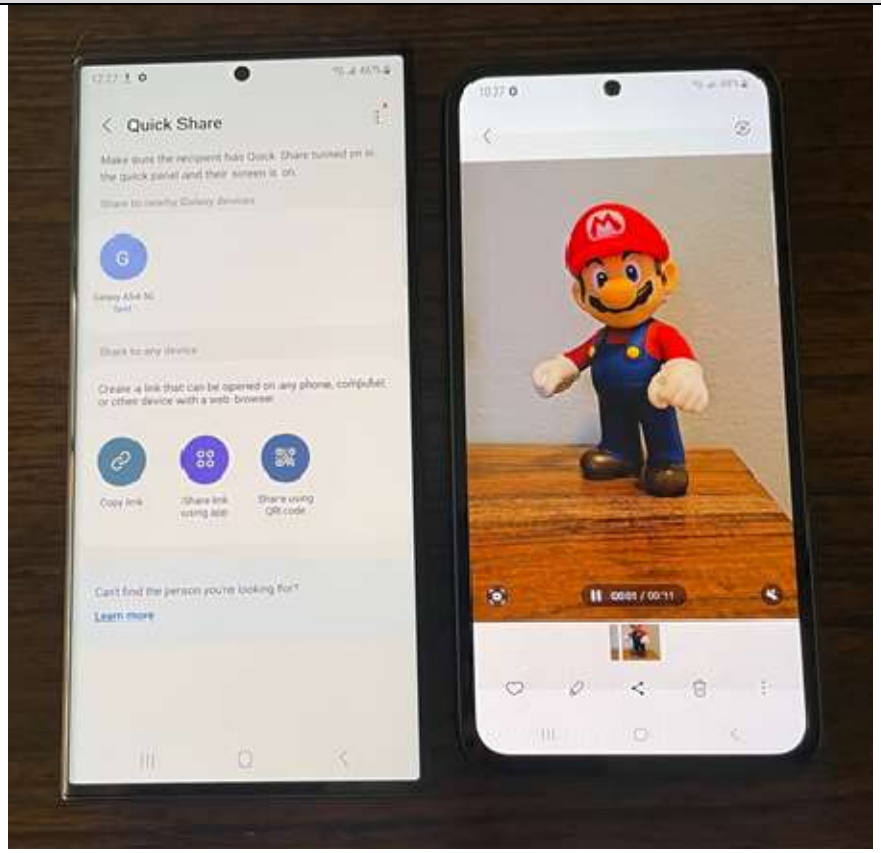
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

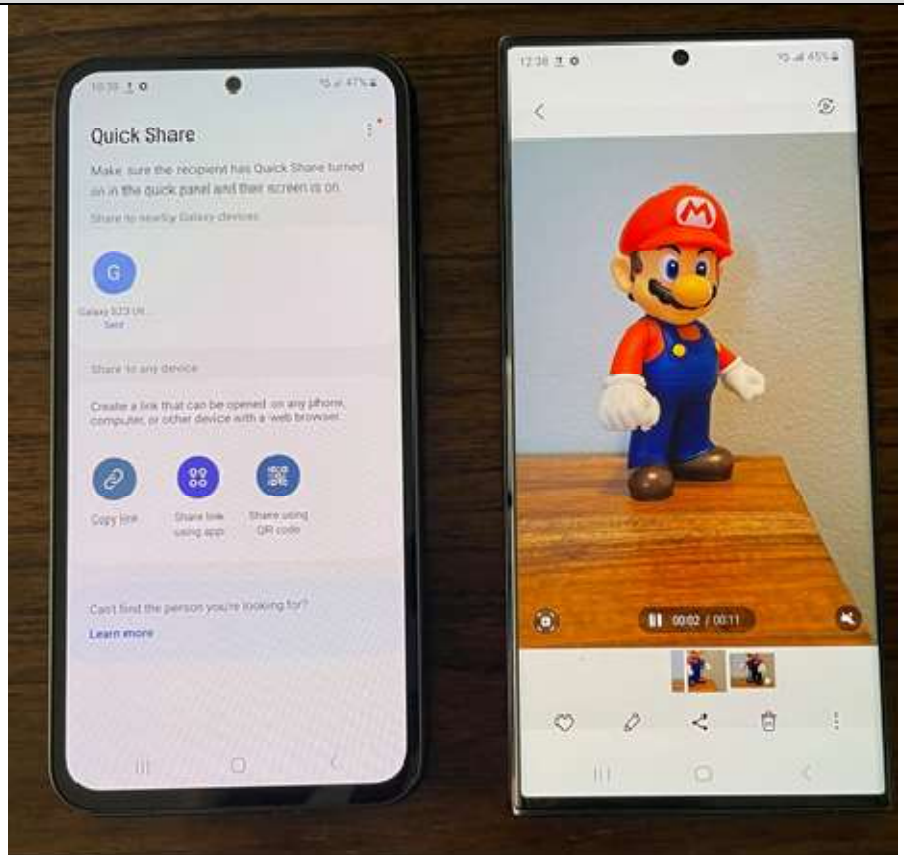
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



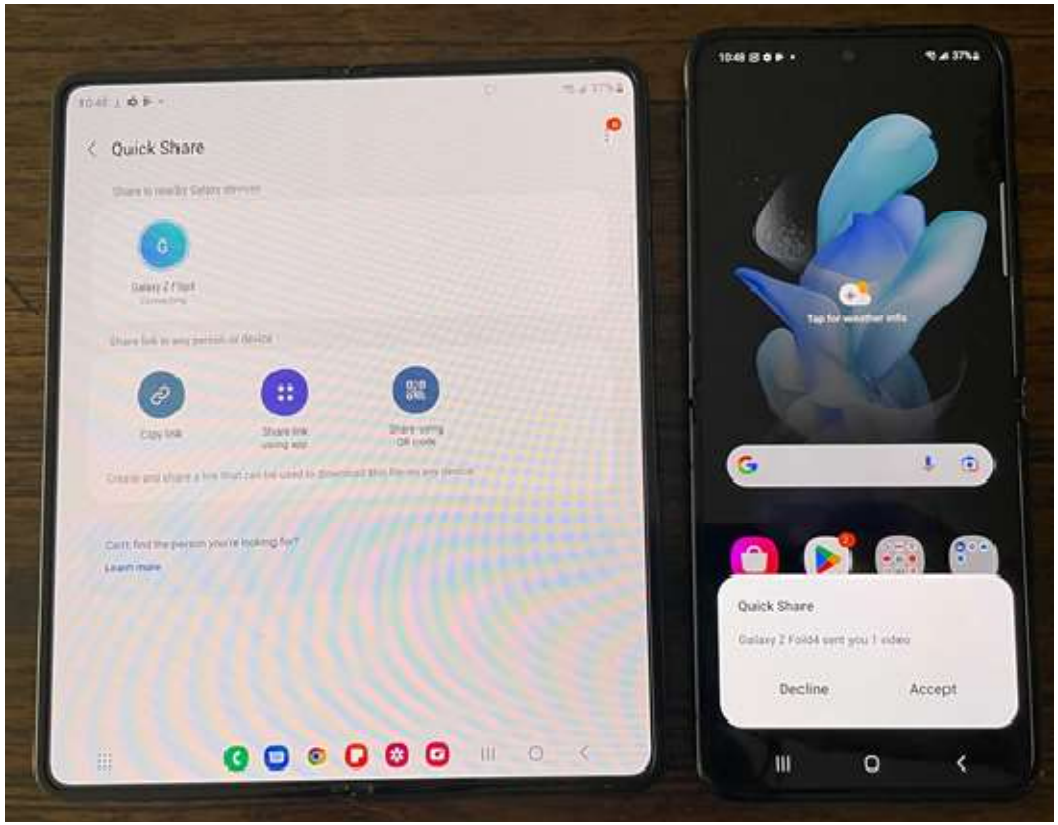
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

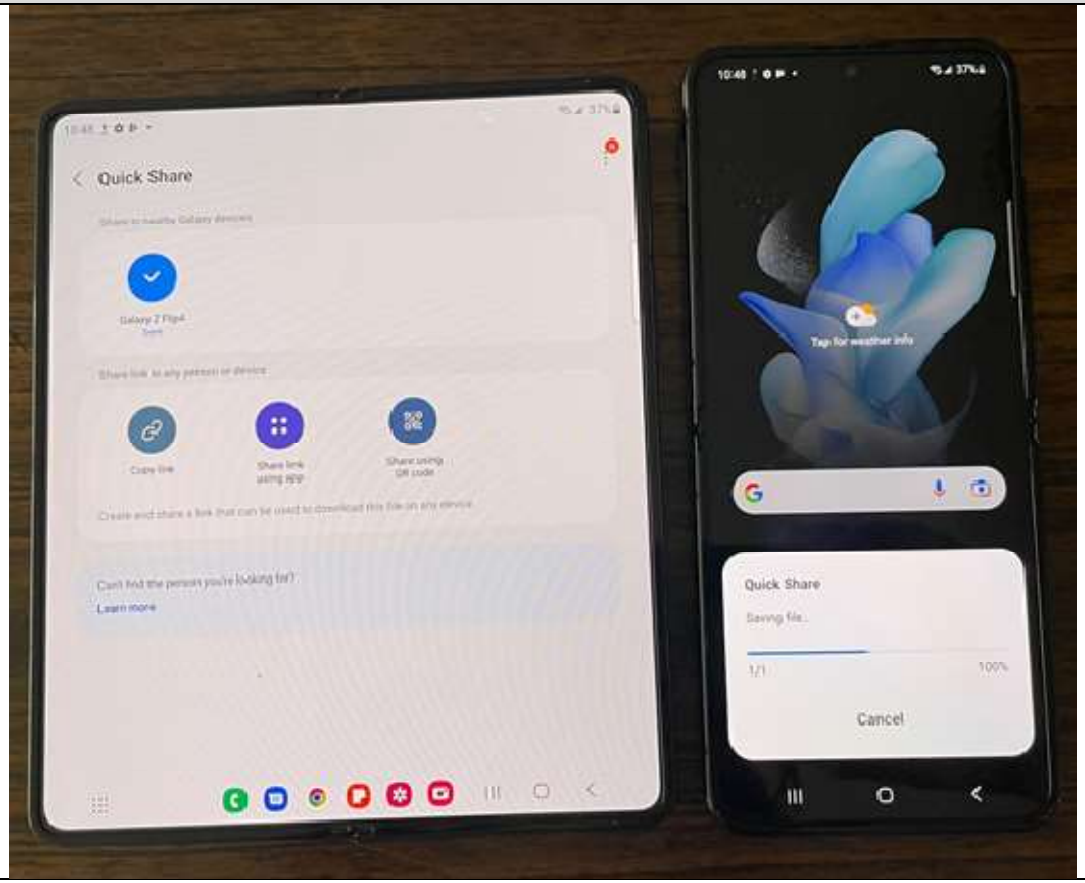

1 item
Galaxy Store
Play Store
Google
Microsoft

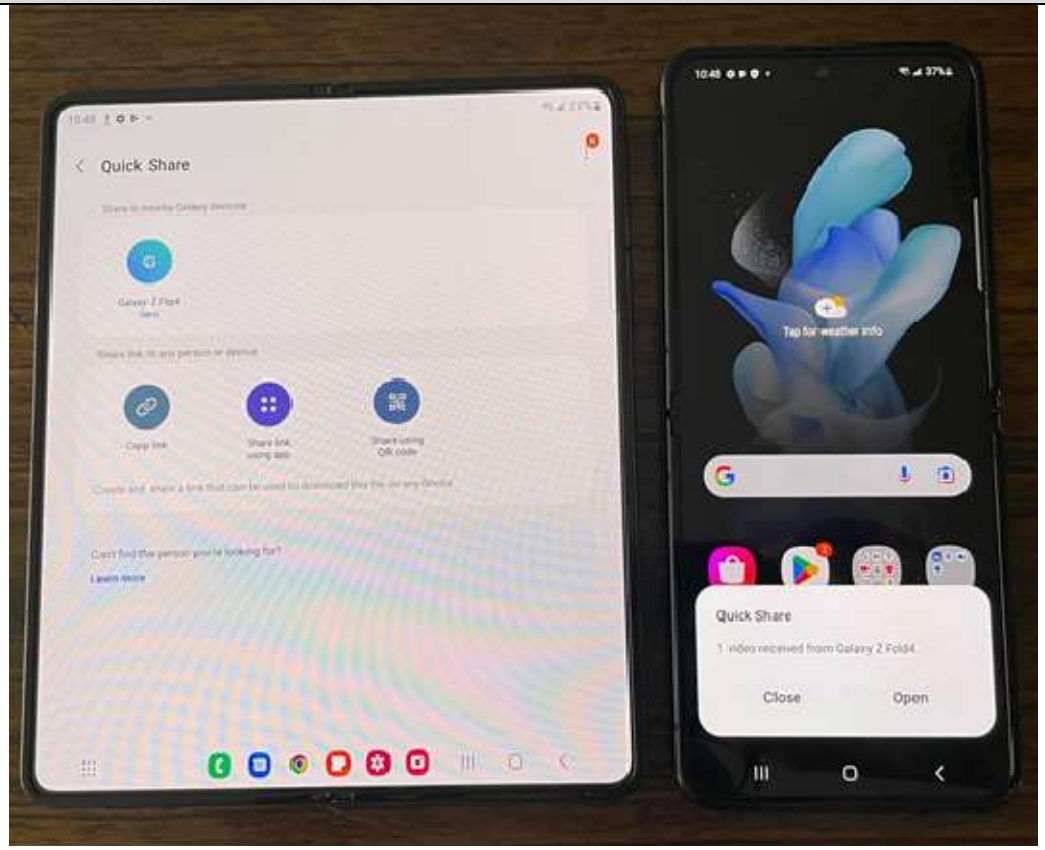
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

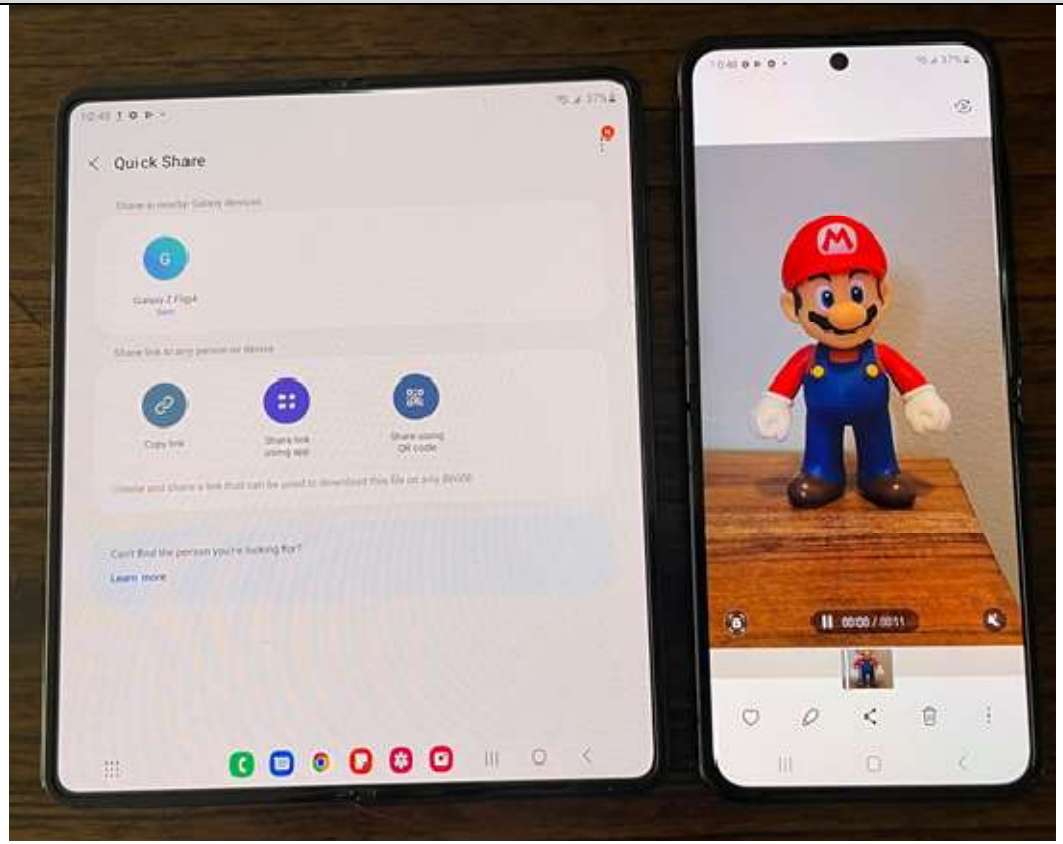
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

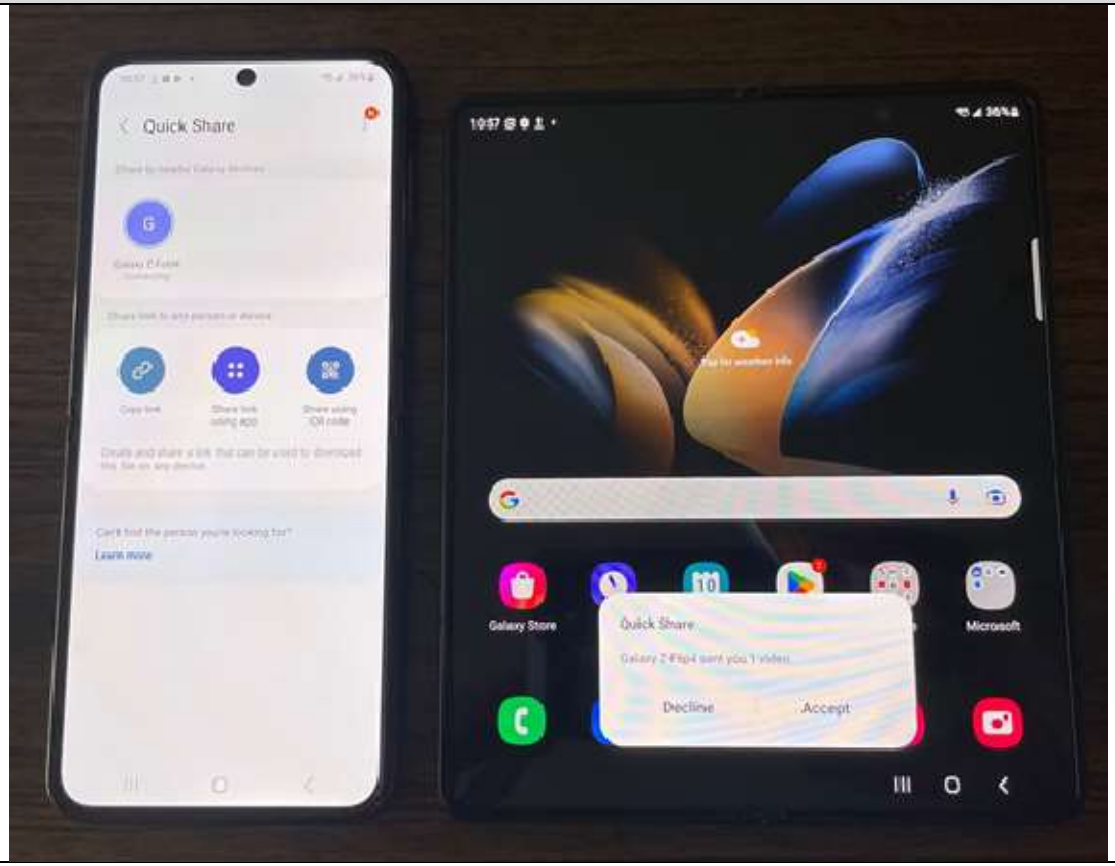
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

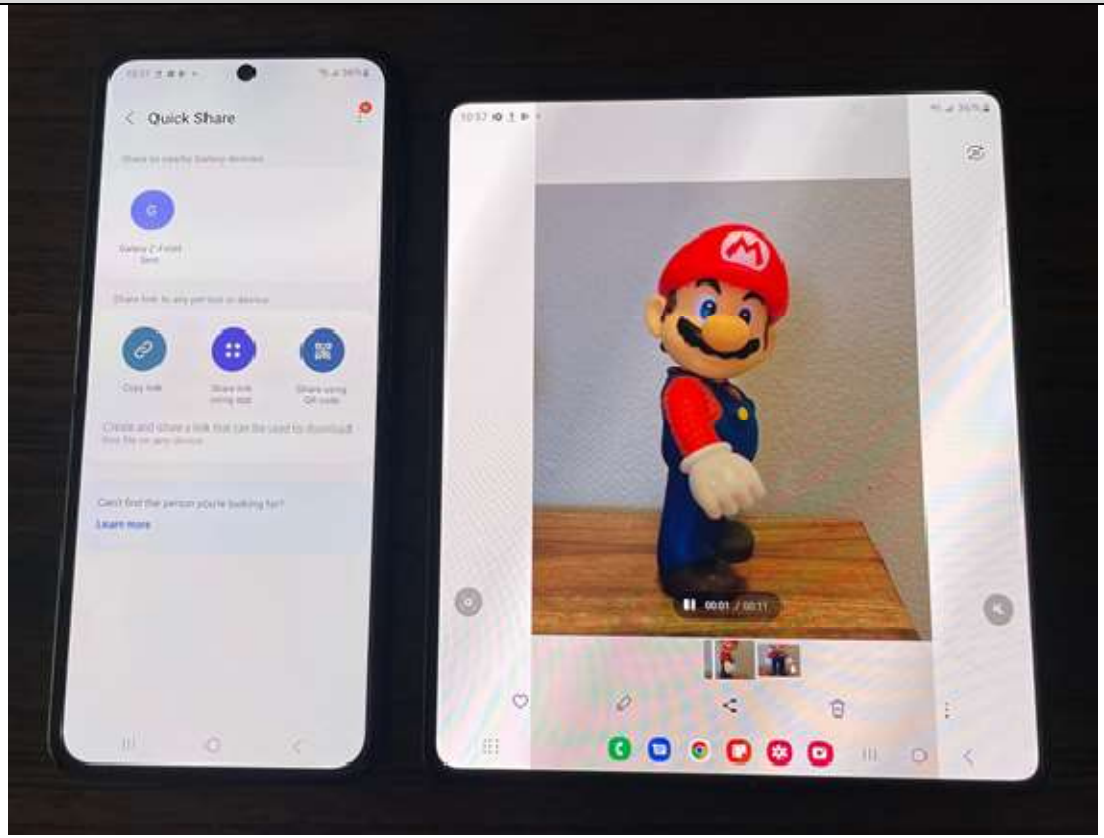
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Quick Share Galaxy Store Microsoft Quick Share Close Open

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Wi-Fi communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/. **Second Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip implementing a first transmission scheme having a first modulation scheme and a first

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	transmission frequency band, the Bluetooth communication chip capable of transmitting video information via Bluetooth communications using the first transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php. Bluetooth Use Bluetooth to exchange data or media files with other Bluetooth-enabled devices. Precautions for using Bluetooth • Samsung is not responsible for the loss, interception, or misuse of data sent or received through Bluetooth. • Always ensure that you share and receive data with devices that are trusted and properly secured. If there are obstacles between the devices, the operating distance may be reduced. • Some devices, especially those that are not tested or approved by the Bluetooth SIG, may be incompatible with your device. • Do not use the Bluetooth feature for illegal purposes (for example, pirating copies of files or illegally tapping communications for commercial purposes). Samsung is not responsible for the repercussion of illegal use of the Bluetooth feature.

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	Pairing with other Bluetooth devices 1 On the Settings screen, tap **Connections** → **Bluetooth** and tap the switch to turn it on. The detected devices will be listed. 2 Select a device to pair with. If the device you want to pair with is not on the list, set the device to enter Bluetooth pairing mode. Refer to the other device's user manuals. Your phone is visible to other devices while the Bluetooth settings screen is open. 3 Accept the Bluetooth connection request on your phone to confirm. The devices will be connected when the other device accepts the Bluetooth connection request. To unpair the devices, tap next to the device name to unpair and tap **Unpair**. **Sending and receiving data** Many apps support data transfer through Bluetooth. You can share data, such as contacts or media files, with other Bluetooth devices. The following actions are an example of sending an image to another device. 1 Open the **Gallery** app and select an image. 2 Tap → **Bluetooth** and select a device to receive the image. If the device you want to pair with is not in the list, turn on its visibility option. 3 Accept the Bluetooth connection request on the other device. Galaxy S23 Series User Guide at pg. 124-125.

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Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

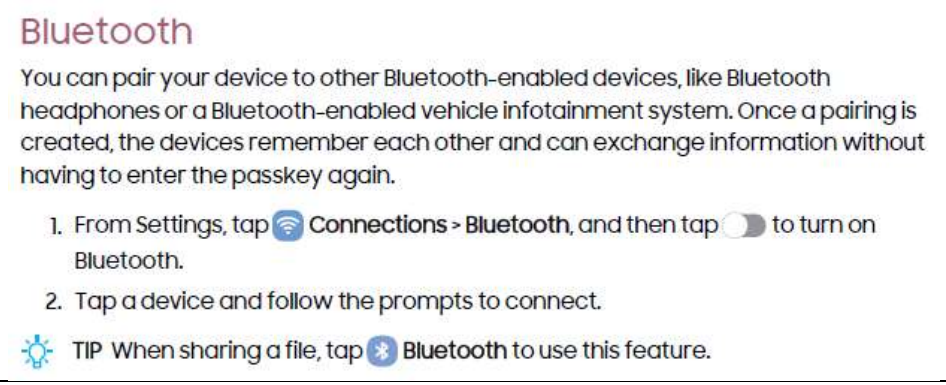
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power [dBm]	Avg Conducted Power [mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power [dBm]	Peak Conducted Power [mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. TIP When sharing a file, tap Bluetooth to use this feature.

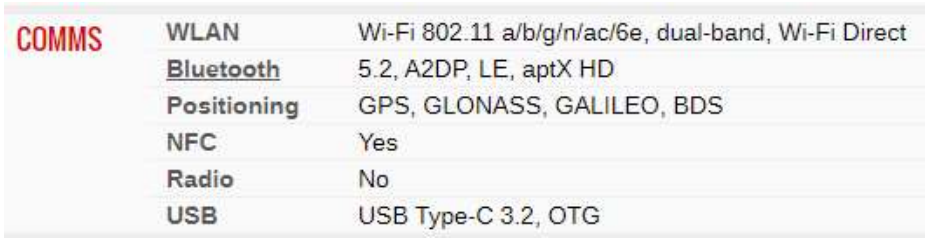
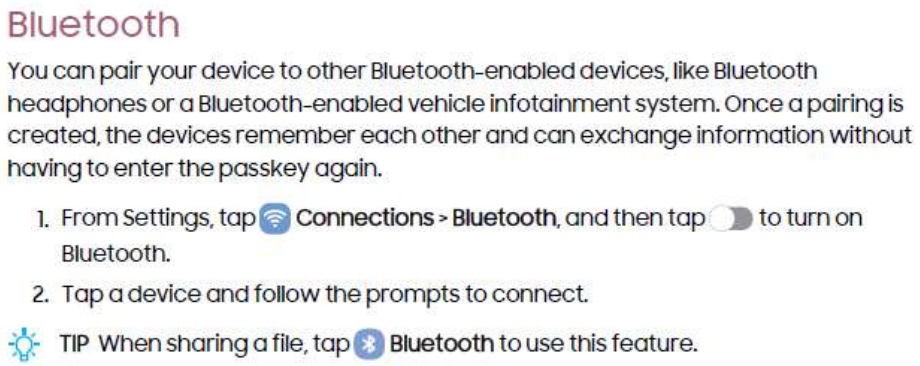
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php 

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6e, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE, aptX HD
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 3.2, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

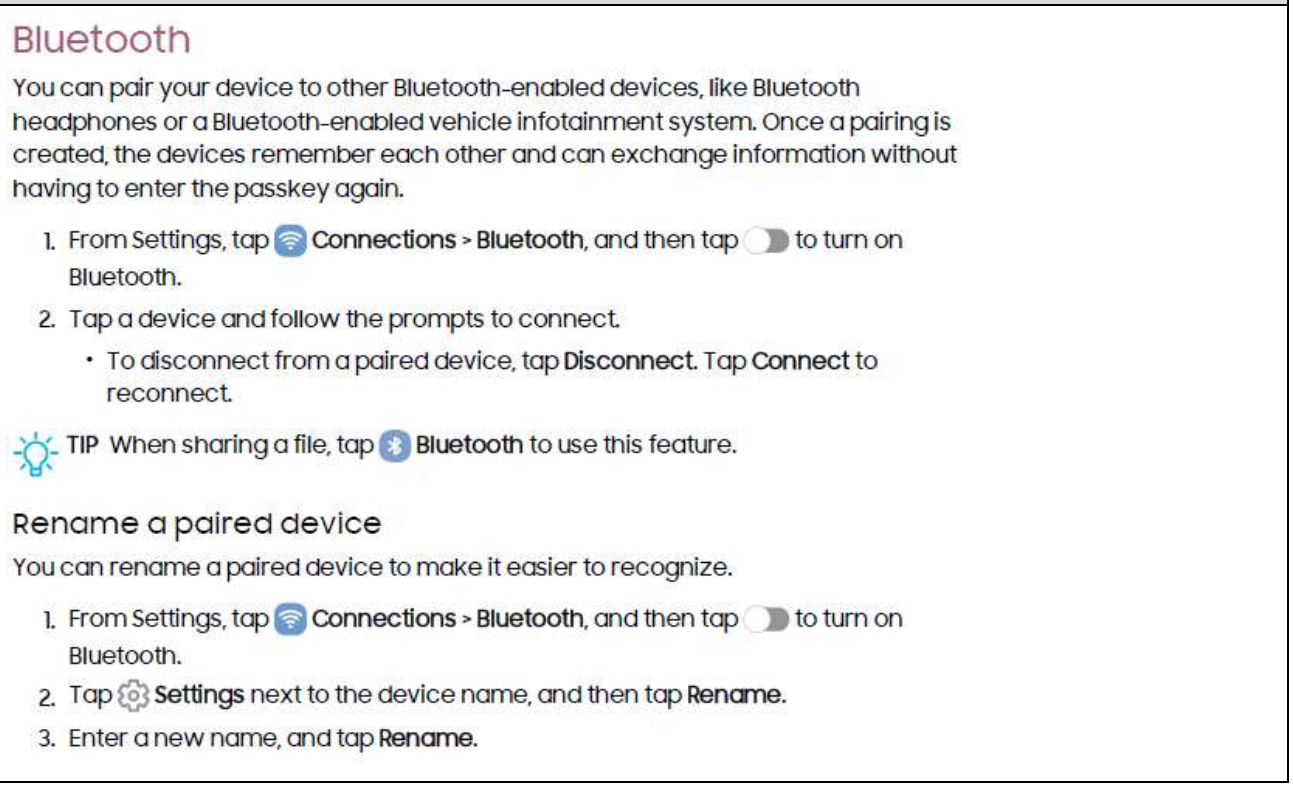
Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Unpair from a Bluetooth device When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Phone name:** Change the name of your device for Bluetooth connections. • **Received files:** View a list of files received using Bluetooth. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy A54 User Guide at pg. 103-105.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

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	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

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and fading.

Two modulation modes are defined. A mandatory mode, called Basic Rate, uses a shaped, binary FM modulation to minimize transceiver complexity. An optional mode, called Enhanced Data Rate, uses PSK modulation and has two variants: π/4-DQPSK and 8DPSK. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate, 2 Mb/s for Enhanced Data Rate using π/4-DQPSK and 3 Mb/s for Enhanced Data Rate using 8DPSK.

Bluetooth

2 FREQUENCY BANDS AND CHANNEL ARRANGEMENT

The Bluetooth system operates in the 2.4 GHz ISM band. This frequency band is 2400 - 2483.5 MHz.

Regulatory Range	RF Channels
2.400-2.4835 GHz	f=2402+k MHz, k=0,…,78

Table 2.1: Operating frequency bands

RF channels are spaced 1 MHz and are ordered in channel number k as shown in Table 2.1.

Bluetooth devices are classified into three power classes based on their highest output power capabilities.

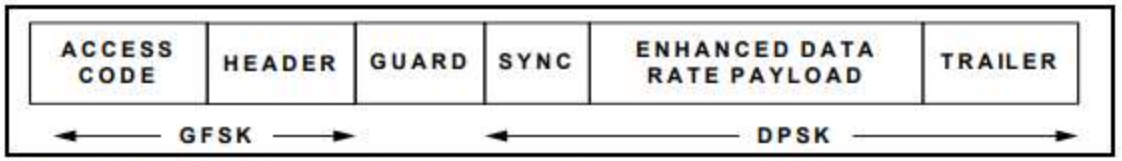
Power Class	Maximum Output Power (Pmax)	Nominal Output Power	Minimum Output Power[1]	Power Control
1	100 mW (20 dBm)	N/A	1 mW (0 dBm)	Pmin<+4 dBm to Pmax Optional: Pmin[2] to Pmax
2	2.5 mW (4 dBm)	1 mW (0 dBm)	0.25 mW (-6 dBm)	Optional: Pmin[2] to Pmax
3	1 mW (0 dBm)	N/A	N/A	Optional: Pmin[2] to Pmax

Table 3.1: Power classes

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	3.1 BASIC RATE **3.1.1 Modulation Characteristics** The Modulation is GFSK (Gaussian Frequency Shift Keying) with a bandwidth-bit period product BT=0.5. The Modulation index shall be between 0.28 and 0.35. A binary one shall be represented by a positive frequency deviation, and a binary zero shall be represented by a negative frequency deviation. The symbol timing shall be less than ±20 ppm.

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	3.2.1 Modulation Characteristics During access code and packet header transmission the Basic Rate GFSK modulation mode shall be used. During the transmission of the synchronization sequence, payload, and trailer sequence a PSK type of modulation with a data rate of 2 Mb/s or optionally 3 Mb/s shall be used. The following subsections specify the PSK modulation for this transmission. ***3.2.1.1 Modulation Method Overview*** The PSK modulation format defined for the 2 Mb/s transmission shall be π/4 rotated differential encoded quaternary phase shift keying (π/4-DQPSK). The PSK modulation format defined for the 3 Mb/s transmission shall be differential encoded 8-ary phase shift keying (8DPSK). The modulation shall employ square-root raised cosine pulse shaping to generate the equivalent lowpass information-bearing signal v(t). The output of the transmitter shall be a bandpass signal that can be represented as $$S(t) = Re\left[v(t)e^{j2\pi F_c t}\right] \quad \text{(EQ 1)}$$ with F_c denoting the carrier frequency. ***3.2.1.2 Differential Phase Encoding*** For the M-ary modulation, the binary data stream $\{b_n\}$, n=1,2,3, ...N, shall be mapped onto a corresponding sequence {Sk}, k=1,2, ...N/$\log_2$(M) of complex valued signal points. M=4 applies for 2 Mb/s and M=8 applies for 3 Mb/s. Gray coding shall be applied as shown in Table 3.4 and Table 3.5. In the event that the length of the binary data stream N is not an integer multiple of log2(M), the last symbol of the sequence $\{S_k\}$ shall be formed by appending data zeros to the appropriate length. The signal points S_k shall be defined by: $$S_k = S_{k-1}e^{j\varphi_k} \qquad k = 1, 2, ..N/\log_2(M) \quad \text{(EQ 2)}$$ $$S_0 = e^{j\phi} \qquad \text{with } \phi \in [0, 2\pi) \quad \text{(EQ 3)}$$ Receiver:

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	4.2.1 Actual Sensitivity Level The actual sensitivity level shall be defined as the input level for which a raw bit error rate (BER) of 0.01% is met. The requirement for a Bluetooth π/4-DQPSK and 8DPSK Enhanced Data Rate receiver shall be an actual sensitivity level of –70 dBm or better. The receiver shall achieve the –70 dBm sensitivity level with any Bluetooth transmitter compliant to the Enhanced Data Rate transmitter specification as defined in Section 3.2. **4.2.6 Reference Signal Definition** A 2 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = π/4-DQPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB A 3 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = 8DPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 1, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Data is transmitted over the air in packets. Two modes are defined: a mandatory mode called Basic Rate and an optional mode called Enhanced Data Rate. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate. Enhanced Data Rate has a primary modulation mode that provides a gross air data rate of 2 Mb/s, and a secondary modulation mode that provides a gross air data rate of 3 Mb/s. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 354, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ The general Enhanced Data Rate packet format is shown in Figure 1.3. Each packet consists of 6 entities: the access code, the header, the guard period, the synchronization sequence, the Enhanced Data Rate payload and the trailer. The access code and header use the same modulation mode as for Basic Rate packets while the synchronization sequence, the Enhanced Data Rate payload and the trailer use the Enhanced Data Rate modulation mode. The guard time allows for the transition between the modulation modes.  *Figure 1.3: Standard Enhanced Data Rate packet format* *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 355, https://www.bluetooth.com/specifications/specs/core-specification-5-0/

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	6.5 PACKET TYPES The packets used on the piconet are related to the logical transports on which they are used. Four logical transports with distinct packet types are defined (see Section 4): • SCO logical transport • eSCO logical transport • ACL logical transport • CSB logical transport. To indicate the different packets on a logical transport, the 4-bit TYPE code is used. The packet types are divided into four segments. The first segment is reserved for control packets. All control packets occupy a single time slot. The second segment is reserved for packets occupying a single time slot. The third segment is reserved for packets occupying three time slots. The fourth segment is reserved for packets occupying five time slots. The slot occupancy is reflected in the segmentation and can directly be derived from the type code. Table 6.2 summarizes the packets defined for the SCO, eSCO, ACL, and CSB logical transport types; a dash means the value is reserved for future use. All packet types with a payload shall use GFSK modulation unless specified otherwise in the following sections. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 410, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ For example, the following screenshots show exemplary Accused Samsung '590 Products using a Bluetooth communication chip to transmit video information by using Bluetooth file sharing:

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	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

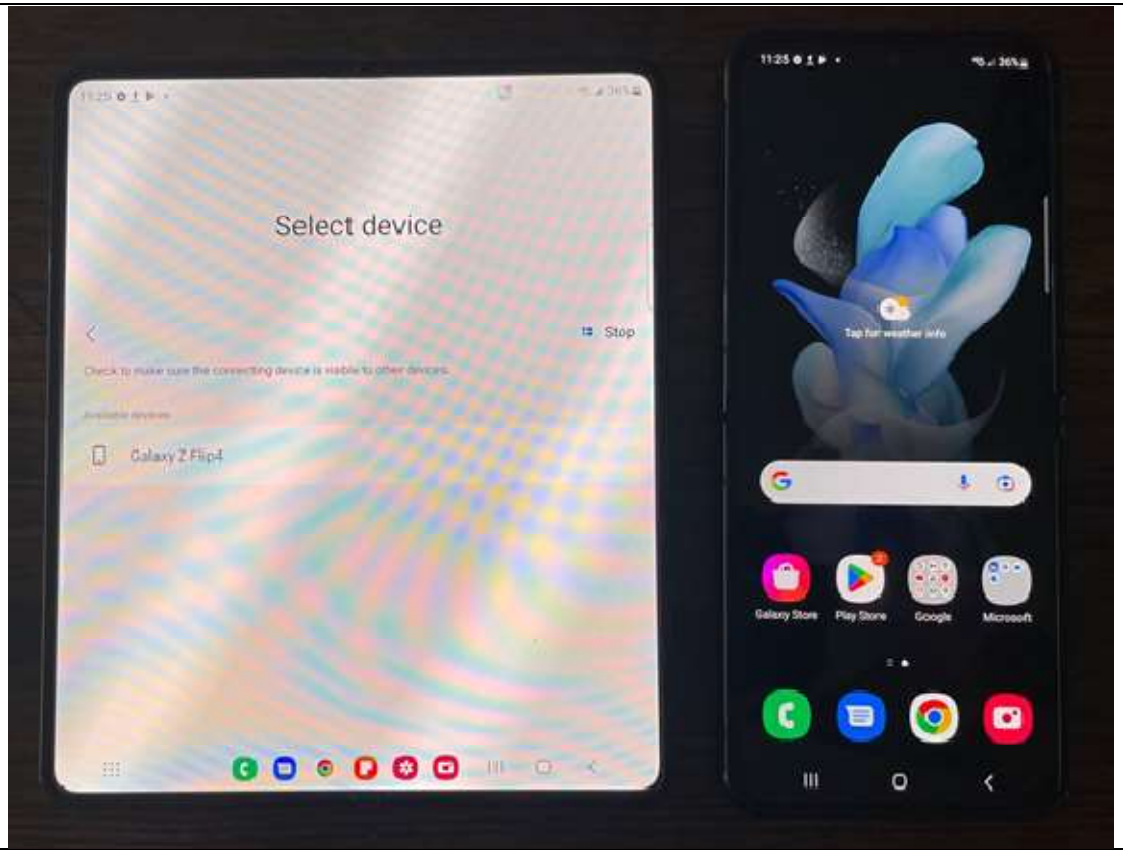


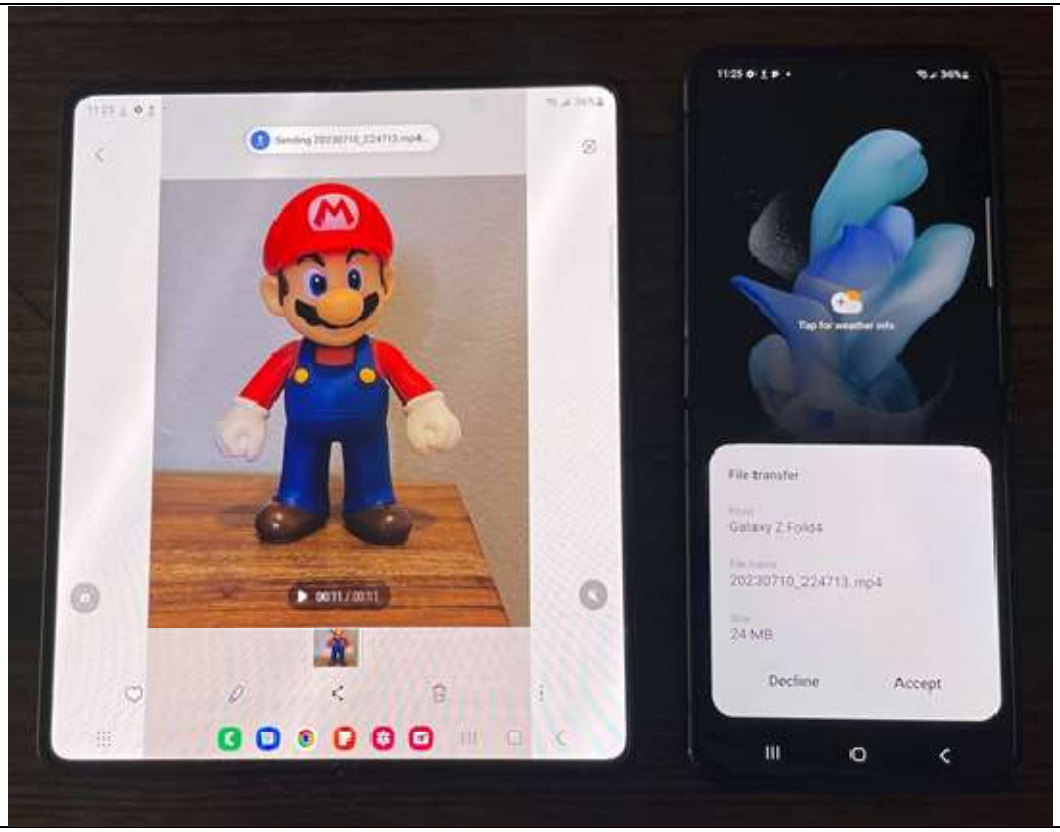
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft


Tap for weather info
File transfer
Galaxy Z Fold4
20230710_224713.mp4
24 MB
Decline
Accept

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

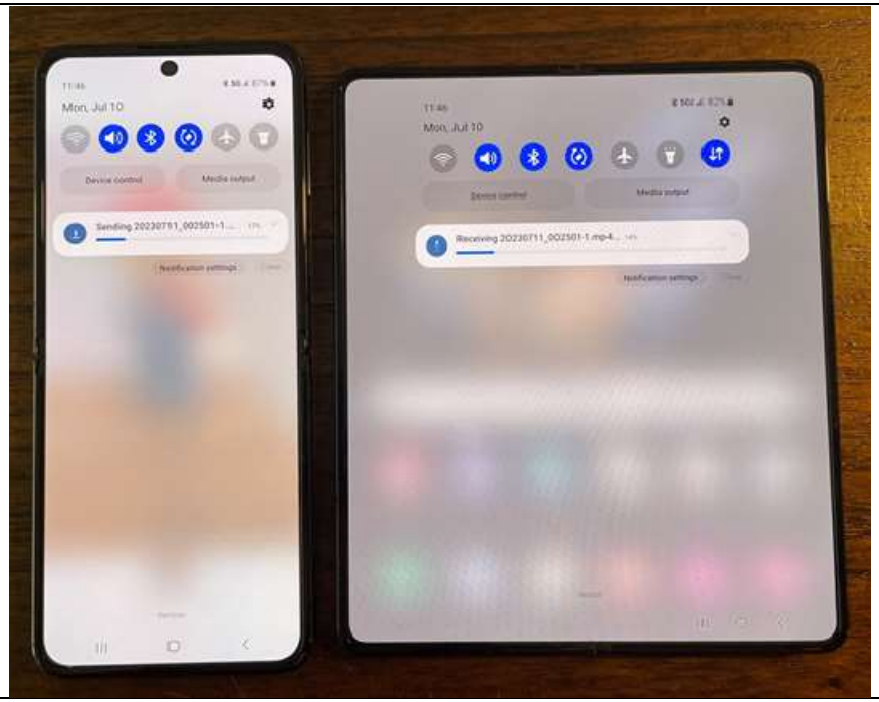
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

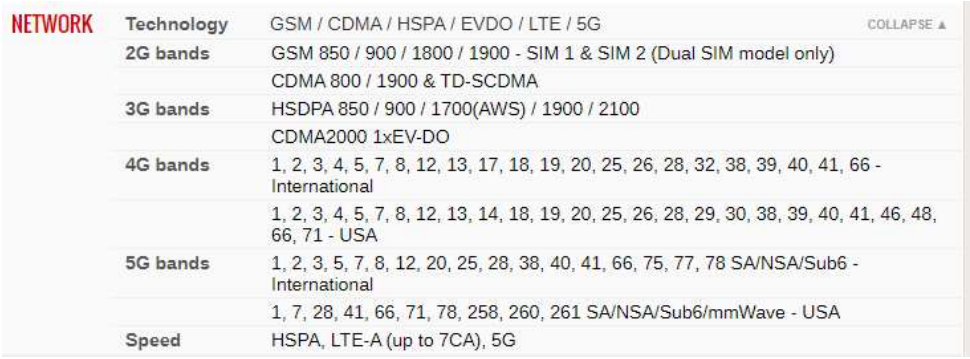
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Bluetooth communication chip and operate in a similar manner.
[1.b] a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a	Each of the Accused Samsung '590 Products includes a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;	For example, each of Accused Samsung '590 Products includes a cellular communication chip implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the cellular communication chip capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band. Specifically, the Accused Samsung '590 Products use a cellular communication chip configured to operate in one or more of 2G/3G/LTE/5G protocols to connect to the external display apparatus (*e.g.*, connect to another smartphone via email/MMS/phone call/Internet) accessing to an internet or a home network (*e.g.*, connect to the internet via cellular data services), and receiving digital information (*e.g.*, receiving digital information via the Internet, email, and/or MMS by using cellular data services). **Galaxy S23 Ultra:** For example, the Galaxy S23 Ultra is configured for at least one or more of GSM, 3G, 4G LTE, and 5G cellular communications in order to connect to another device, access the Internet, and receive digital information by using cellular data services. For example, the Galaxy S23 Ultra comprises a cellular communication chip and processor and/or CPU that is capable of these functions (*e.g.*, via a multi media message (MMS) or email over cellular network).  NETWORK Technology — GSM / CDMA / HSPA / EVDO / LTE / 5G — COLLAPSE ▲ 2G bands — GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only) CDMA 800 / 1900 & TD-SCDMA 3G bands — HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 CDMA2000 1xEV-DO 4G bands — 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA 5G bands — 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International 1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA Speed — HSPA, LTE-A (up to 7CA), 5G Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

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Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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Table 9-20

LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

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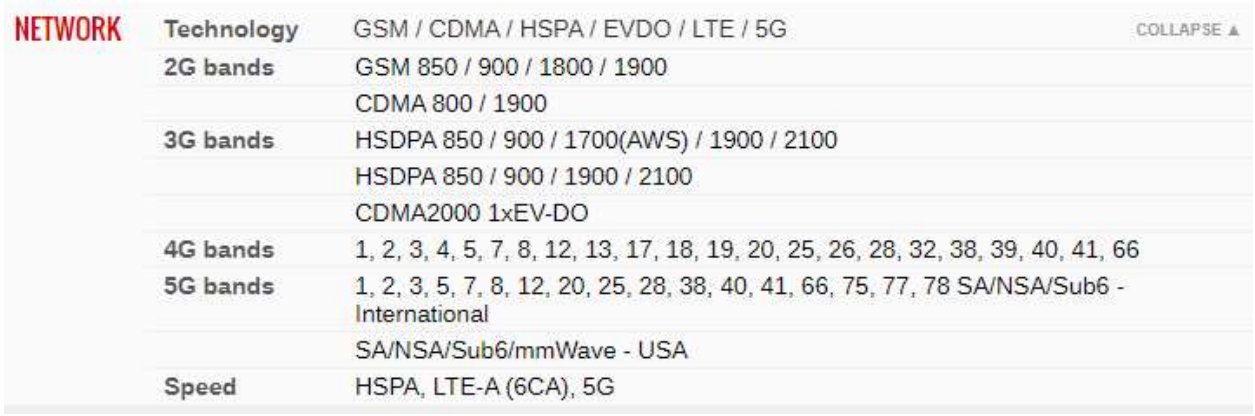
Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



NETWORK		
	Technology	GSM / CDMA / HSPA / EVDO / LTE / 5G COLLAPSE ▲
	2G bands	GSM 850 / 900 / 1800 / 1900
		CDMA 800 / 1900
	3G bands	HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100
		HSDPA 850 / 900 / 1900 / 2100
		CDMA2000 1xEV-DO
	4G bands	1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66
	5G bands	1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International
		SA/NSA/Sub6/mmWave - USA
	Speed	HSPA, LTE-A (6CA), 5G

Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

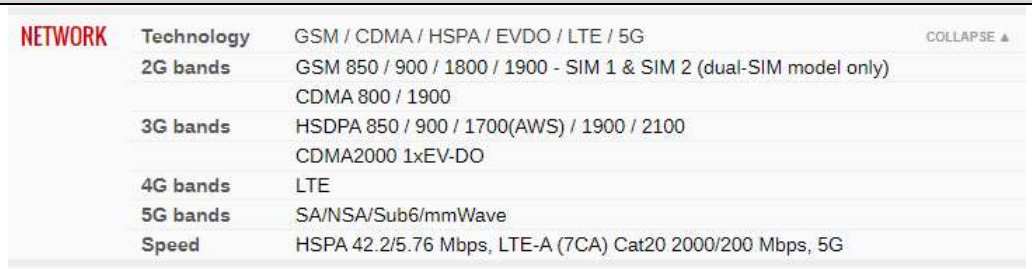
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

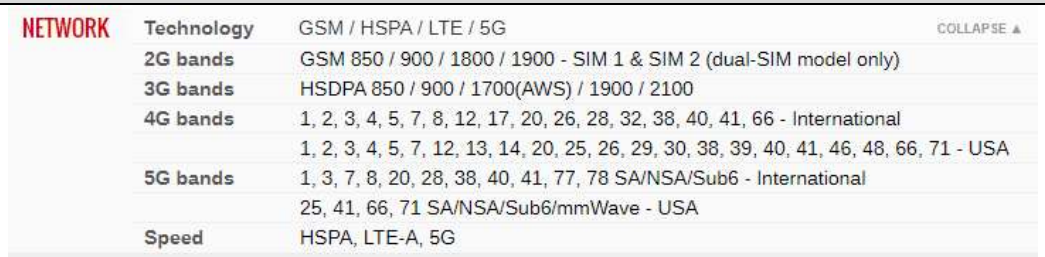
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **Cellular Frequency Bandwidth and Modulation/Demodulation Method:** ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **2G:**

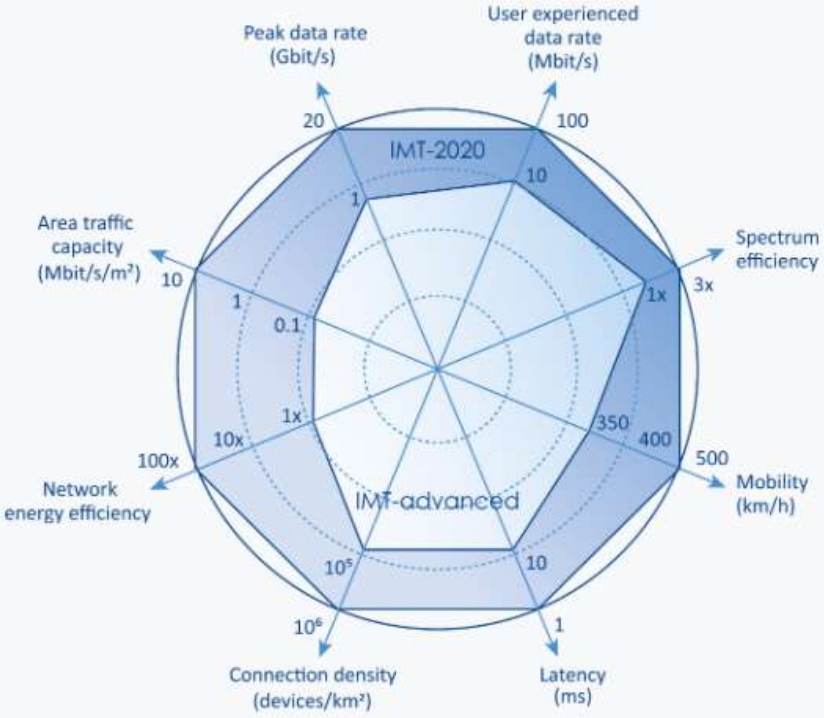
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Global System for Mobile communication (GSM) The technology behind the Global System for Mobile communication (GSM™) uses Gaussian Minimum Shift Keying (GMSK) modulation a variant of Phase Shift Keying (PSK) with Time Division Multiple Access (TDMA) signalling over Frequency Division Duplex (FDD) carriers. The physical layer is specified in 3GPP TS 45.001 and the logical channels in 3GPP TS 45.002. The channel coding is specified in 3GPP TS 45.003 and the modulation is specified in 3GPP TS 45.004. Although originally designed for operation in the 900 MHz band, it was soon adapted for 1800 MHz. The introduction of GSM into North America meant further adaptation to the 800 and 1900 MHz bands. Over the years, the versatility of GSM has resulted in the specifications being adapted to many more frequency bands to meet niche markets. A full list can be found in 3GPP TS 45.005. GSM has a channel spacing of 200kHz and was designed principally for voice telephony, but a range of bearer services was defined (a subset of those available for fixed line Integrated Services Digital Networks, ISDN), allowing circuit-switched data connections at up to 9600 bits/s. At the time of the original system design, this rate compared favourably to those available over fixed connections. However, with the passage of time, fixed connection data rates increased dramatically. The GSM channel structure and modulation technique did not permit faster rates, and thus the High Speed Circuit-Switched Data (HSCSD) service was introduced in the GSM Phase 2+. **Enhanced Data rates for Global Evolution (EDGE)** As its name suggests, EDGE (Enhanced Data rates for Global Evolution) is an enhancement of the GSM™ radio access technology to provide faster bit rates for data applications, both circuit- and packet-switched. As an enhancement of the existing GSM physical layer, EDGE is realized via modifications of the existing layer 1 3GPP specifications TS 45.000 rather than by separate, stand-alone specifications. The increased data rate is accomplished by a new modulation technique (8PSK as opposed to GSM/GPRS's GMSK, yielding a three-fold increase in bit rate for an identical symbol rate) coupled with new channel coding, resulting in improved spectral efficiency. This is important, because it allows EDGE to be introduced piecemeal into existing GSM networks without disrupting the frequency reuse plan of the existing deployment.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	By way of illustration, the General Packet Radio Service (GPRS) can offer a data rate of 115 (and a theoretical data rate of 171) kbit/s whereas EDGE on top of GPRS can increase this theoretical data rate to 384 kbit/s. This is comparable with the rate for early implementations of Wideband Code Division Multiple Access (W-CDMA) of the 3rd generation of UMTS and a reason why EDGE is considered to be the bridge between the 2nd and the 3rd generation of mobile communication systems. https://www.etsi.org/technologies/mobile/2g **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111): • **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h • **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h • **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	LONG TERM EVOLUTION (LTE) Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

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	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example: • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM • LTE DL 4 Rx antenna ports https://www.etsi.org/technologies/mobile/4g **5G:**

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	So 5G should deliver significantly increased operational performance (e.g. increased spectral efficiency, higher data rates, low latency), as well as superior user experience (near to fixed network but offering full mobility and coverage). 5G needs to cater for massive deployment of Internet of Things, while still offering acceptable levels of energy consumption, equipment cost and network deployment and operation cost. It needs to support a wide variety of applications and services. Comparison of key capabilities of IMT-Advanced (4th generation) with IMT-2020 (5th generation) according to ITU-R M.2083: 

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The minimum requirements:

- for peak data rate: Downlink: 20 Gbit/s, Uplink: 10 Gbit/s
- for peak spectral efficiencies: Downlink: 30 bit/s/Hz, Uplink: 15 bit/s/Hz
- user plane latency (single user, small packets): 4 ms for eMBB, 1 ms for URLLC
- control plane latency (idle => active): 10-20ms

Other requirements:

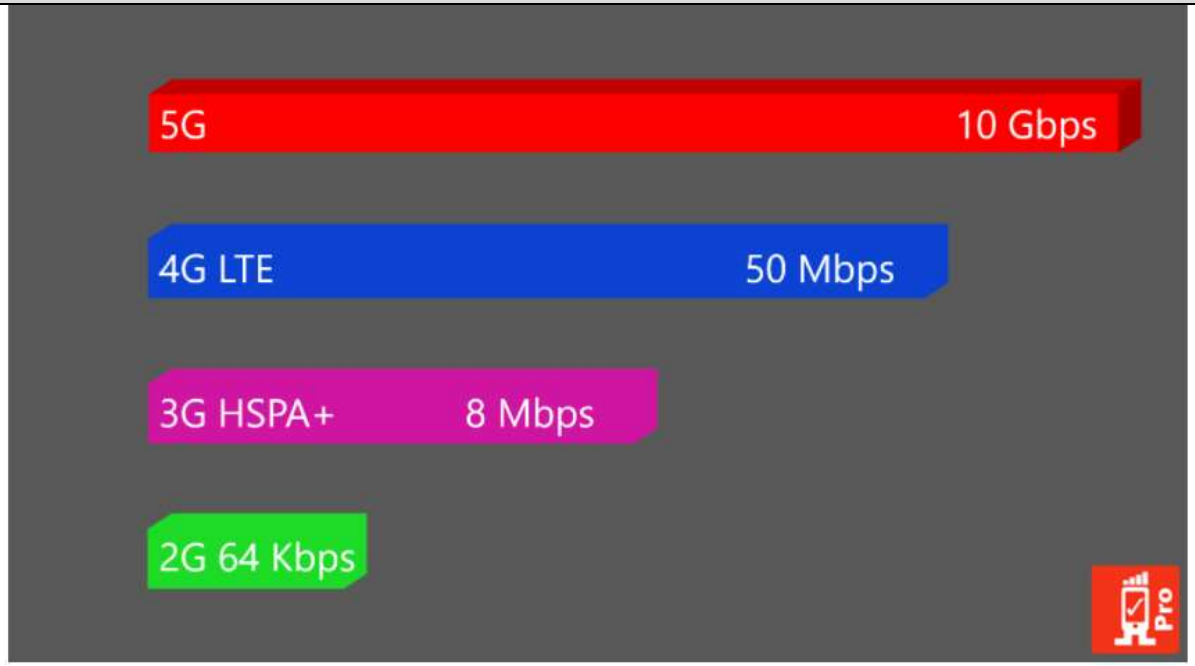
- maximum aggregated system bandwidth: at least 100 MHz, up to 1GHz in higher frequency bands (above 6GHz)
- mobility: up to 500km/h in rural eMBB

- Add support of NR DL 256QAM for frequency range 2 (FR2)

https://www.etsi.org/technologies/mobile/5g

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

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https://rantcell.com/comparison-of-2g-3g-4g-5g.html

Further, AIDA64 reports confirm that the Accused Samsung '590 Products include one or more processors to connect to an external display apparatus, access the Internet, and receive digital information (*e.g.*, via MMS protocol over cellular network and/or via email or phone call):

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

For example, the following screenshots show exemplary Accused Samsung '590 Products using a cellular communication chip to transmit and receive digital video information via MMS and similar functionality also applies to transmitting and receiving digital video via Internet or home network:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) – WiFi off	Video Information Receiving Device (Samsung Galaxy A54 5G) – WiFi off



Video Information Transmitting Device (Samsung Galaxy A54 5G) – WiFi off	Video Information Receiving Device (Samsung Galaxy S23 Ultra) – WiFi off

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



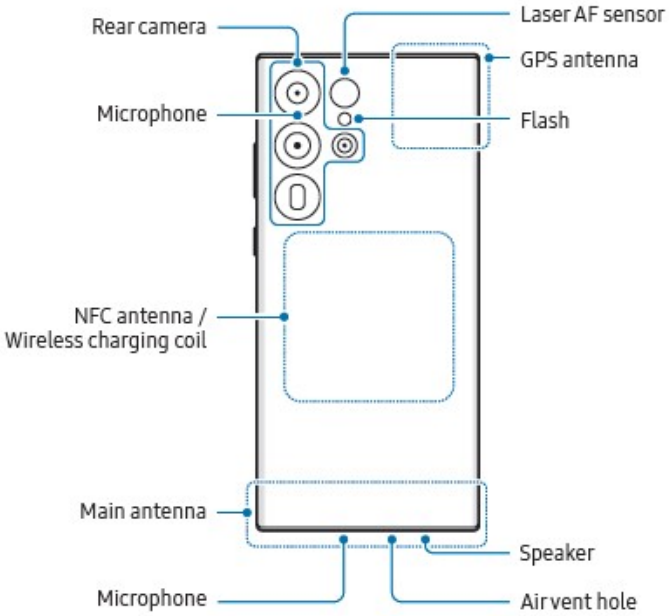
Video Information Transmitting Device (Samsung Galaxt ZFold 4) – WiFi off	Video Information Receiving Device (Samsung Galaxy ZFlip 4) – WiFi off

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

Video Information Transmitting Device (Samsung Galaxy ZFlip 4) – WiFi off	Video Information Receiving Device (Samsung Galaxt ZFold 4) – WiFi off

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a cellular chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/. **Doctrine of Equivalents:** To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a second radio communication circuit, each

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	of these products include software, hardware, or a combination of the two that perform the equivalent functions of connecting by radio to the external display apparatus, accessing to an internet or a home network, and receiving digital information. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, they use an integrated Bluetooth/Wi-Fi chipset and/or cellular communication chipset to perform these functions by using wireless transmissions. The performance of this function achieves substantially the same result, for example, connecting to an external display apparatus, accessing to an internet or a home network, and receiving digital information.
[1.c] a third radio communication circuit capable of transmitting information and using a third transmission frequency band;	Each of the Accused Samsung '590 Products includes a third radio communication circuit capable of transmitting information and using a third transmission frequency band. For example, each of the Accused Samsung '590 Products includes a NFC communication chip capable of transmitting information (*e.g.*, Samsung Pay and/or Samsung Wallet) and using a third transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Series User Guide at pg. 6 (Galaxy S23 Ultra device layout). **NFC and contactless payments** You can use your phone to read near field communications tags (NFC) that contain information about products. You can also use this feature to make payments and buy tickets for transportation or events after downloading the required apps. The device contains a built-in NFC antenna. Handle the device carefully to avoid damaging the NFC antenna.

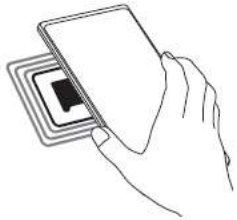
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Reading information from NFC tags

Use the NFC feature to read product information from NFC tags.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

2 Place the NFC antenna area on the back of your device near an NFC tag.
The information from the tag appears.



Ensure that the device's screen is turned on and unlocked. Otherwise, the device will not read NFC tags or receive data.

Making payments with the NFC feature

Before you can use the NFC feature to make payments, you must register for a mobile payment service. To register or get more information about services, contact your service provider.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

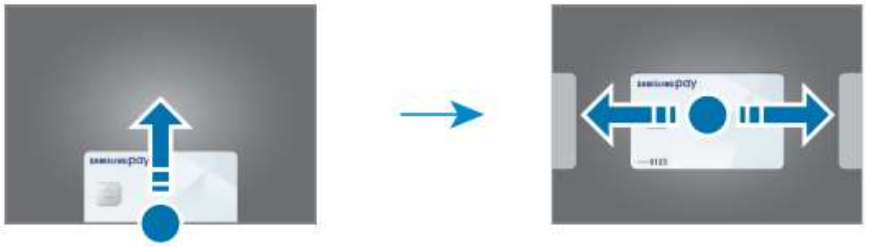
2 Touch the NFC antenna area on the back of your device to the NFC card reader.

To set the default payment app, open the Settings screen and tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment**, and then select an app.

- The payment services list may not include all available payment apps.
- If you update the payment app or install a new one, the payment services that you used before may not work properly. If that is the case, on the Settings screen, tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment** or **Others**, and then select another app instead of the updated or newly installed app. Or, deselect the selected app.

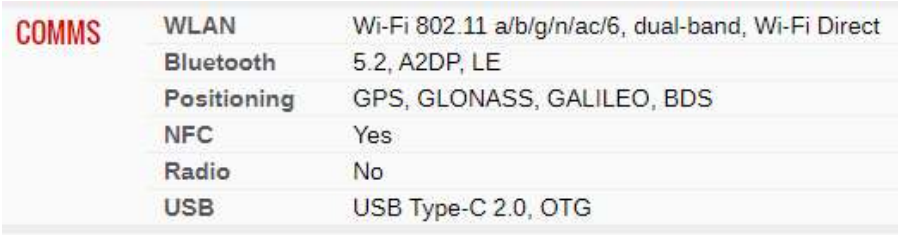
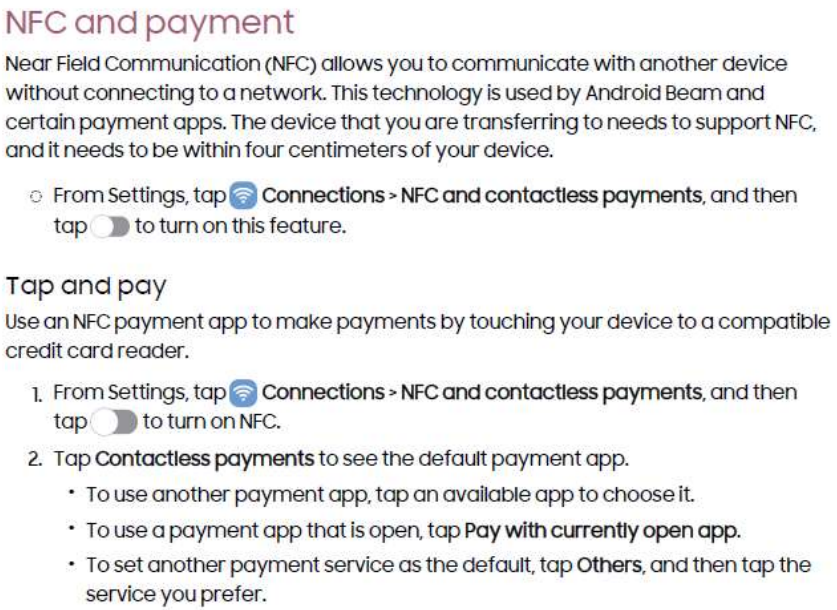
Galaxy S23 Series User Guide at pgs. 125-126.

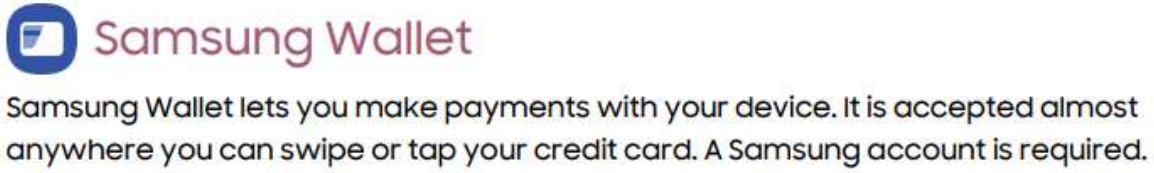
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Setting up Samsung Pay When running this app for the first time or restarting it after performing a data reset, follow the on-screen instructions to complete the initial setup. 1 Open the **Samsung Pay** app. 2 Sign in to your Samsung account and read and agree to the terms and conditions. 3 Register your fingerprint and a PIN to use when making payments. This PIN will be used to verify various actions in Samsung Pay, such as making payments and unlocking the app. **Registering cards** Open the **Samsung Pay** app and follow the on-screen instructions to complete your card registration.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	## Making payments 1 Drag a card image at the bottom of the screen upwards. Alternatively, open the **Samsung Pay** app. Then, on the cards list, swipe to the left or right and select a card to use.  2 Scan your fingerprint or enter the payment PIN you set. 3 Touch the back of your device to the card reader. When the card reader recognizes the card information, the payment will be processed. • Payments may not be processed depending on your network connection. • The verification method for payments may vary depending on the card reader. ### Cancelling payments You can cancel payments by visiting the place where you made them. On the cards list, swipe to the left or right to select the card you used. Follow the on-screen instructions to complete payment cancellation. Galaxy S23 Series User Guide at pgs. 94-95.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

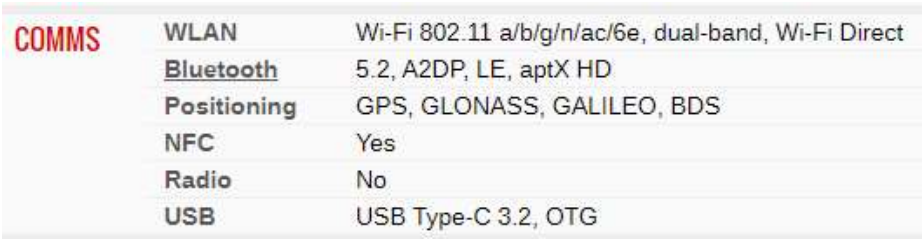
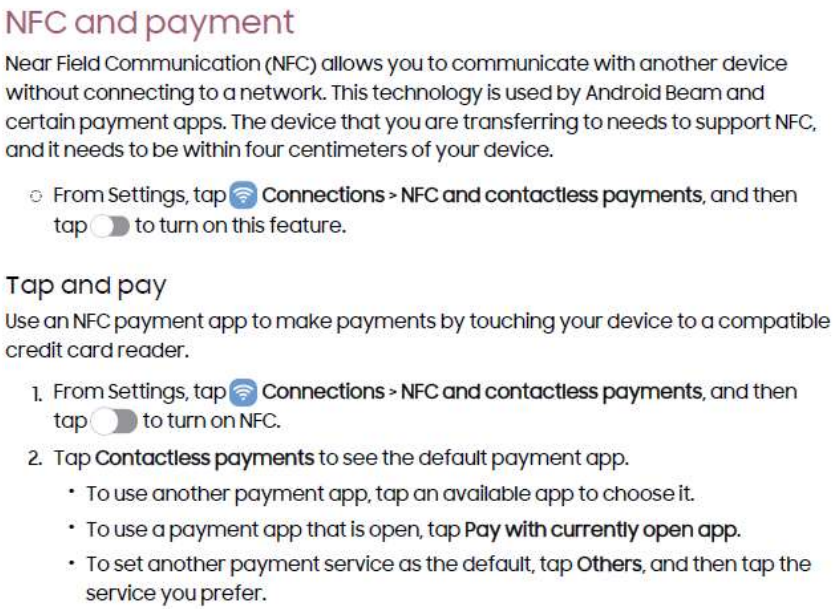
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:**  Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

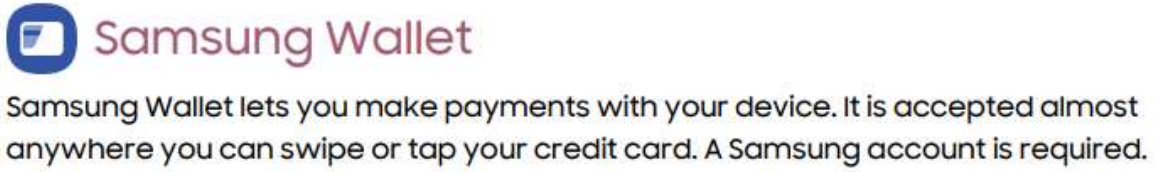
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
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U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
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NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
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GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
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LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
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LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

NFC and payment

Near Field Communication (NFC) allows you to communicate with another device without connecting to a network. This technology is used by Android Beam and certain payment apps. The device that you are transferring to needs to support NFC, and it needs to be within four centimeters of your device.

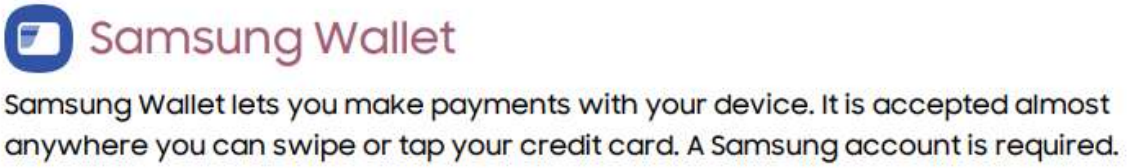
- From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on this feature.

Tap and pay

Use an NFC payment app to make payments by touching your device to a compatible credit card reader.

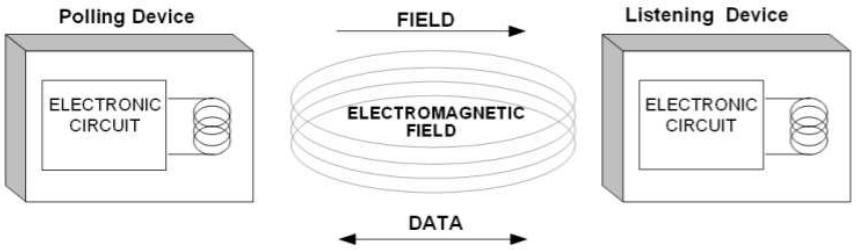
1. From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on NFC.
2. Tap **Contactless payments** to see the default payment app.
   - To use another payment app, tap an available app to choose it.
   - To use a payment app that is open, tap **Pay with currently open app**.
   - To set another payment service as the default, tap **Others**, and then tap the service you prefer.

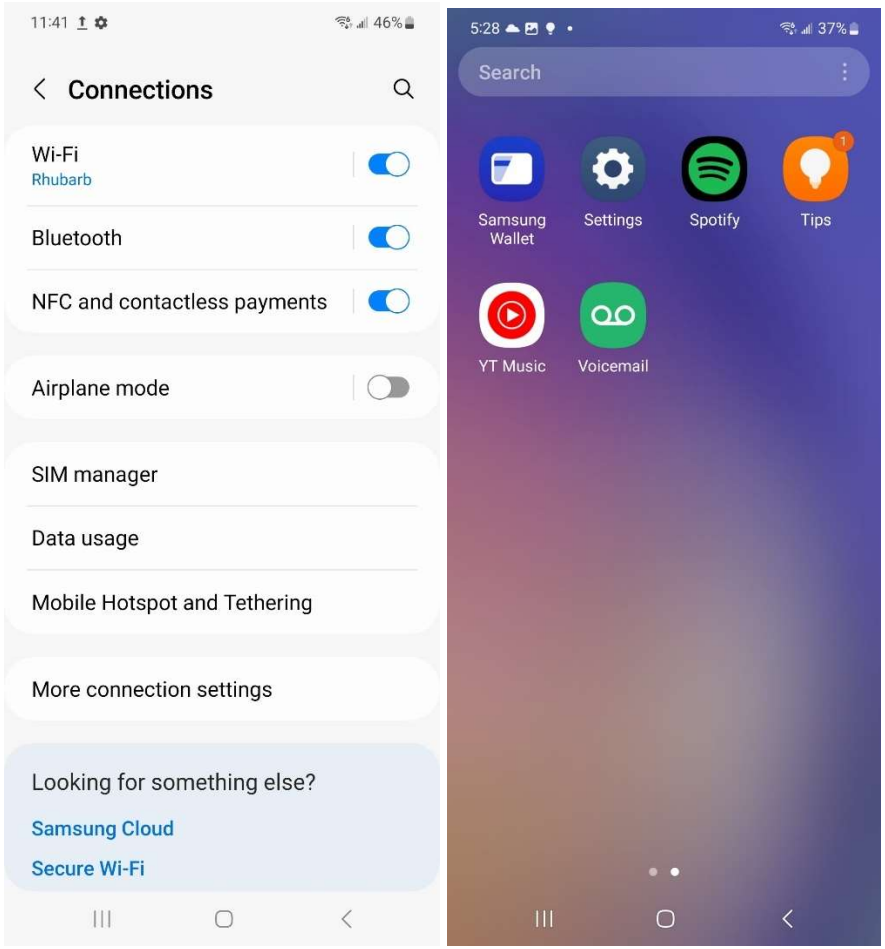
Galaxy A54 User Guide at pg. 105.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 57.

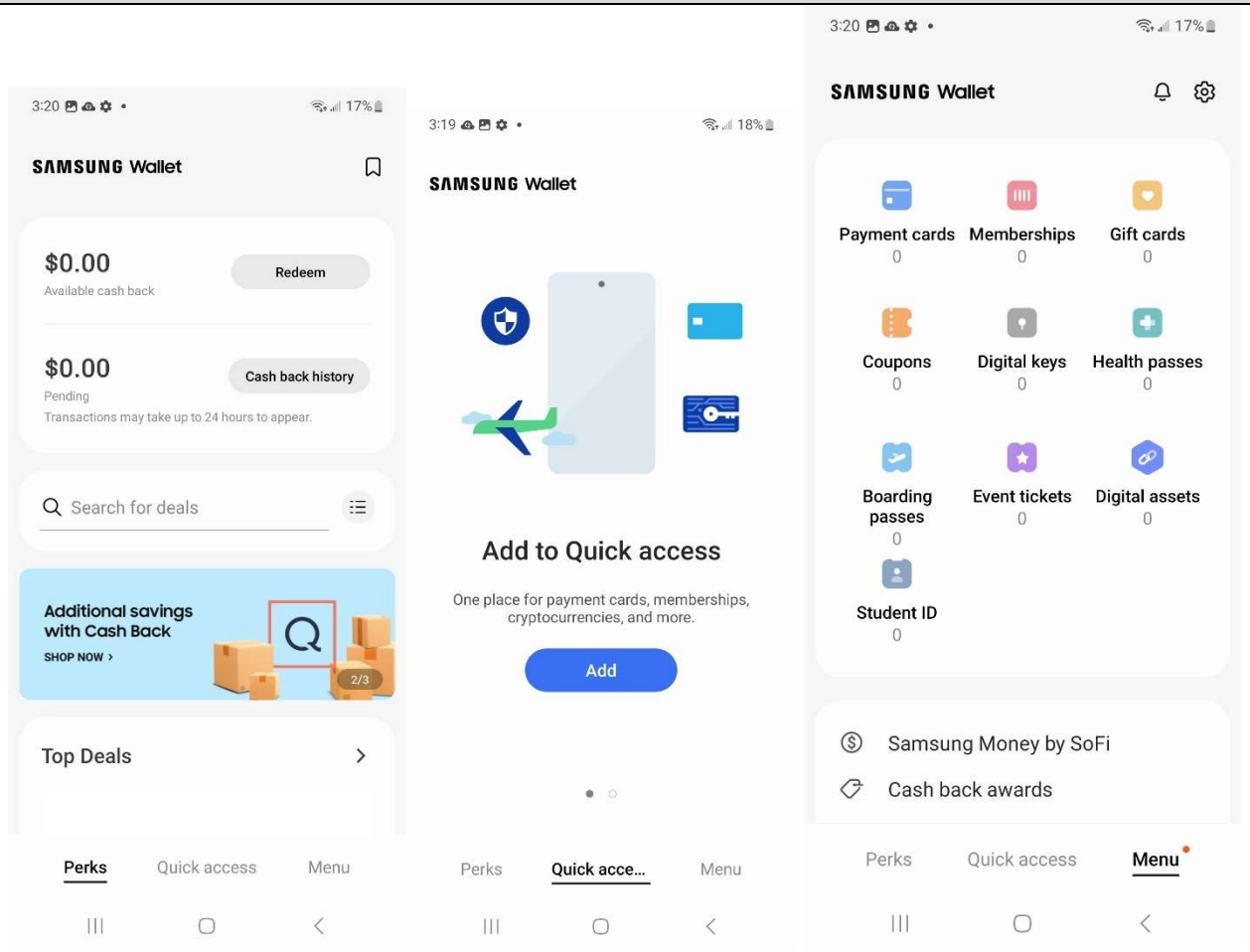
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

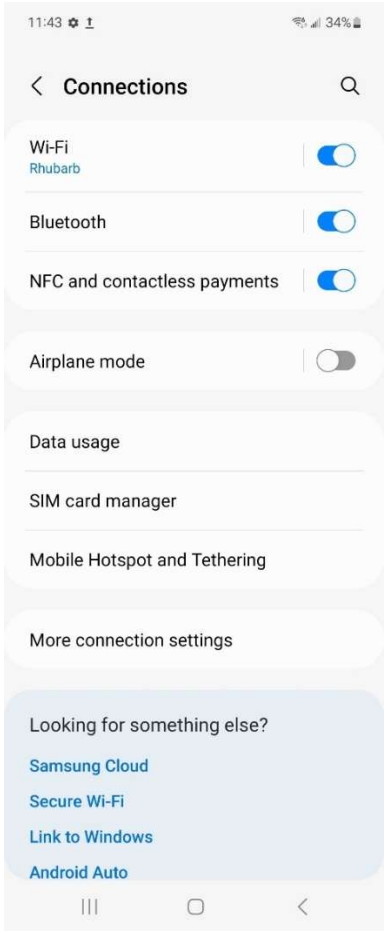
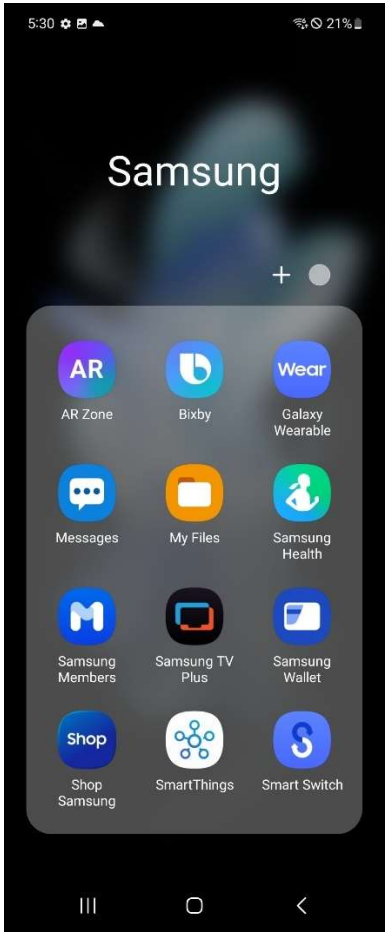
Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **NFC Frequency Bandwidth:** 3 Basics of Data Transmission with NFC Like the RFID Standards 14443 and FeliCa NFC uses an inductive coupling. Similar to the transformer principle, the magnetic near-field of two conductor coils is used to couple the polling device (initiator) and listening device (target).  *Figure 1: Polling device (initiator) and listening device (target) configuration [15]* The operating frequency is 13.56 MHz, and a bitrate of 106 kbit/s (partly also 212 kbit/s and 424 kbit/s) is used. Modulation schemes are amplitude on/off keying (OOK) with different modulation depth (100 % or 10 %) and BPSK. *See* https://cdn.rohde-schwarz.com/pws/dl_downloads/dl_application/application_notes/1ma182/1MA182_5E_NFC_WHITE_PAPER.pdf For example, the following screenshots show exemplary Accused Samsung '590 Products using a NFC communication chip to transmit information by using Samsung Pay and/or Samsung Wallet applications:

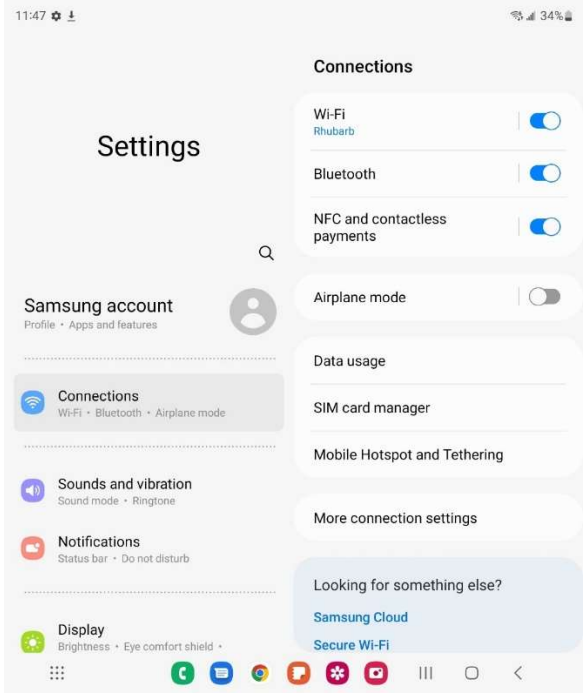
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G: 

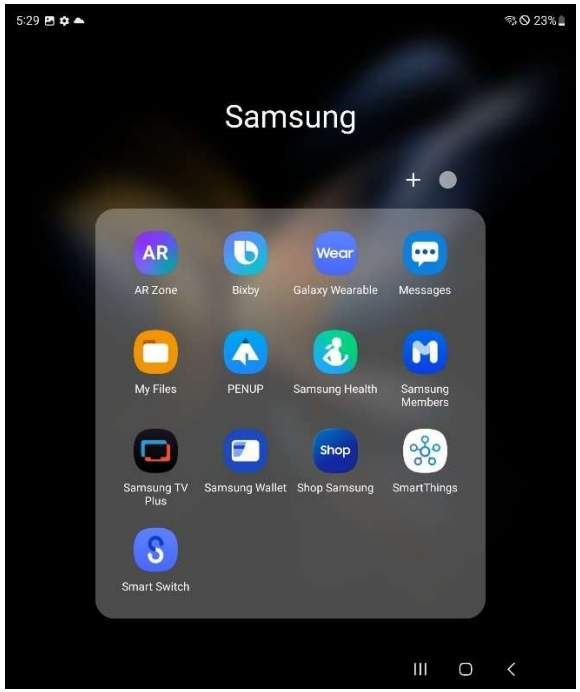
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy ZFlip 4:   Samsung Galaxy ZFold 4:

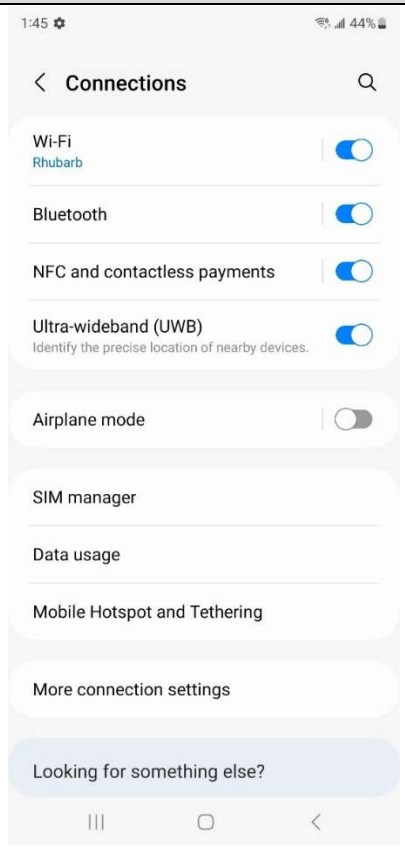
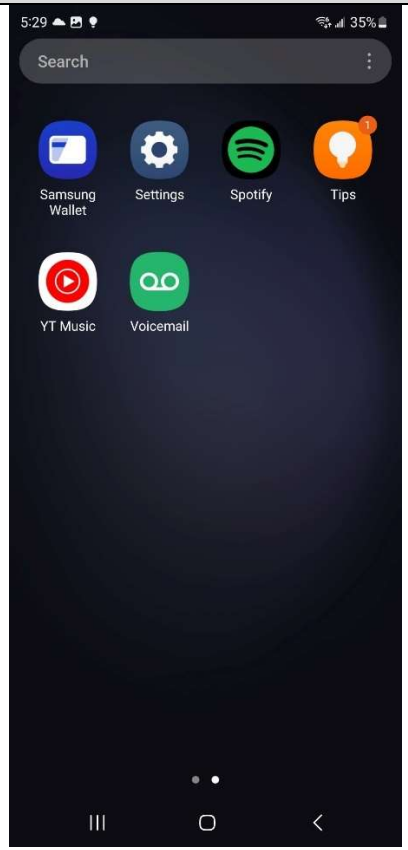
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



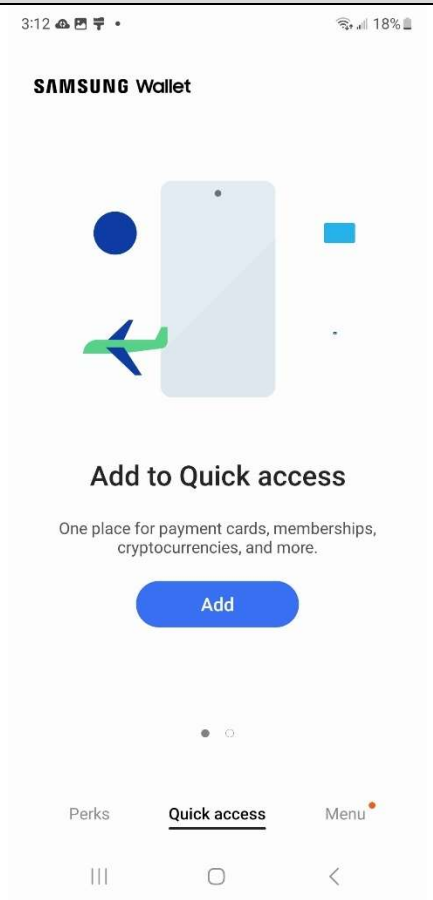


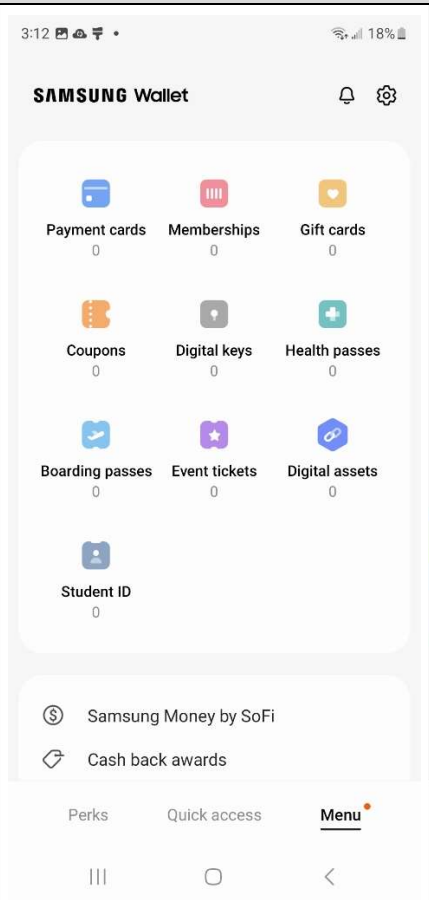
Samsung Galaxy S23 Ultra:

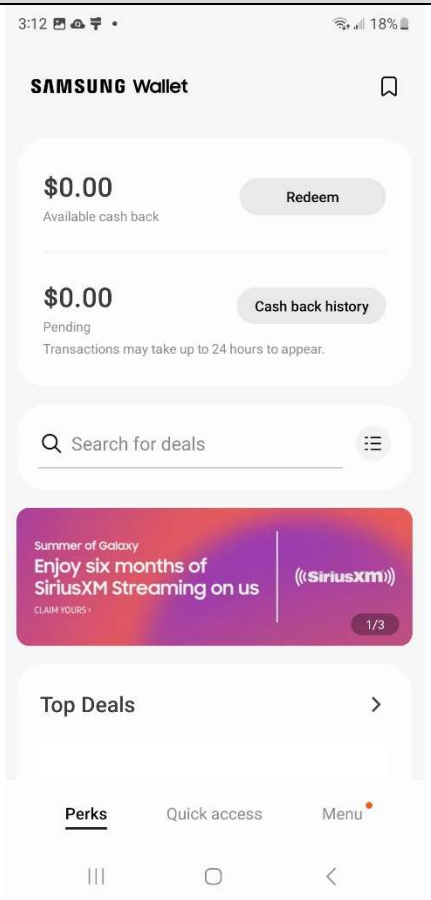
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 

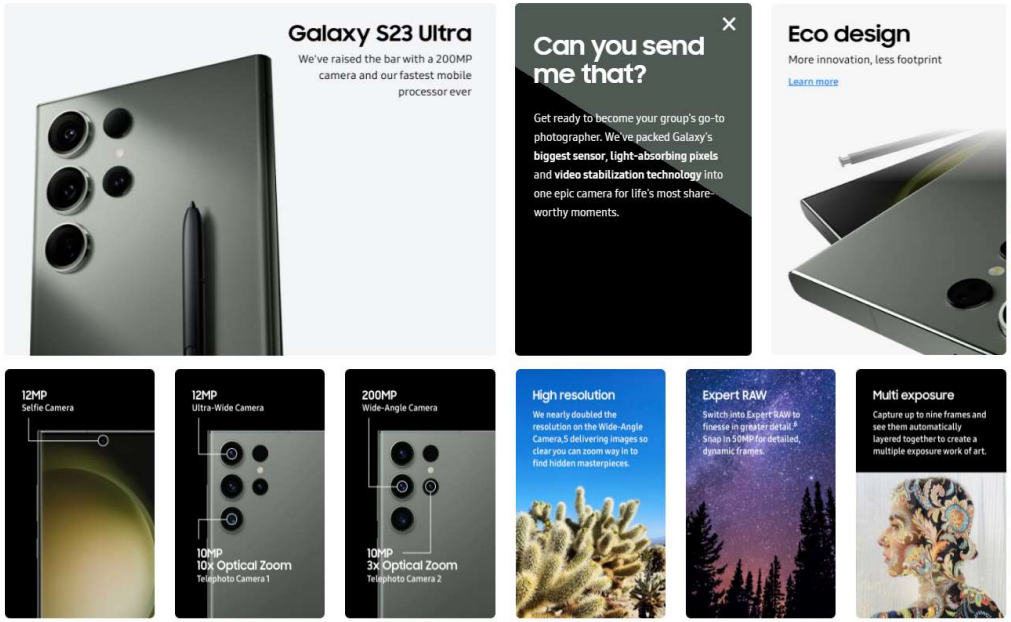
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement







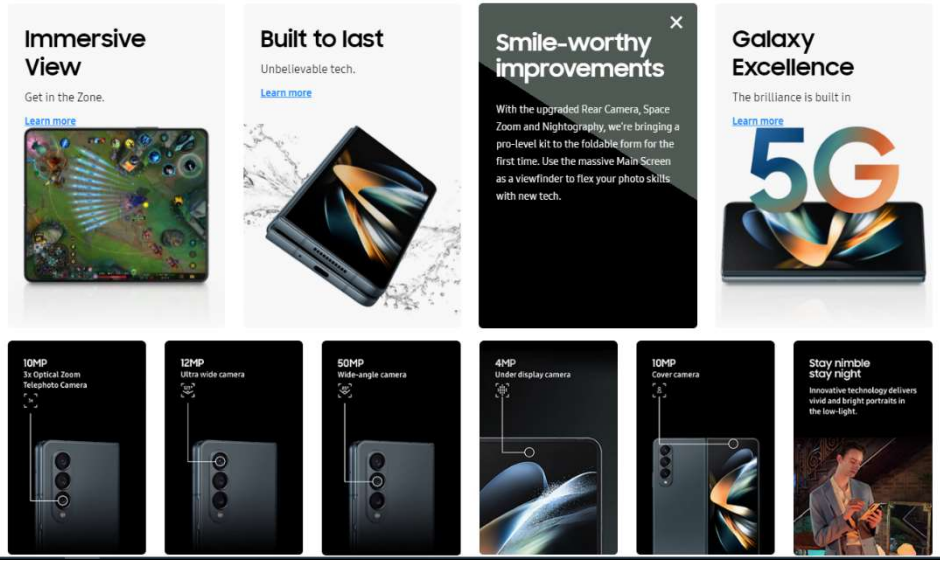
See also Appendix 8 showing that the remaining Accused Samsung '590 Products include a NFC communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00089063/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[1.d] an imaging circuit capable of receiving video information and still picture information via an optical system;	Each of the Accused Samsung '590 Products includes an imaging circuit capable of receiving video information and still picture information via an optical system. For example, each of the Accused Samsung '590 Products include a chipset that works in conjunction with a camera for receiving video information and still picture information from an optical system (*e.g.*, a camera that generates video and still pictures). 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Quad	200 MP, f/1.7, 24mm (wide), 1/1.3", 0.6µm, multi-directional PDAF, Laser AF, OIS
		10 MP, f/4.9, 230mm (periscope telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 10x optical zoom
		10 MP, f/2.4, 70mm (telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55", 1.4µm, Dual Pixel PDAF, Super Steady video
	Features	LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/240fps, 1080p@960fps, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), Dual Pixel PDAF
	Features	Dual video call, Auto-HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Triple	50 MP, f/1.8, 23mm (wide), 1.0µm, Dual Pixel PDAF, OIS
		10 MP, f/2.4, 66mm (telephoto), 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 123˚, 12mm (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	8K@24fps, 4K@60fps, 1080p@60/240fps (gyro-EIS), 720p@960fps (gyro-EIS), HDR10+
SELFIE CAMERA	Single	4 MP, f/1.8, 26mm (wide), 2.0µm, under display
		Cover camera:
		10 MP, f/2.2, 24mm (wide), 1/3", 1.22µm
	Features	HDR
	Video	4K@30/60fps, 1080p@30/60fps, gyro-EIS

Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

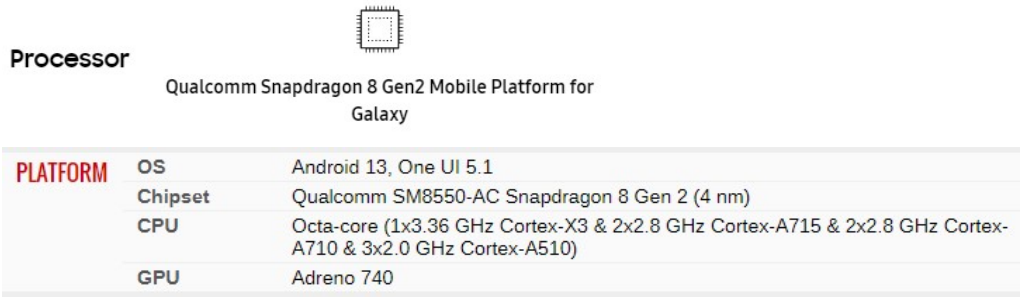
MAIN CAMERA	Dual	12 MP, f/1.8, 24mm (wide), 1/1.76", 1.8µm, Dual Pixel PDAF, OIS
		12 MP, f/2.2, 123˚ (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	4K@30/60fps, 1080p@60/240fps, 720p@960fps, HDR10+
SELFIE CAMERA	Single	10 MP, f/2.4, 26mm (wide), 1.22µm
	Features	HDR
	Video	4K@30fps

Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

MAIN CAMERA	Triple	50 MP, f/1.8, (wide), 1/1.56", 1.0µm, PDAF, OIS 12 MP, f/2.2, 123˚ (ultrawide), 1.12µm 5 MP, f/2.4, (macro)
	Features	LED flash, panorama, HDR
	Video	4K@30fps, 1080p@30/60fps, 720p@480fps
SELFIE CAMERA	Single	32 MP, f/2.2, 26mm (wide), 1/2.8", 0.8µm
	Video	4K@30fps, 1080p@30/60fps

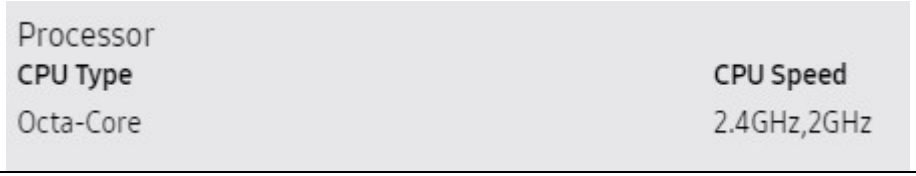
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



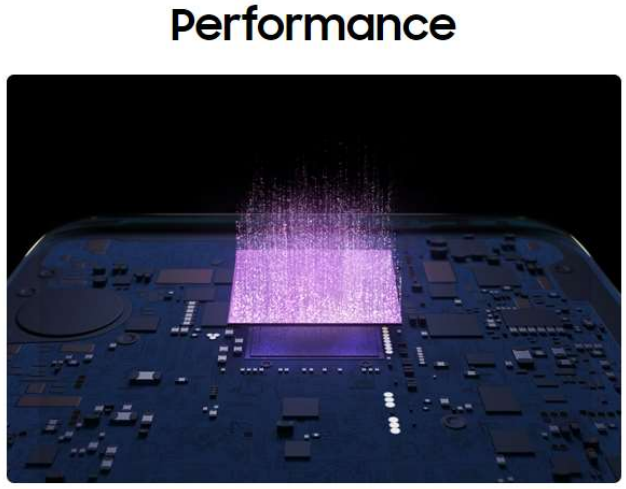
Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

In addition, the AIDA64 Reports show that each of the Accused Samsung '590 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (*e.g.*, CPU, ISP, or DSP) processes video.

Product	AIDA 64 Report- Camera

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy S23 Ultra	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 6.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 3.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 2.20 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy Z Fold4	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.40 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
		Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.30 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.74 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy Z Flip4	<< Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 5.00 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.17 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.70 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy A54 5G	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.54 mm Focus Modes: infinity, auto, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 8.0 MP (3264 × 2448) Focal Length: 3.72 mm

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

<< Rear-Facing Camera >>
Resolution: 12 MP (4000 × 3000)
Focal Length: 1.74 mm
Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

<< Front-Facing Camera >>
Resolution: 5.7 MP (2880 × 1980)
Focal Length: 3.72 mm
Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

The AIDA64 Reports and tech specs show that the Accused Samsung '590 Products contain one or more processors.

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

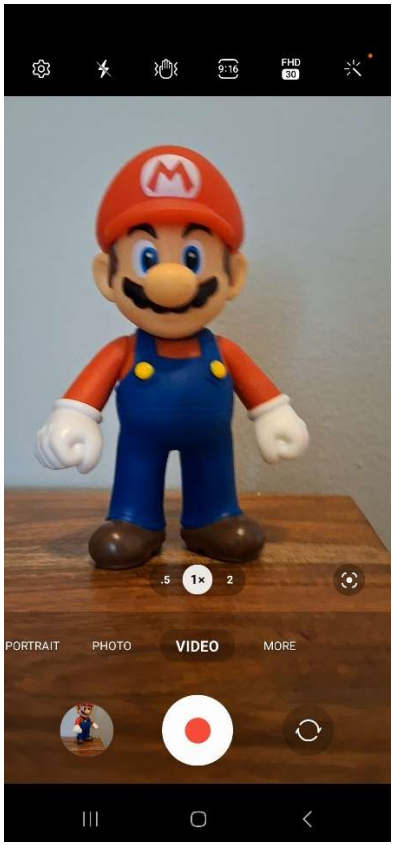
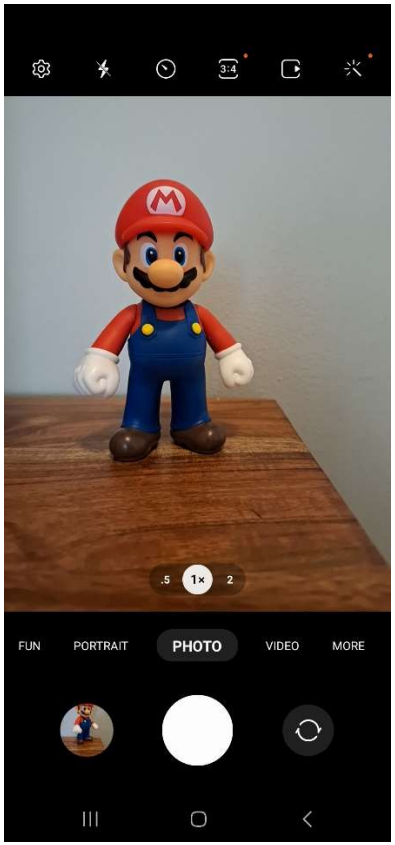
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

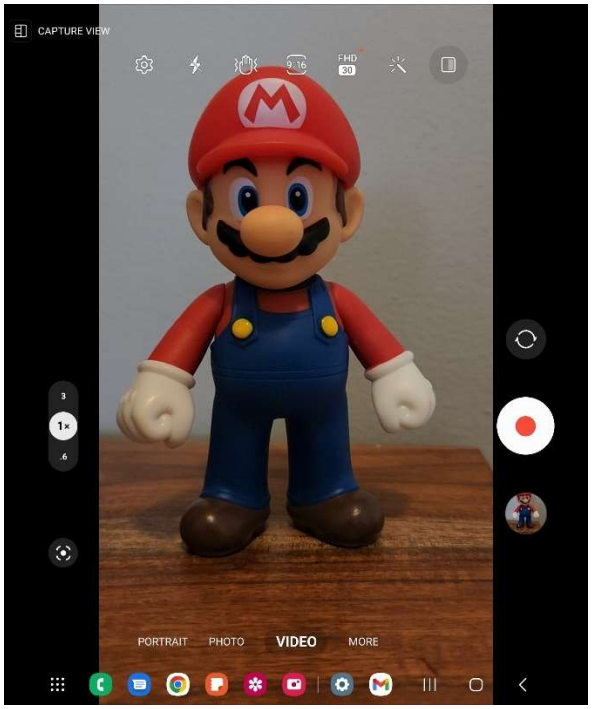
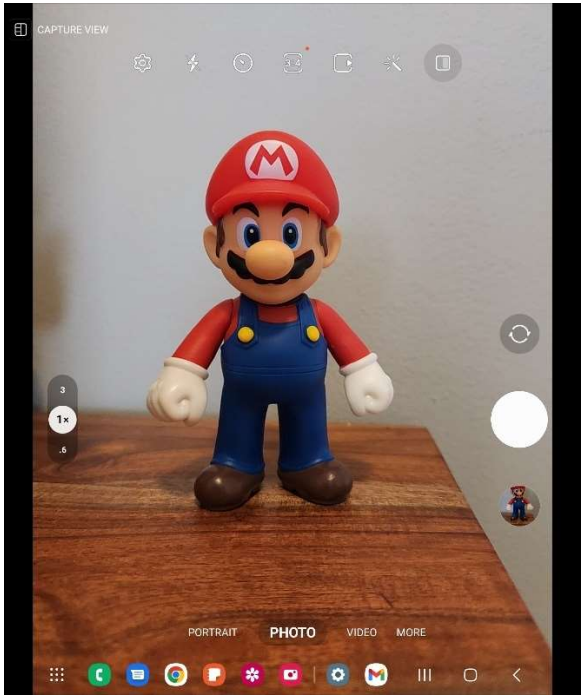
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show exemplary Accused Samsung '590 Products recording video and taking video and still pictures:

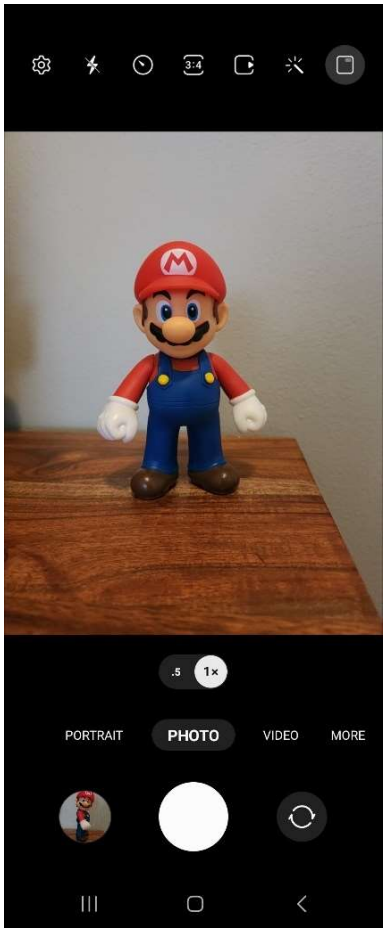
Camera Recording Video (Samsung Galaxy S23 Ultra)	Camera Taking Still Picture (Samsung Galaxy S23 Ultra)





U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy A54 G)	Camera Taking Still Picture (Samsung Galaxy A54G)
		

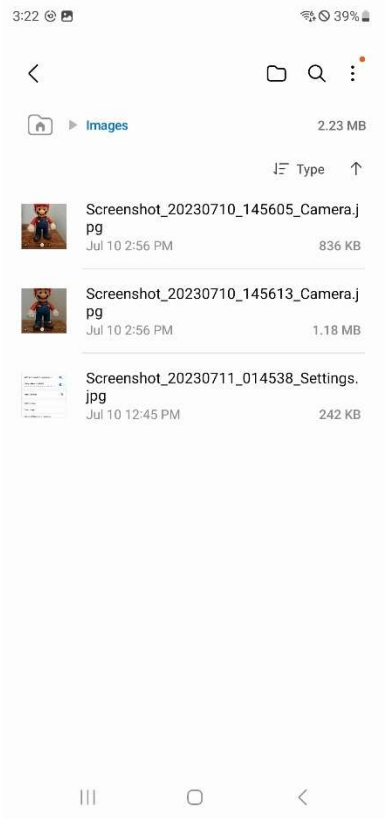
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy Z Fold4)	Camera Taking Still Picture (Samsung Galaxy Z Fold4)
		

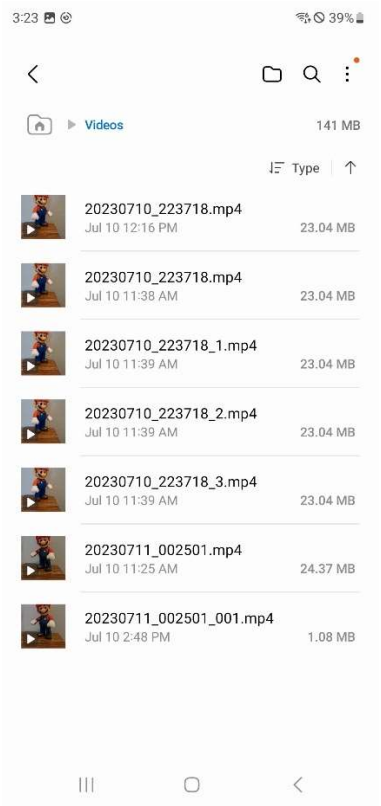
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy Z Flip4)	Camera Taking Still Picture (Samsung Galaxy Z Flip4)
		
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include front and back cameras for recording video and still pictures. *See*	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS00089063/; *see also* https://www.samsung.com/us/support/answer/ANS00079026/.
[1.e] a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;	Each of the Accused Samsung '590 Products includes a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method. For example, each of the Accused Samsung '590 Products includes a compression circuit compressing the still picture information via at least the JPEG standard compression scheme and the video information via at least the MPEG-4 compression scheme. For example, the following screenshots show exemplary Accused Samsung '590 Products using a compression circuit compressing the still picture information via at least the JPEG standard compression scheme and the video information via at least the MPEG-4 compression scheme:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

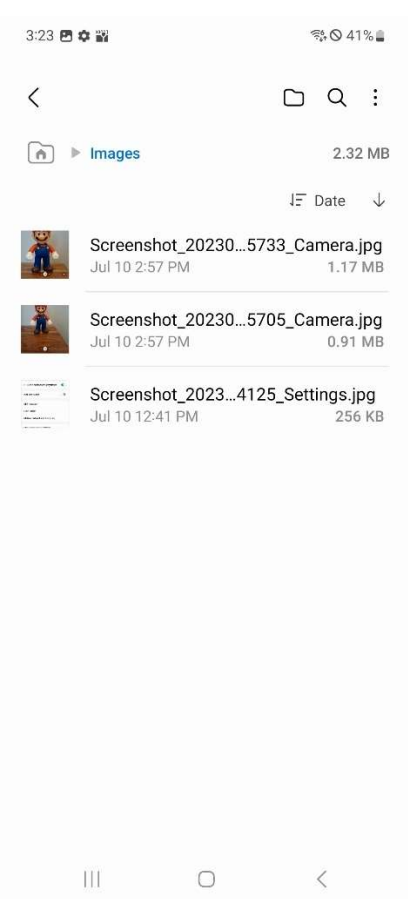
Still picture information using a ".jpg" file extension (Samsung Galaxy S23 Ultra)	Video information using a ".mp4" file extension (Samsung Galaxy S23 Ultra)

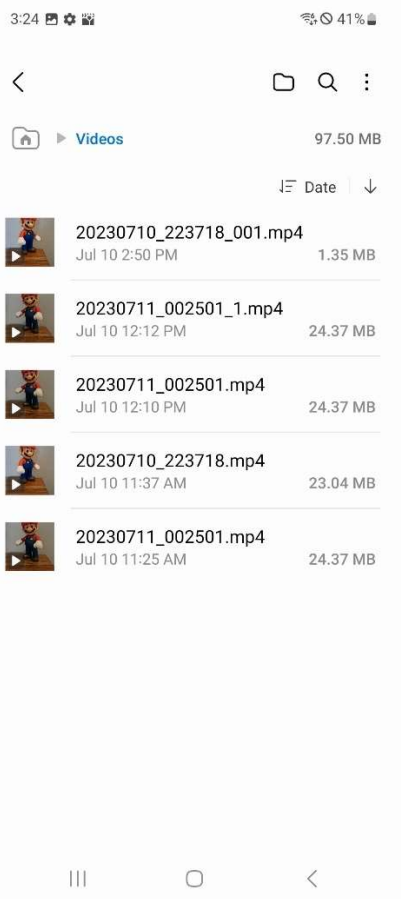


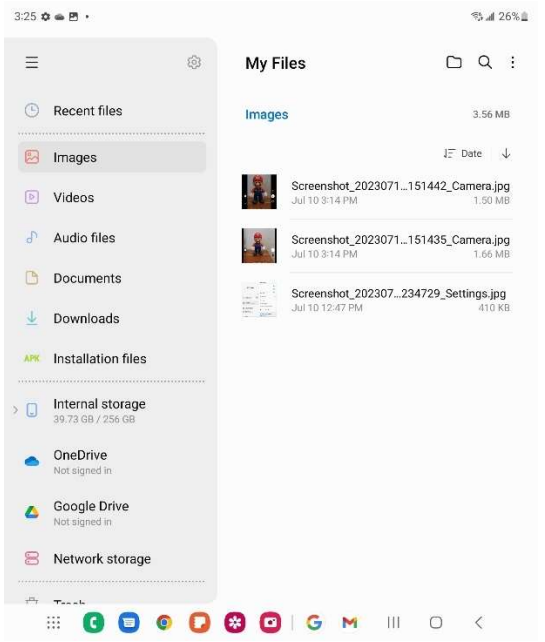
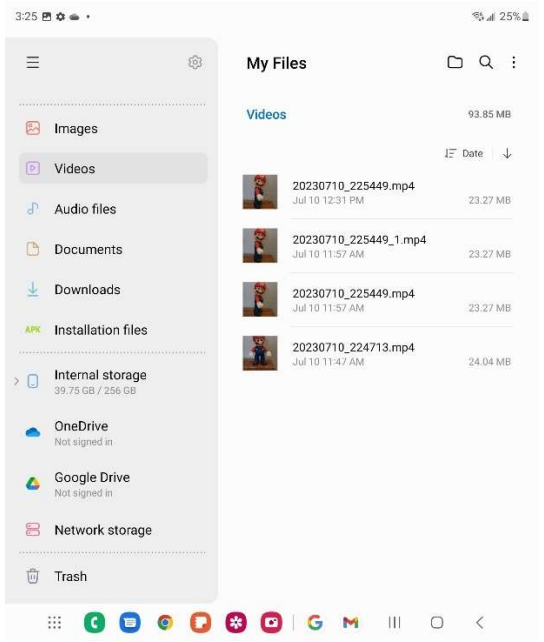


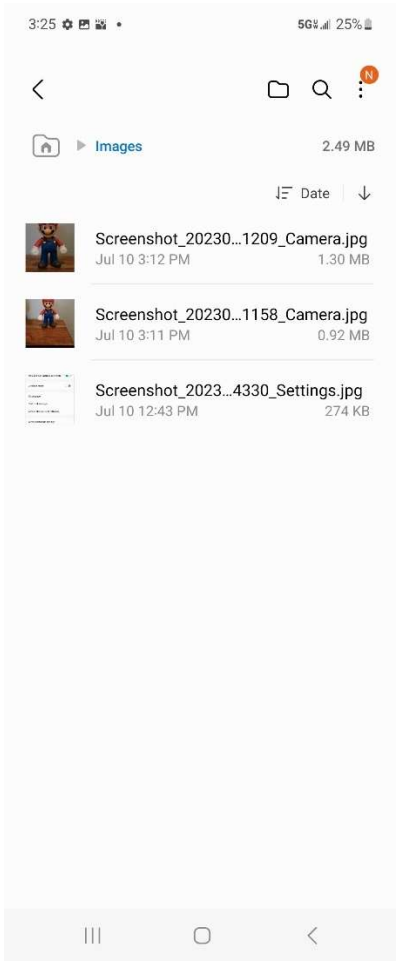
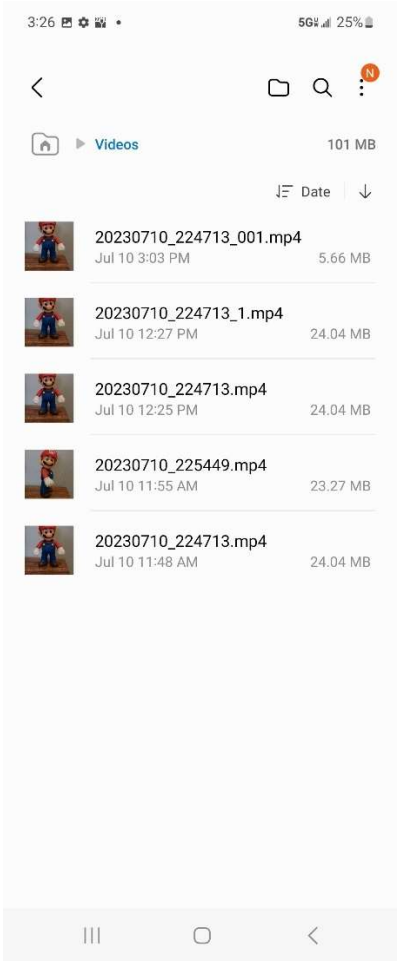
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Still picture information using a ".jpg" file extension (Samsung Galaxy A54 5G)	Video information using a ".mp4" file extension (Samsung Galaxy A54 5G)





U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Still picture information using a ".jpg" file extension (Samsung Galaxy ZFlip 4)	Video information using a ".mp4" file extension (Samsung Galaxy ZFlip 4)
		

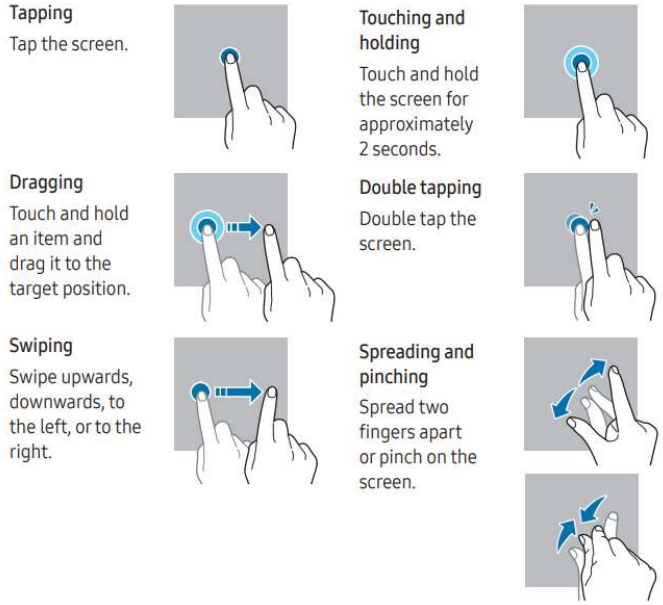
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Still picture information using a ".jpg" file extension (Samsung Galaxy ZFold 4)	Video information using a ".mp4" file extension (Samsung Galaxy ZFold 4)
		

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include similar compressions circuit.
[1.f] an input device capable of receiving a user indication;	Each of the Accused Samsung '590 Products includes an input device capable of receiving a user indication. For example, each of the Accused Samsung '590 Products includes a touch screen capable of receiving a user indication. **Galaxy S23 Ultra:** DISPLAY Type: Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (HBM), 1750 nits (peak) Size: 6.8 inches, 114.7 cm^2 (~89.9% screen-to-body ratio) Resolution: 1440 x 3088 pixels, 19.3:9 ratio (~500 ppi density) Protection: Corning Gorilla Glass Victus 2 Always-on display Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Understanding the screen

Controlling the touch screen



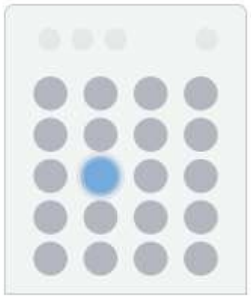
- Do not allow the touch screen to come into contact with other electrical devices. Electrostatic discharges can cause the touch screen to malfunction.
- To avoid damaging the touch screen, do not tap it with anything sharp or apply excessive pressure to it with your fingertips or other object.
- It is recommended not to use fixed graphics on part or all of the touch screen for extended periods. Doing so may result in afterimages (screen burn-in) or ghosting.

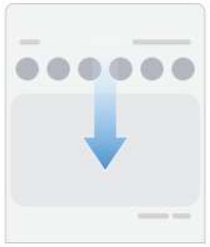
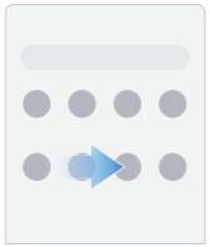
The device may not recognize touch inputs close to the edges of the screen, which are outside of the touch input area.

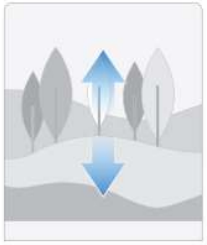
Galaxy S23 Series User Guide at pg. 23.

Galaxy Z Flip4:

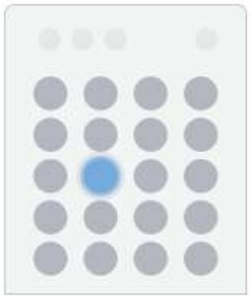
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	DISPLAY Type: Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak) Size: 6.7 inches, 101.5 cm^2 (~85.4% screen-to-body ratio) Resolution: 1080 x 2640 pixels (~426 ppi density) Cover display: Super AMOLED, 1.9 inches, 260 x 512 pixels (Gorilla Glass Victus+) Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

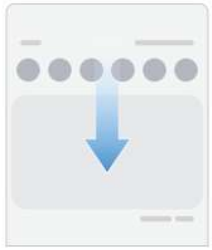
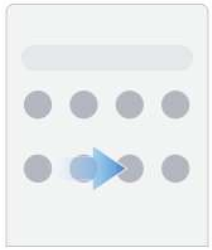
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Navigation A touch screen responds best to a light touch from the pad of your finger or a capacitive stylus. Using excessive force or a metallic object on the touch screen may damage the surface of the screen and the damage will not be covered by the warranty. Tap  Lightly touch items to select or launch them. • Tap an item to select it. • Double-tap an image to zoom in or out.

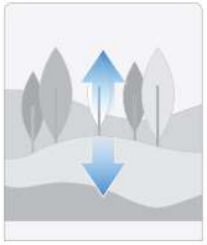
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Swipe  Lightly drag your finger across the screen. • Swipe the screen to unlock the device. • Swipe the screen to scroll through the Home screens or menu options. Drag and drop  Touch and hold an item, and then move it to a new location. • Drag an app shortcut to add it to a Home screen. • Drag a widget to place it in a new location.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Zoom in and out  Bring your thumb and forefinger together or apart on the screen to zoom in and out. • Move your thumb and forefinger apart on the screen to zoom in. • Move your thumb and forefinger together on the screen to zoom out. Touch and hold  Touch and hold items to activate them. • Touch and hold a field to display a pop-up menu of options. • Touch and hold a Home screen to customize the Home screen. Galaxy Z Flip4 and Fold4 User Guide at pgs. 24-26.

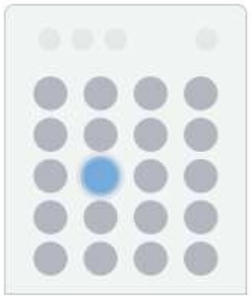
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Fold4: DISPLAY — Type: Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak) Size: 7.6 inches, 183.2 cm^2 (~90.9% screen-to-body ratio) Resolution: 1812 x 2176 pixels (~373 ppi density) Cover display: Dynamic AMOLED 2X, 120Hz, Corning Gorilla Glass Victus+ 6.2 inches, 904 x 2316 pixels, 23.1:9 ratio Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php

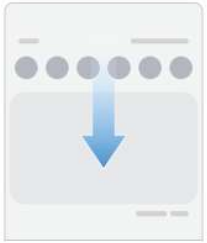
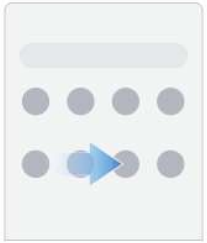
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Navigation A touch screen responds best to a light touch from the pad of your finger or a capacitive stylus. Using excessive force or a metallic object on the touch screen may damage the surface of the screen and the damage will not be covered by the warranty. Tap  Lightly touch items to select or launch them. • Tap an item to select it. • Double-tap an image to zoom in or out.

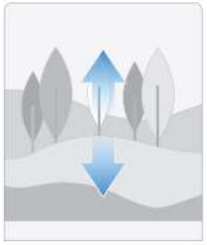
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Swipe  Lightly drag your finger across the screen. • Swipe the screen to unlock the device. • Swipe the screen to scroll through the Home screens or menu options. Drag and drop  Touch and hold an item, and then move it to a new location. • Drag an app shortcut to add it to a Home screen. • Drag a widget to place it in a new location.

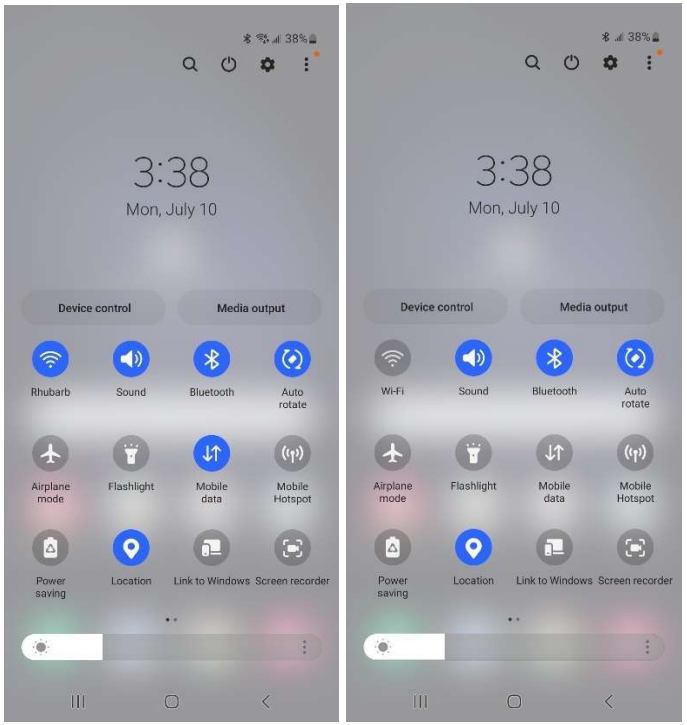
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Zoom in and out  Bring your thumb and forefinger together or apart on the screen to zoom in and out. • Move your thumb and forefinger apart on the screen to zoom in. • Move your thumb and forefinger together on the screen to zoom out. Touch and hold  Touch and hold items to activate them. • Touch and hold a field to display a pop-up menu of options. • Touch and hold a Home screen to customize the Home screen. Galaxy Z Flip4 and Fold4 User Guide at pgs. 24-26.

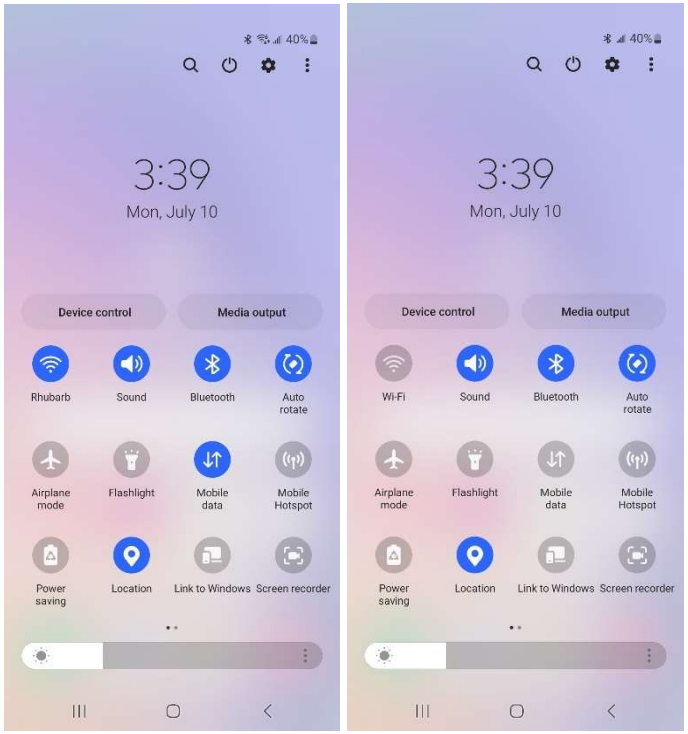
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 5G: DISPLAY Type: Super AMOLED, 120Hz, HDR10+, 1000 nits (HBM) Size: 6.4 inches, 100.5 cm^2 (~82.9% screen-to-body ratio) Resolution: 1080 x 2340 pixels, 19.5:9 ratio (~403 ppi density) Protection: Corning Gorilla Glass 5 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

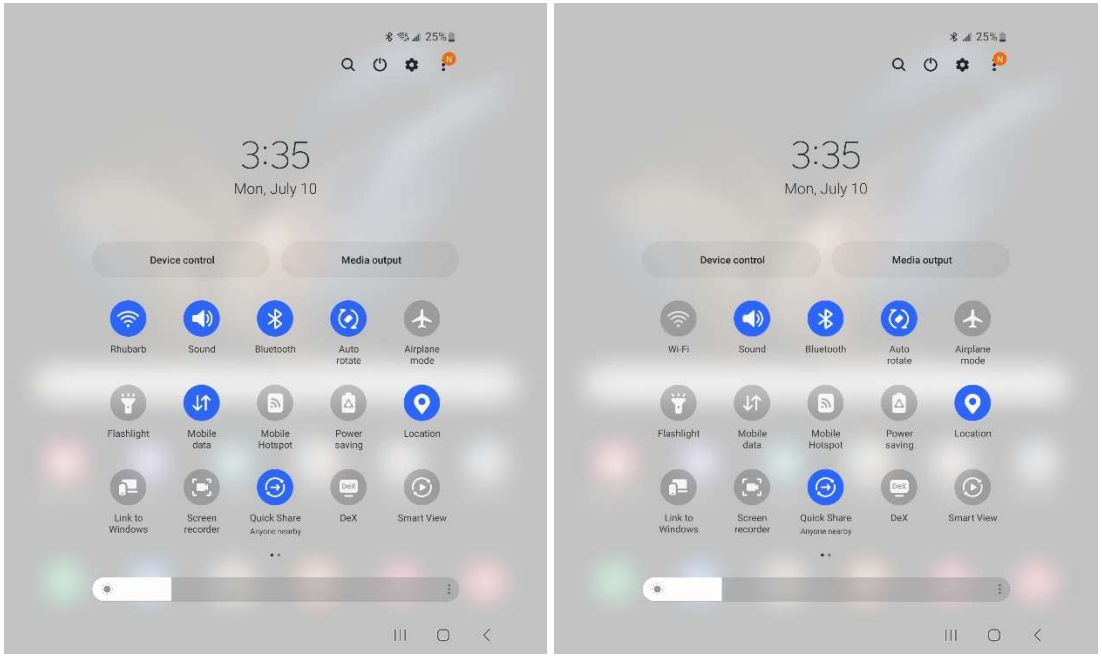
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Navigation A touch screen responds best to a light touch from the pad of your finger or a capacitive stylus. Using excessive force or a metallic object on the touch screen may damage the surface of the screen and the damage will not be covered by the warranty. Tap  Lightly touch items to select or launch them. • Tap an item to select it. • Double-tap an image to zoom in or out.

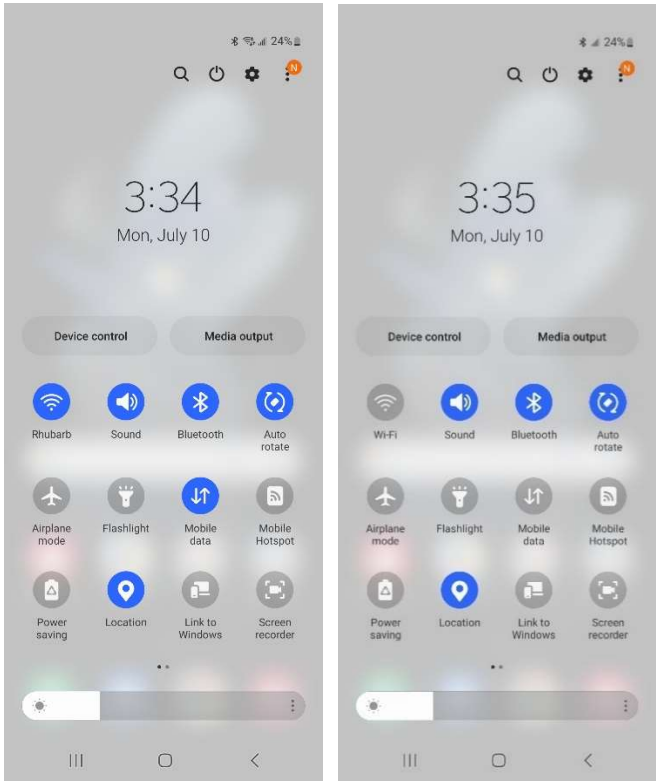
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Swipe  Lightly drag your finger across the screen. • Swipe the screen to unlock the device. • Swipe the screen to scroll through the Home screens or menu options. Drag and drop  Touch and hold an item, and then move it to a new location. • Drag an app shortcut to add it to a Home screen. • Drag a widget to place it in a new location.

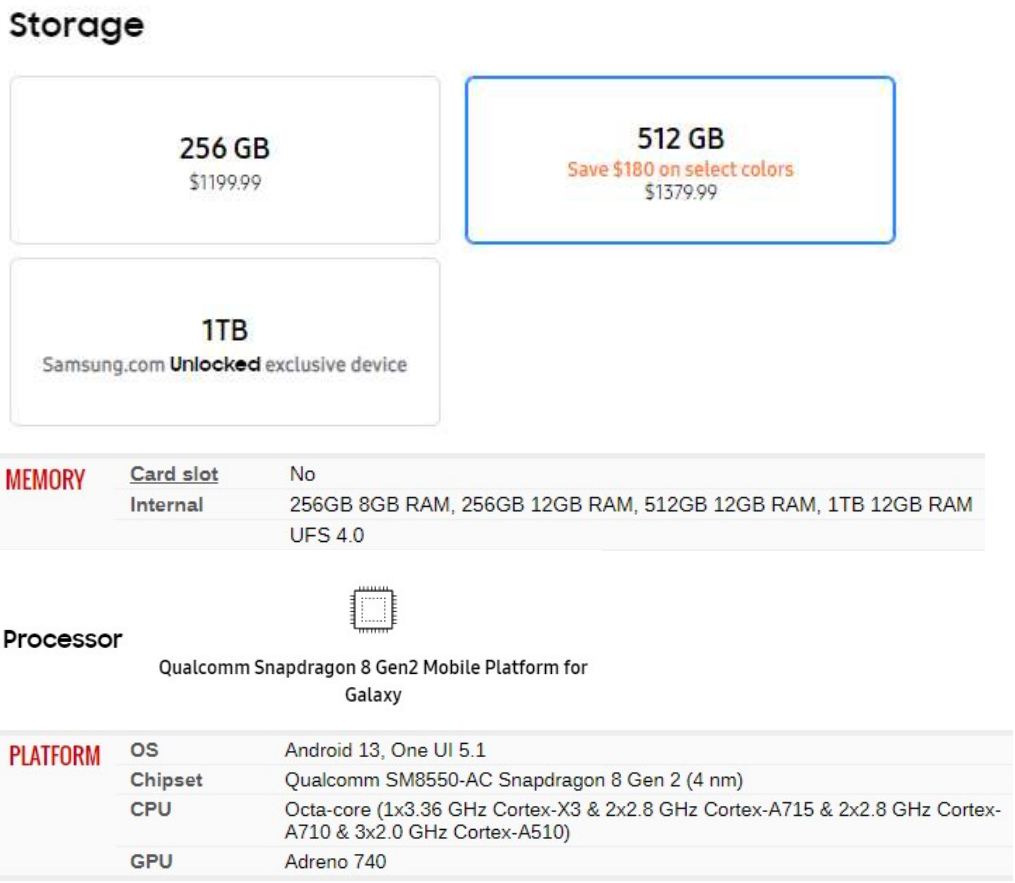
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Zoom in and out  Bring your thumb and forefinger together or apart on the screen to zoom in and out. • Move your thumb and forefinger apart on the screen to zoom in. • Move your thumb and forefinger together on the screen to zoom out. Touch and hold  Touch and hold items to activate them. • Touch and hold a field to display a pop-up menu of options. • Touch and hold a Home screen to customize the Home screen.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 User Guide at pg. 12-14. For example, the following screenshots show exemplary Accused Samsung '590 Products using a touch screen receiving a user indication to turn cellular/Wi-Fi off: Touch screen receiving a user indication to turn cellular/Wi-Fi off (Samsung Galaxy S23 Ultra) 

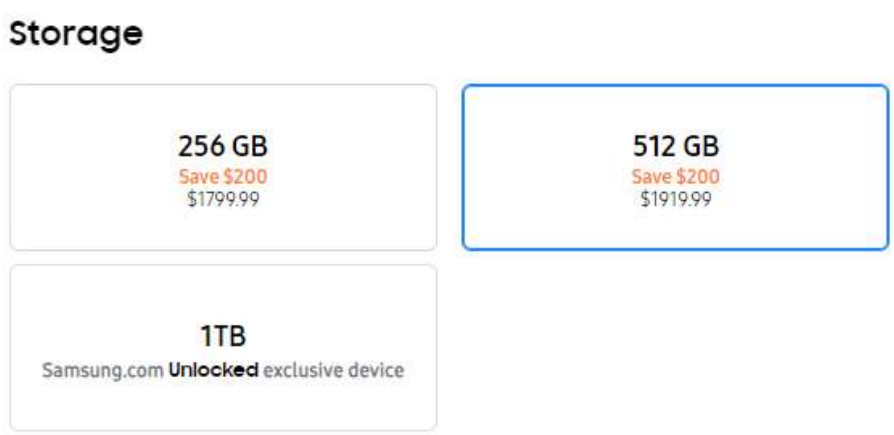
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Touch screen receiving a user indication to turn cellular/Wi-Fi off (Samsung Galaxy A54 5G) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Touch screen receiving a user indication to turn cellular/Wi-Fi off (Samsung Galaxy ZFold 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Touch screen receiving a user indication to turn cellular/Wi-Fi off (Samsung Galaxy ZFlip 4)  *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a similar input device (*e.g.*, a display with touch interface).
[1.g] an accumulation circuit capable of accumulating video information received by the imaging circuit after the video	Each of the Accused Samsung '590 Products includes an accumulation circuit capable of accumulating video information received by the imaging circuit after the video information is compressed by the compression circuit.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
information is compressed by the compression circuit; and	For example, each of the Accused Samsung '590 Products includes a processor together with local storage that comprise an accumulation circuit capable of accumulating video information received by the imaging circuit after the video information is compressed by the compression circuit. 

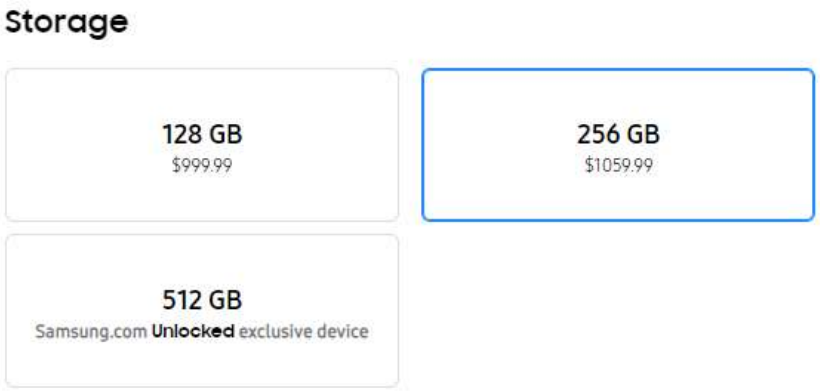
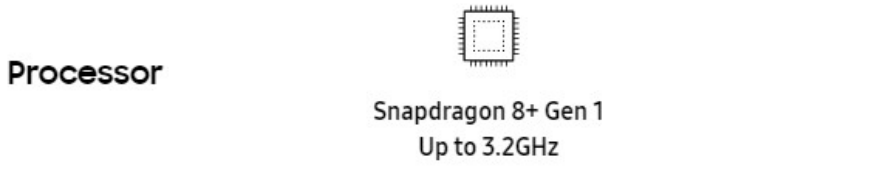
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

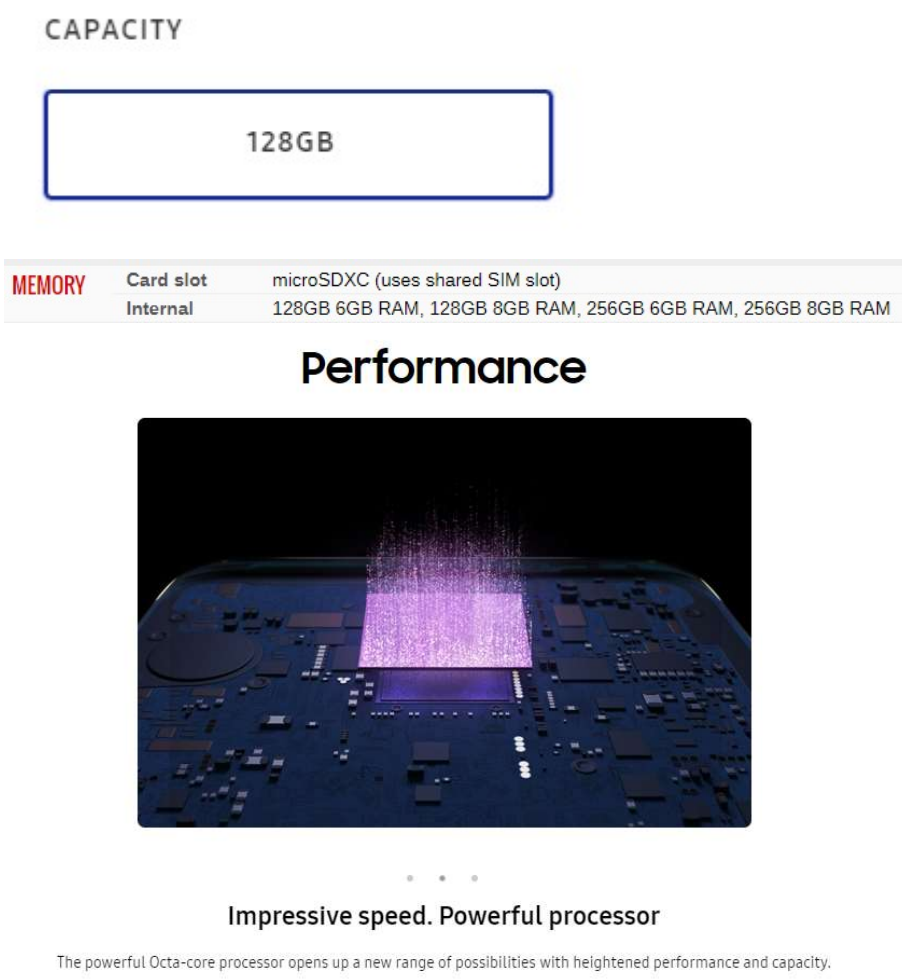


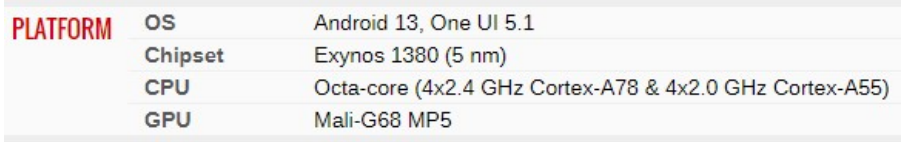
MEMORY	Card slot	No
	Internal	256GB 12GB RAM, 512GB 12GB RAM, 1TB 12GB RAM
		UFS 3.1



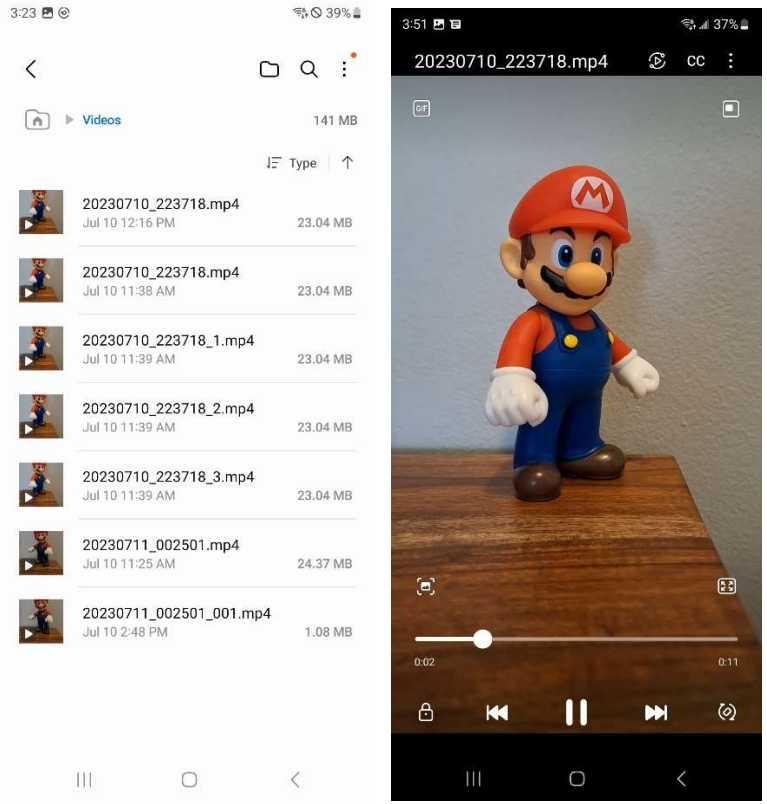
PLATFORM	OS	Android 12L, upgradable to Android 13, One UI 5.1
	Chipset	Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm)
	CPU	Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510)
	GPU	Adreno 730

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.  MEMORY — Card slot: No; Internal: 128GB 8GB RAM, 256GB 8GB RAM, 512GB 8GB RAM; UFS 3.1  PLATFORM — OS: Android 12, upgradable to Android 13, One UI 5.1; Chipset: Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm); CPU: Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510); GPU: Adreno 730 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

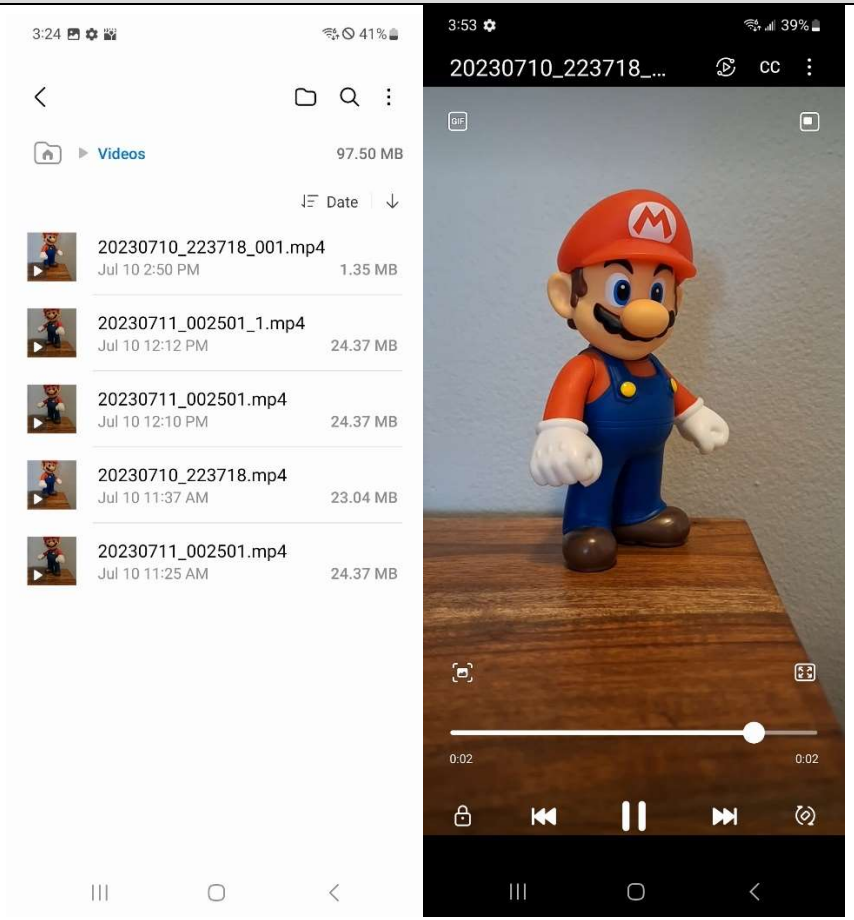
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php. For example, the following screenshots show exemplary Accused Samsung '590 Products using an accumulation circuit capable of accumulating video information received by the imaging circuit after the video information is compressed by the compression circuit: Video storage (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



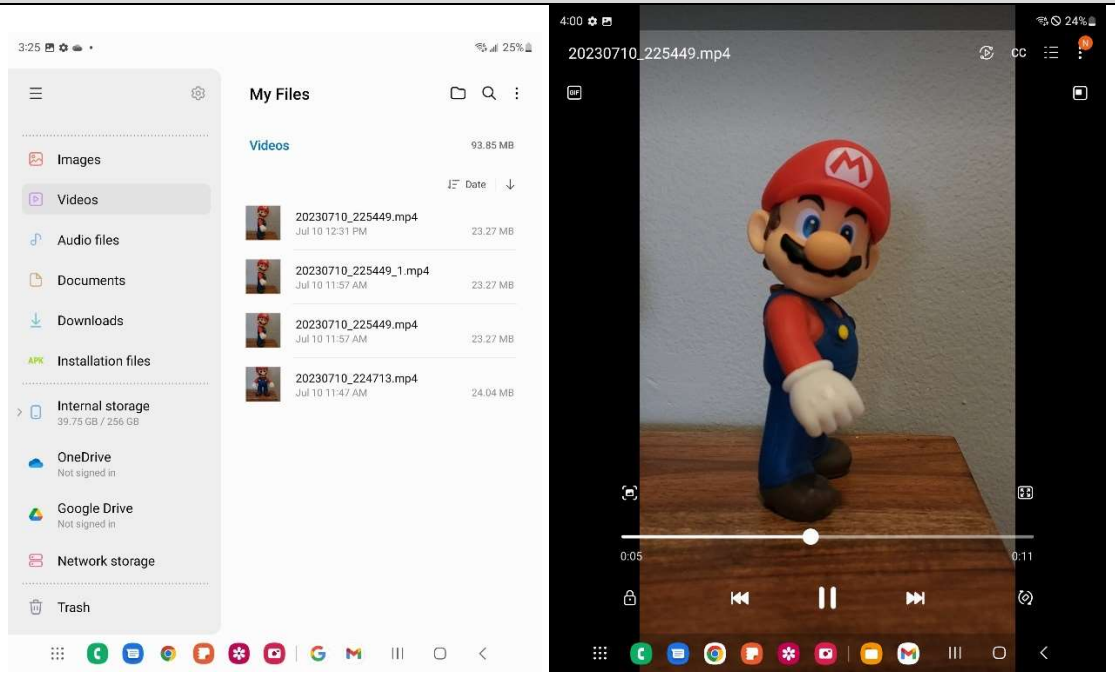
Video storage (Samsung GalaxyA54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

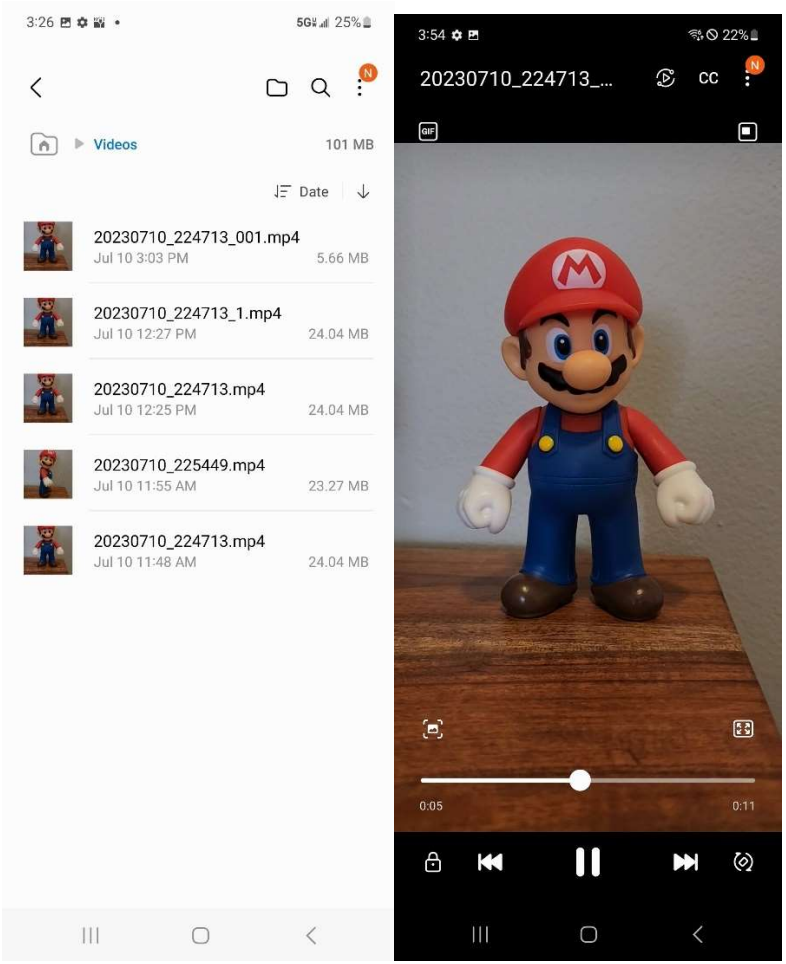


Video storage (Samsung GalaxyZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video storage (Samsung GalaxyZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a similar accumulation circuit (e.g., memory). *See* https://www.samsung.com/us/support/answer/ANS00079026/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[1.h] a controller controlling assignment of connection of each of the first, second, and third radio communication circuits,	Each of the Accused Samsung '590 Products includes a controller controlling assignment of connection of each of the first, second, and third radio communication circuits. For example, each of the Accused Samsung '590 Products includes a chipset (*e.g.*, Samsung Exynos) that includes one or more processors (*e.g.*, CPU) that executed the operating system source code to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits for various functions and/or applications (*e.g.*, Quickshare, Bluetooth file share, email, MMS, Samsung Wallet). **How to use Quick Share feature on Galaxy device** Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update.** **Step 2.** Tap on **Download and install.** **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

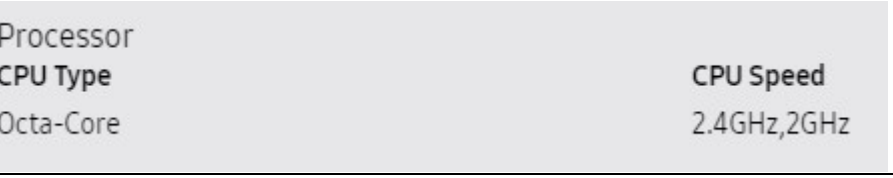


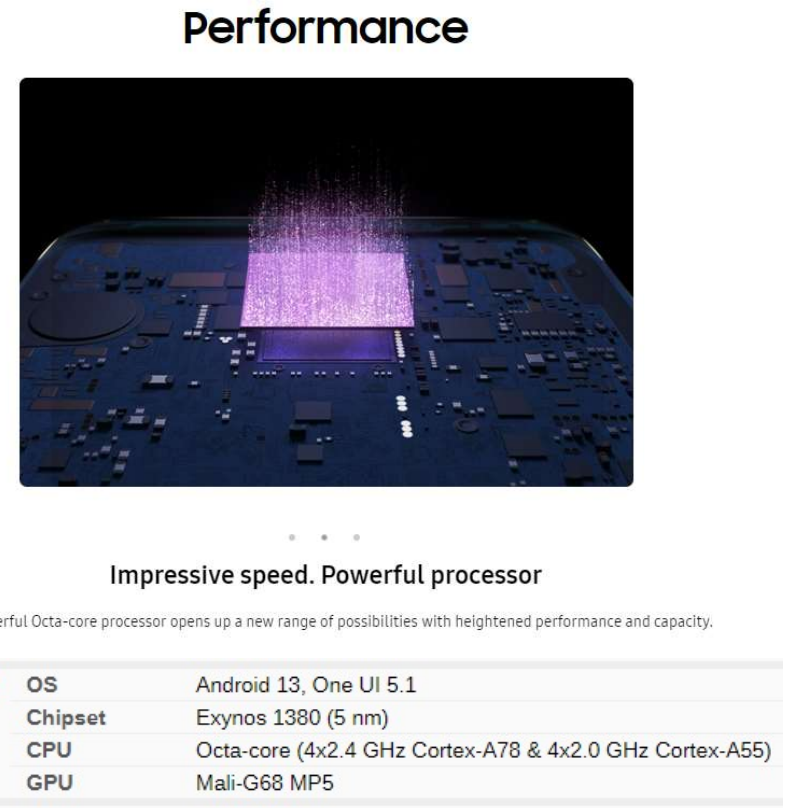
Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

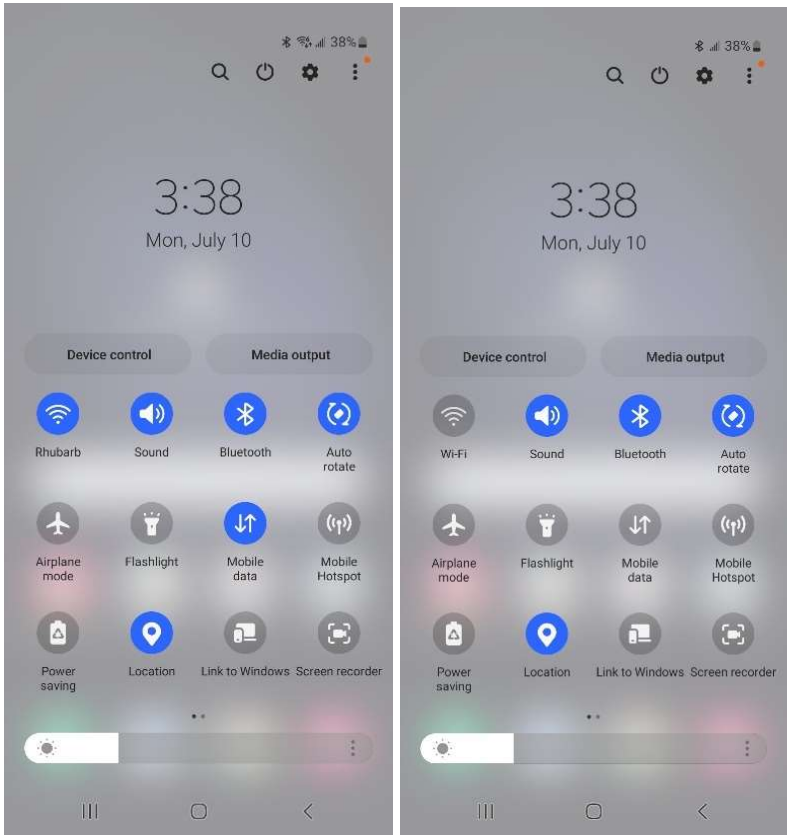


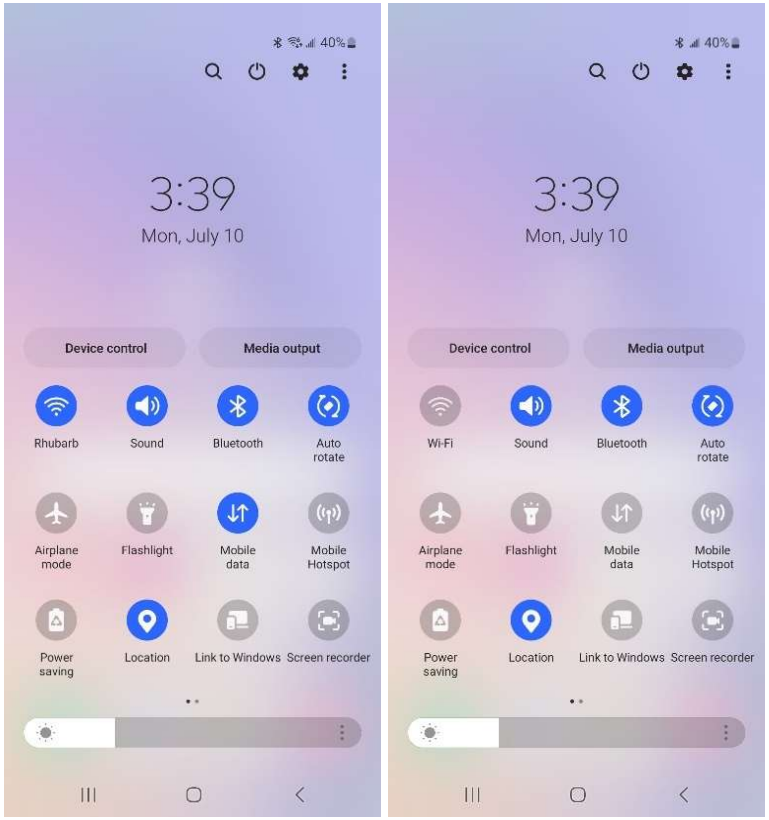
Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

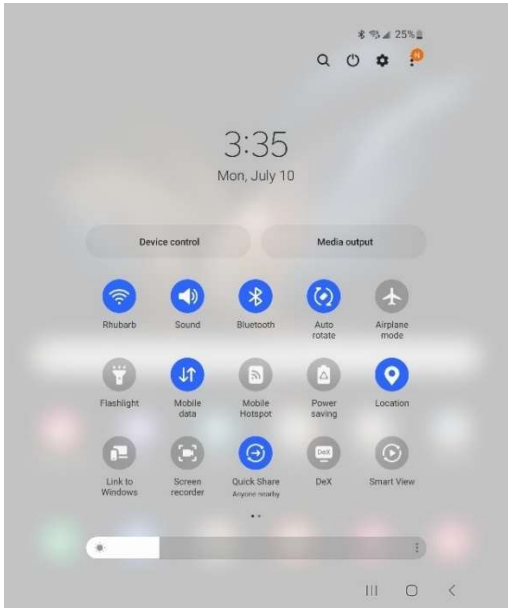
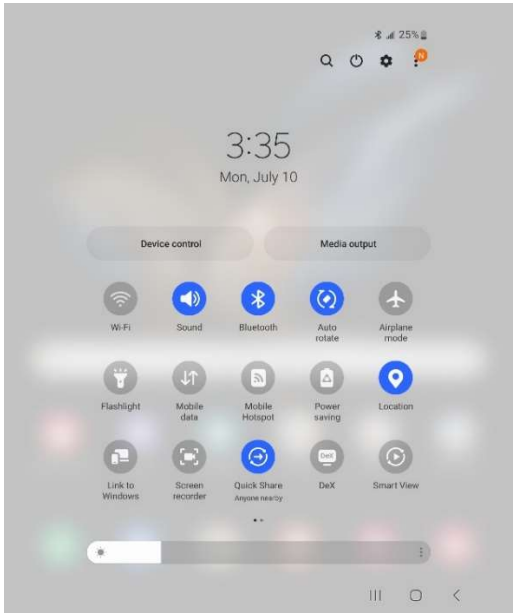
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

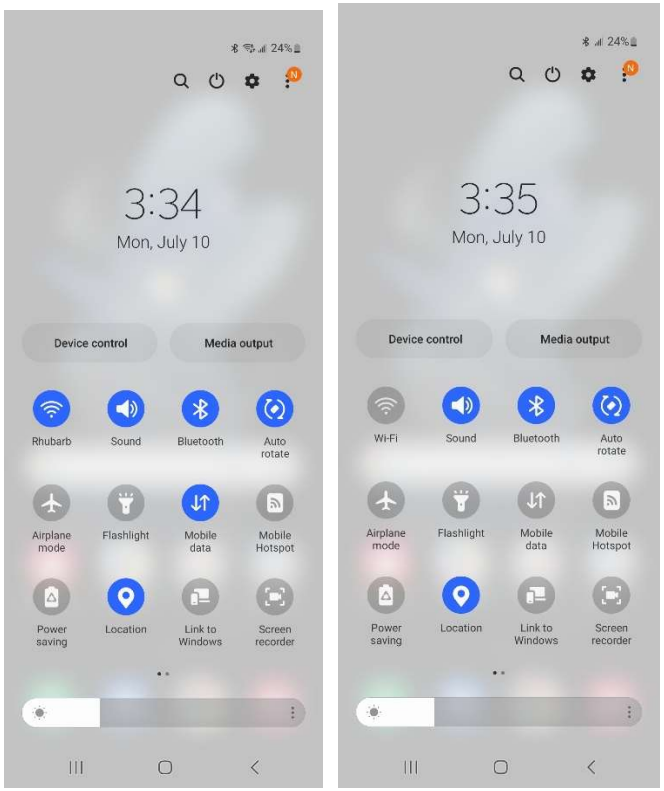
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 PLATFORM OS: Android 12, upgradable to Android 13, One UI 5.1 Chipset: Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm) CPU: Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510) GPU: Adreno 730 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

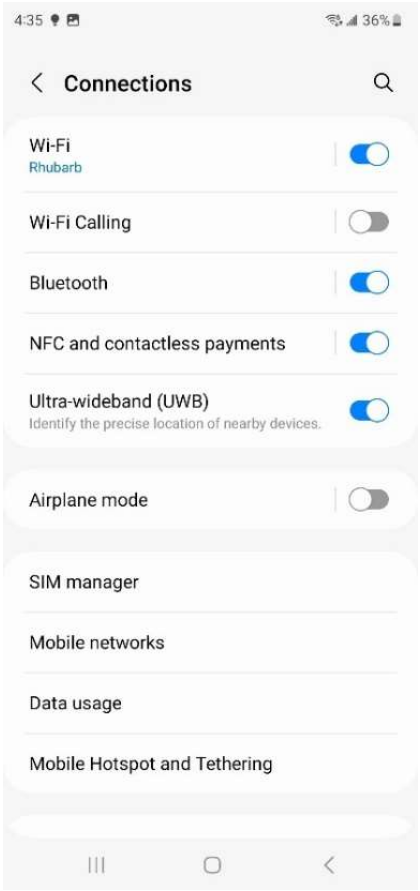
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php. For example, the following screenshots show exemplary Accused Samsung '590 Products using a controller (*e.g.*, application processor or CPU) to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication chips by turning them on/off through the quick control menu:

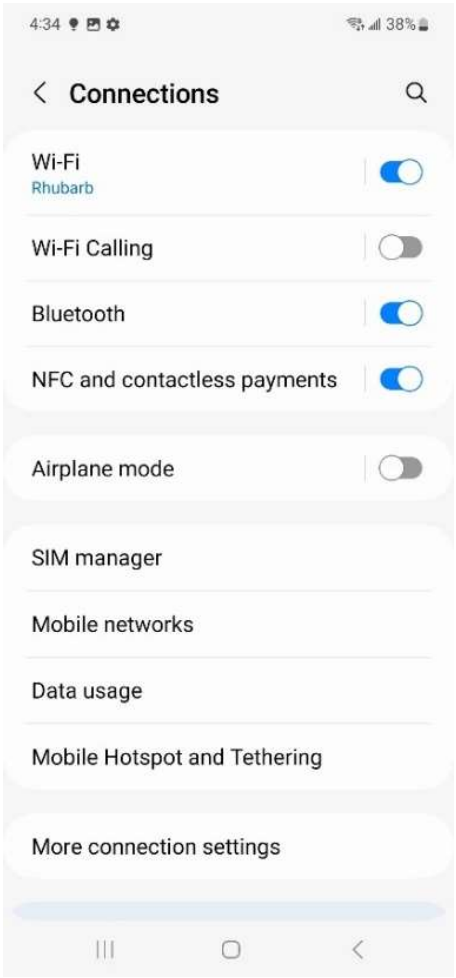
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

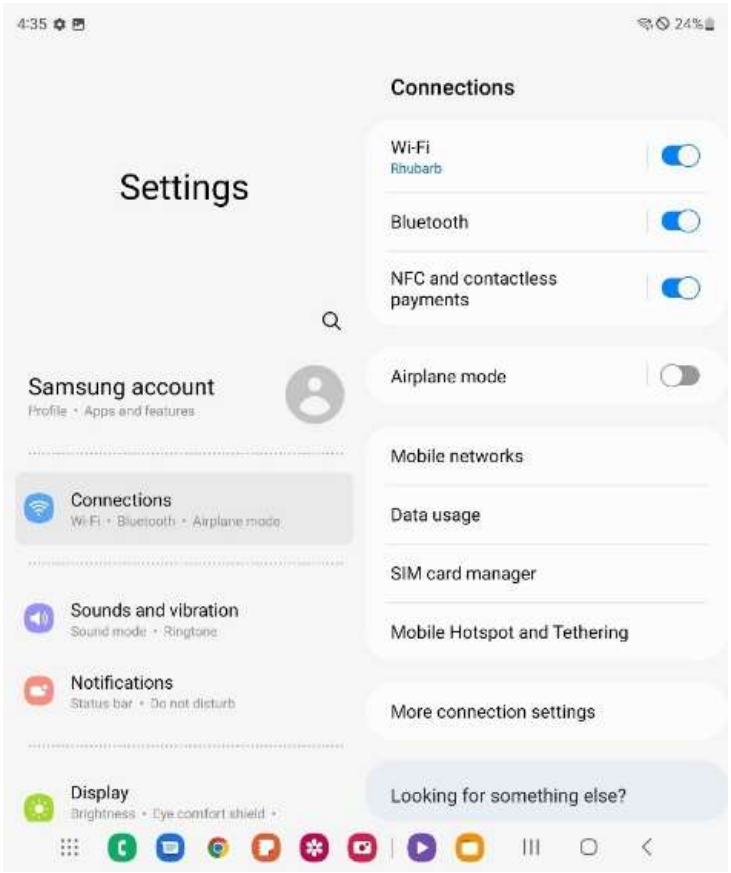
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

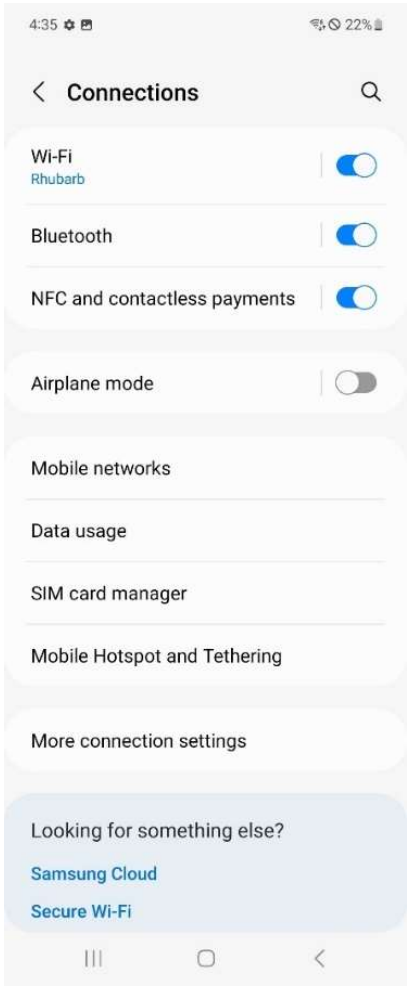
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)  

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)  As an additional example of controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into "Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

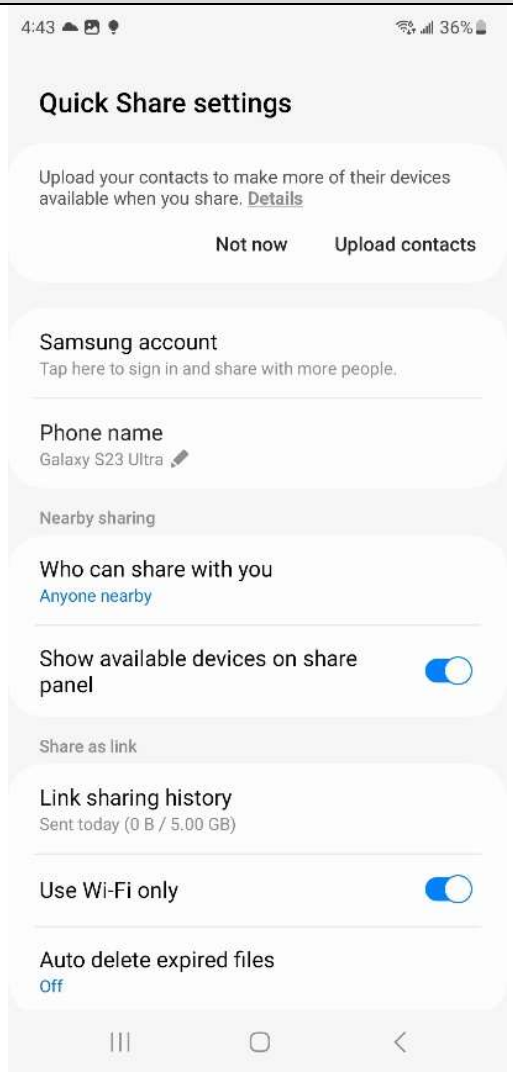
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

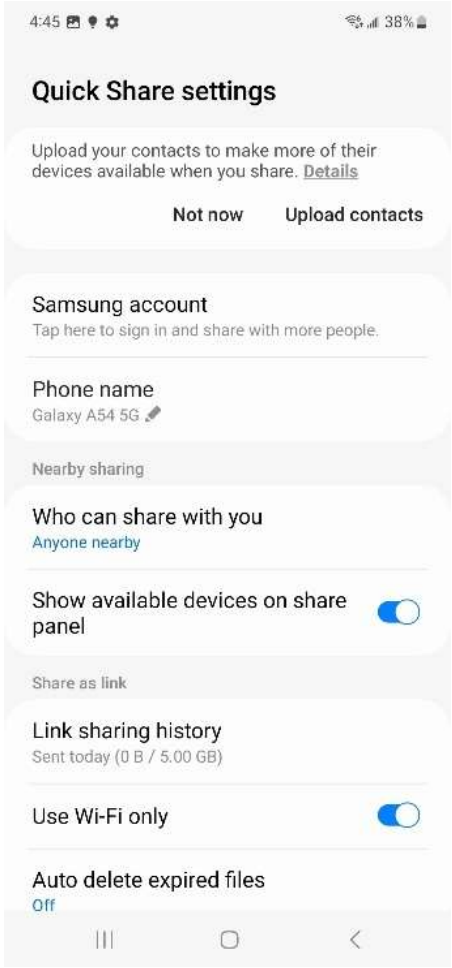
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4) 

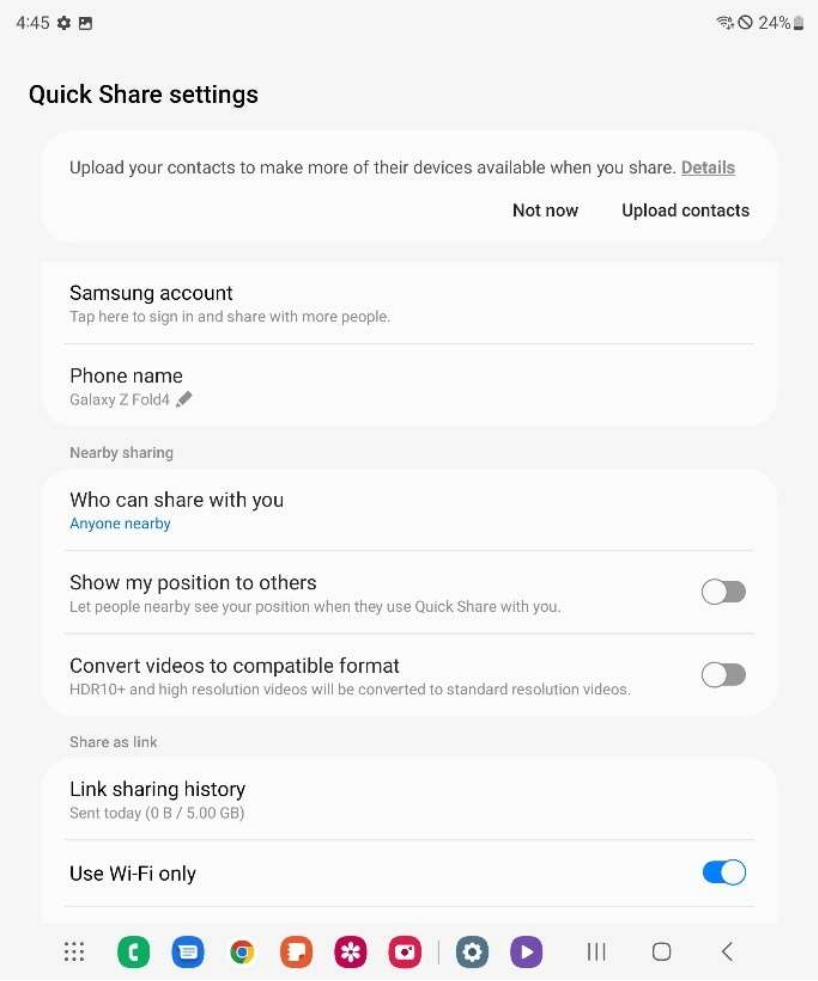
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of the controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products receive instructions from the user to use "Quick Share," "Samsung Pay," "Bluetooth File Share," and/or access the internet which will be accepted by the operating system executing on the one or more CPUs and based on such execution the controller will control the assignment of the connection by sending the instructions to one of the WiFi, NFC, Bluetooth, and cellular circuits, respectively. *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that control assignment of a connection in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/samsung-pay/; https://www.samsung.com/us/support/answer/ANS00083184/.
[1.i] wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio,	In each of the Accused Samsung '590 Products, the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio. **First Infringement Theory:** For example, the following screenshots show exemplary Accused Samsung '590 Products using Wi-Fi communication chip to transmit saved video information by using Wi-Fi (e.g., Quick Share) for sharing files:

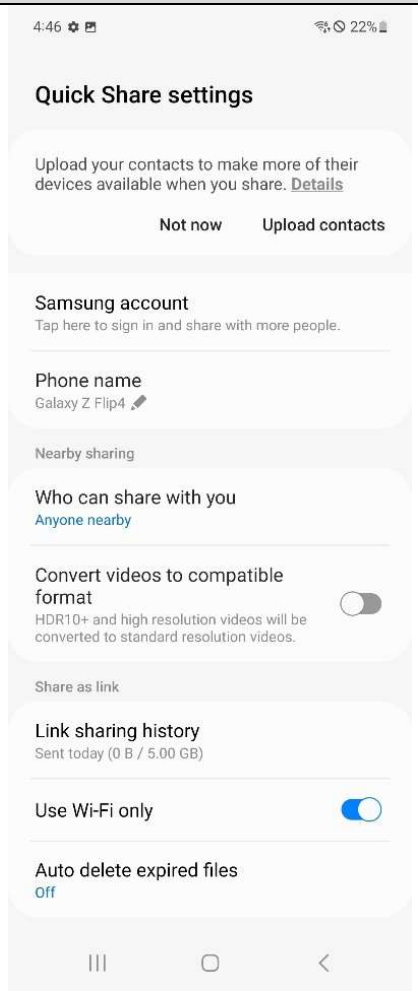
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Samsung Galaxy 23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

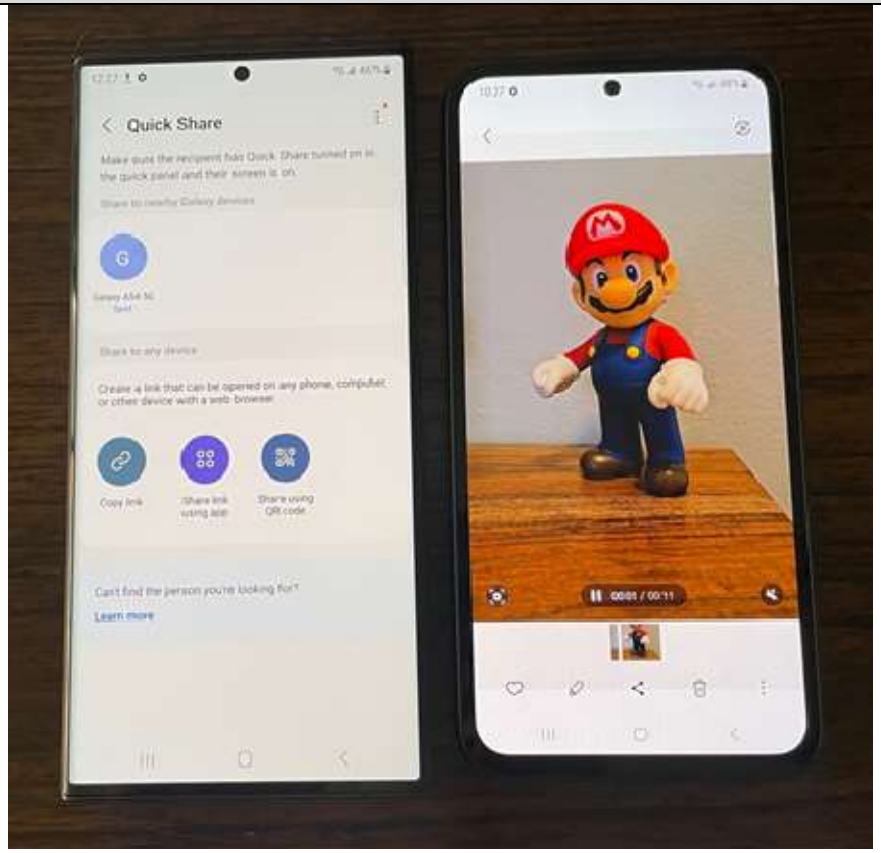
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

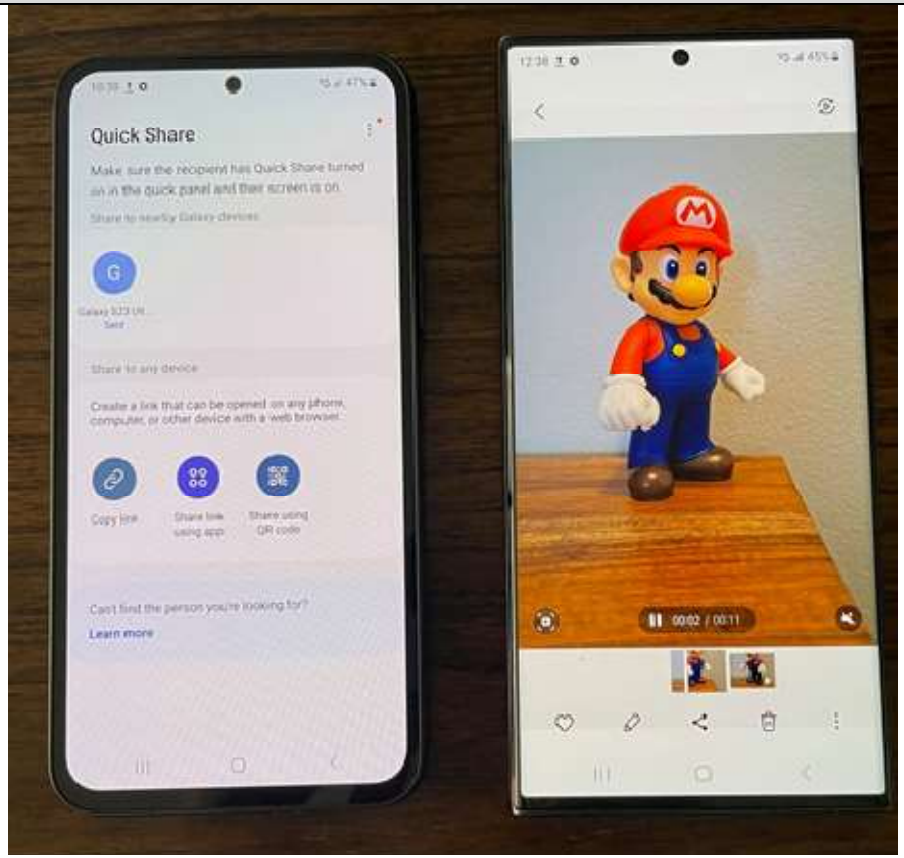
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

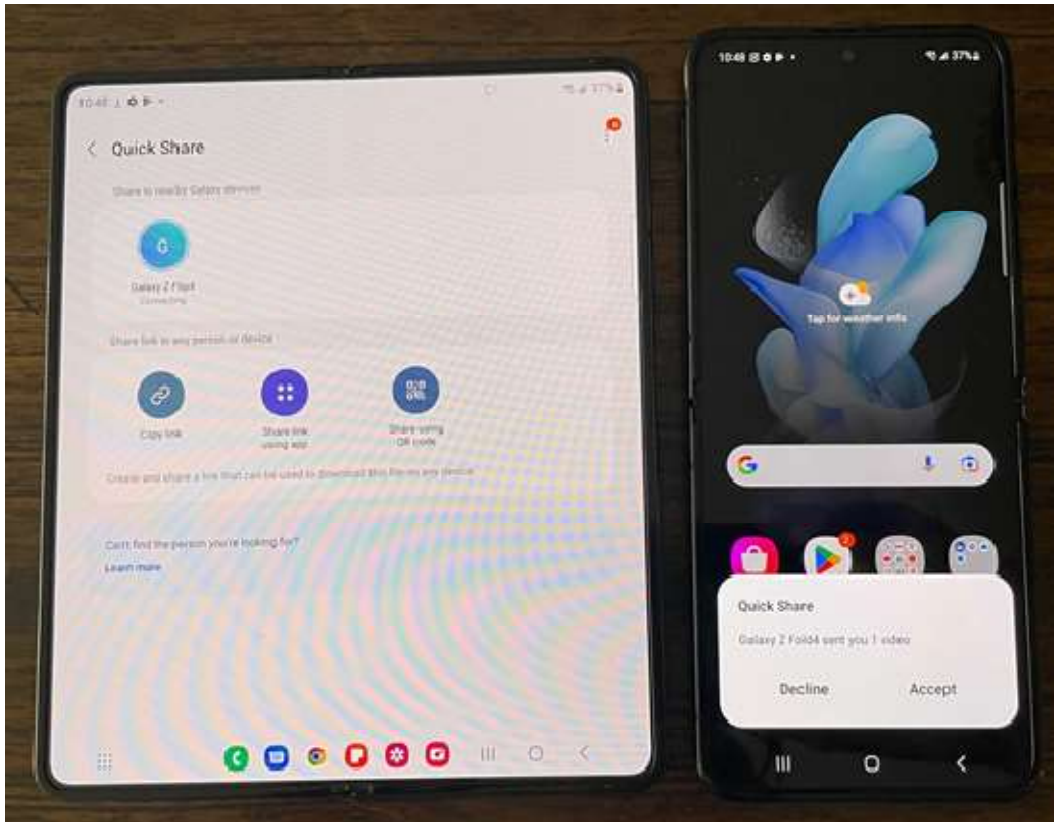


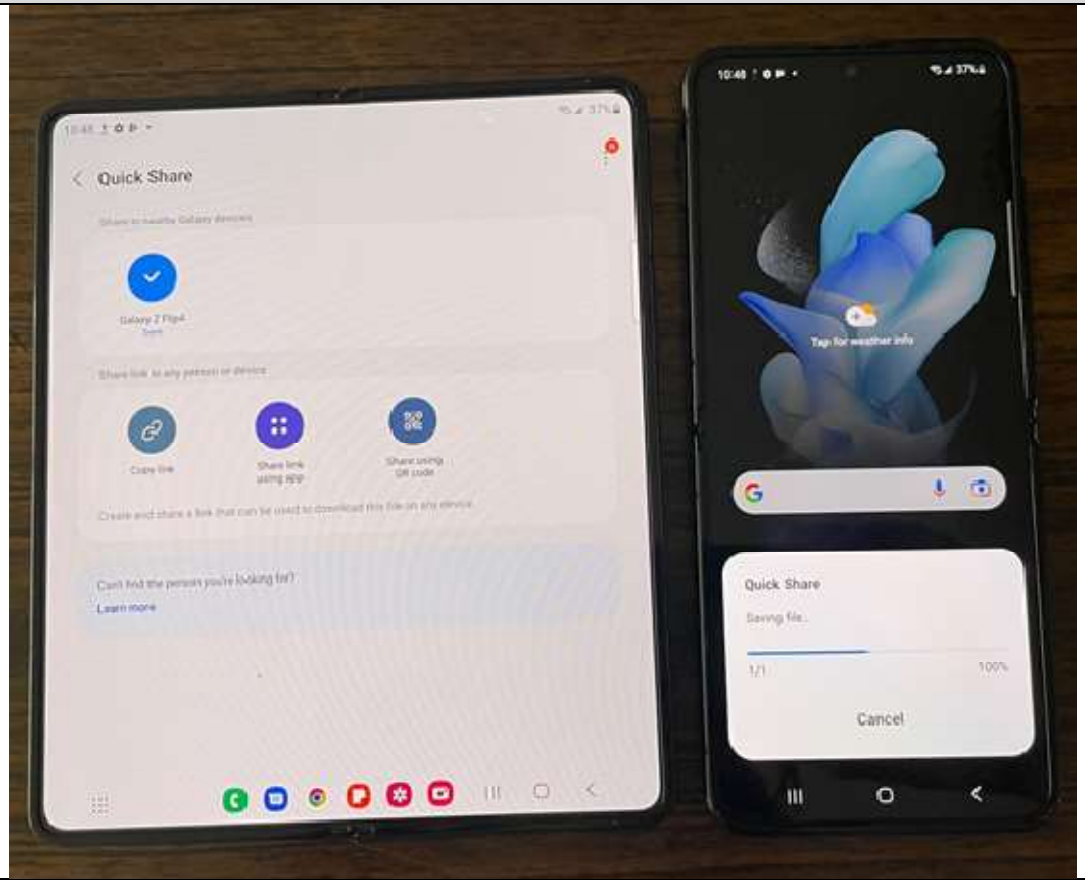
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

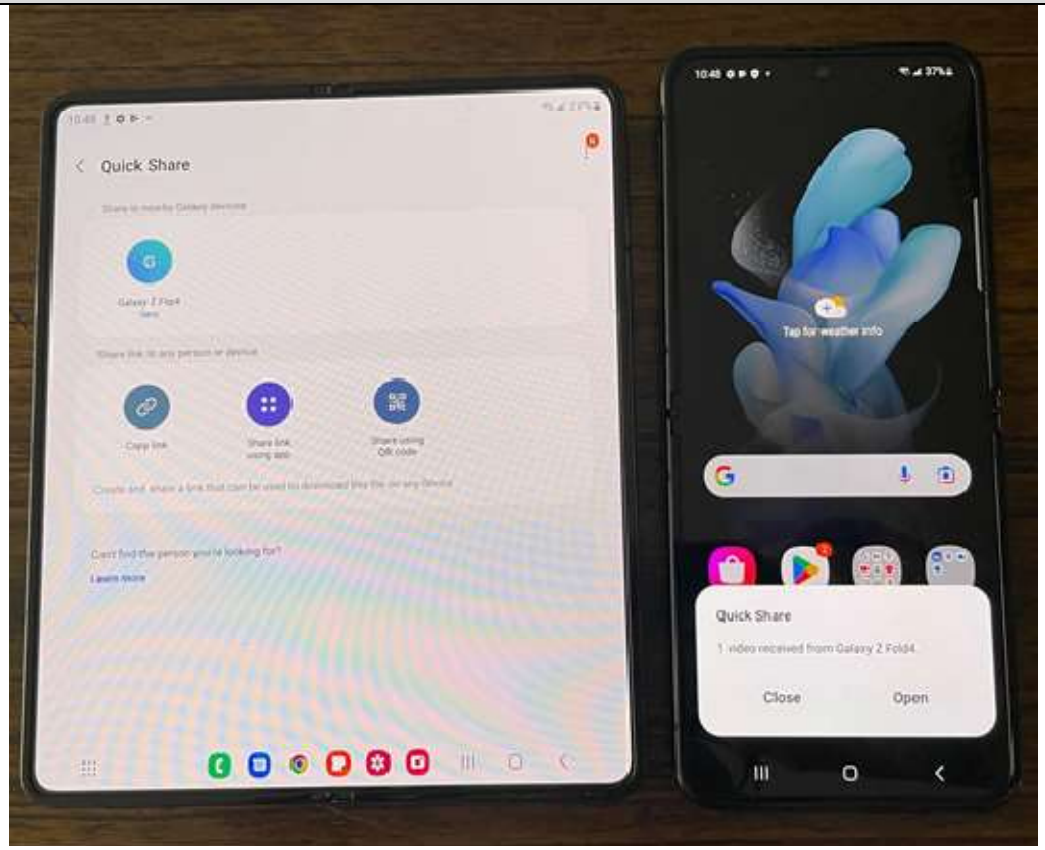
	


1 item
Galaxy Store
Play Store
Google
Microsoft

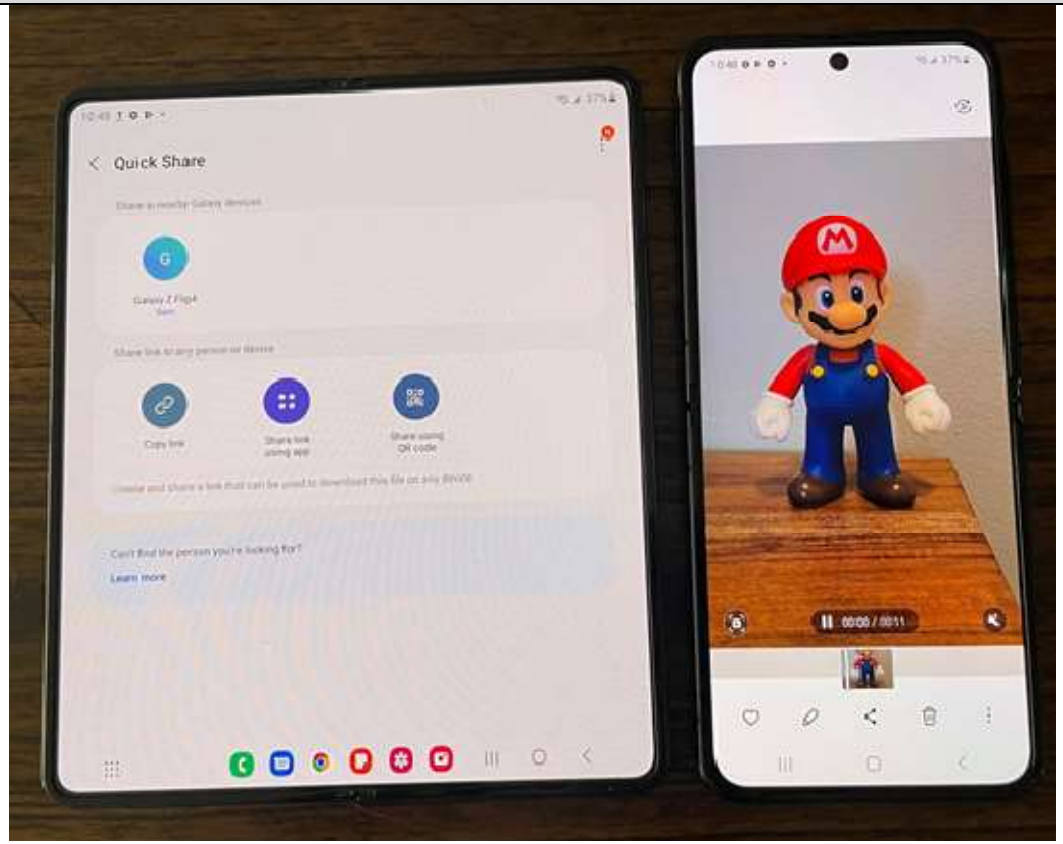
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



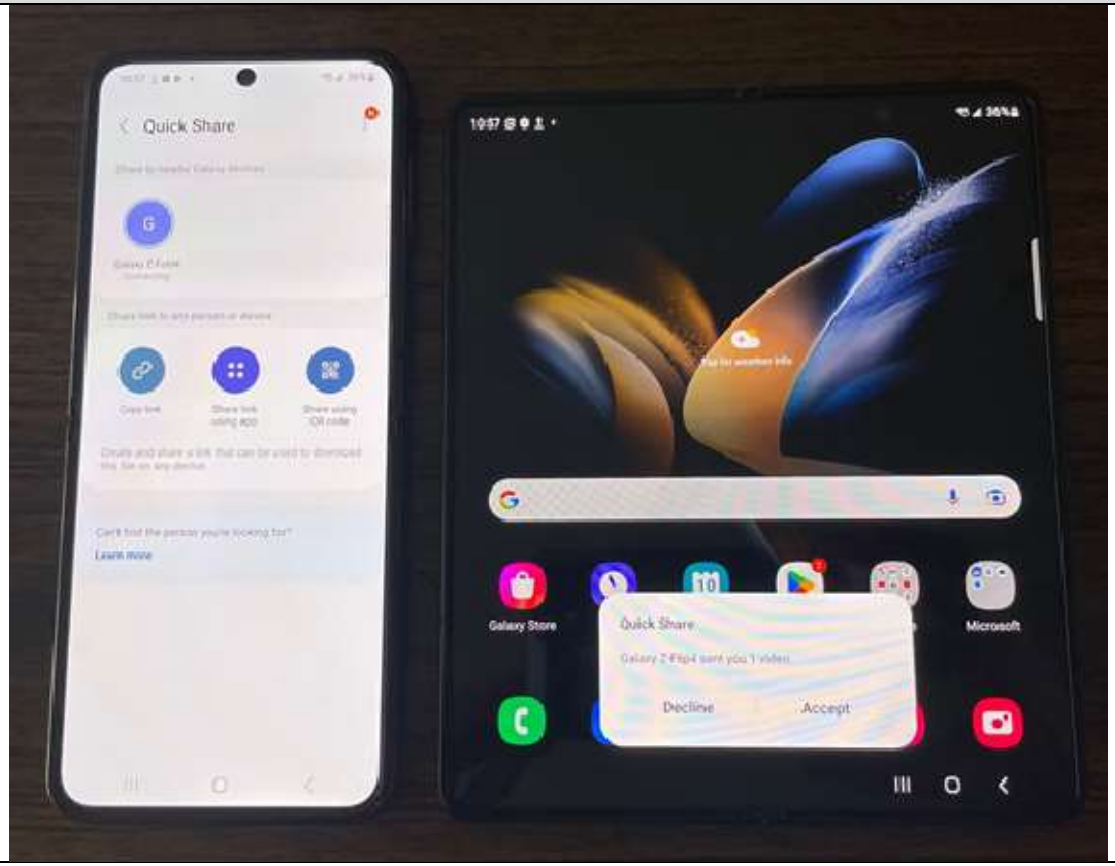
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Second Infringement Theory:

For example, the following screenshots show exemplary Accused Samsung '590 Products using a Bluetooth communication chip to transmit saved video information by using Bluetooth for sharing files:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

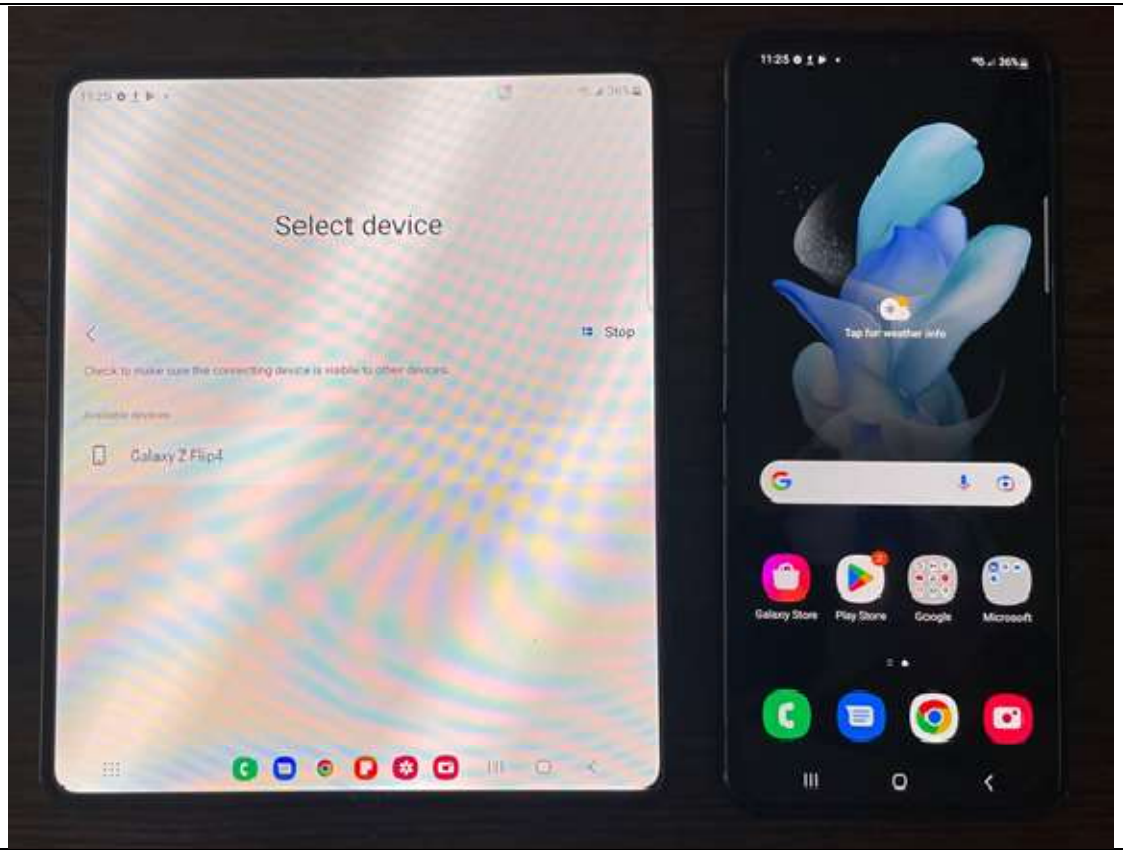
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



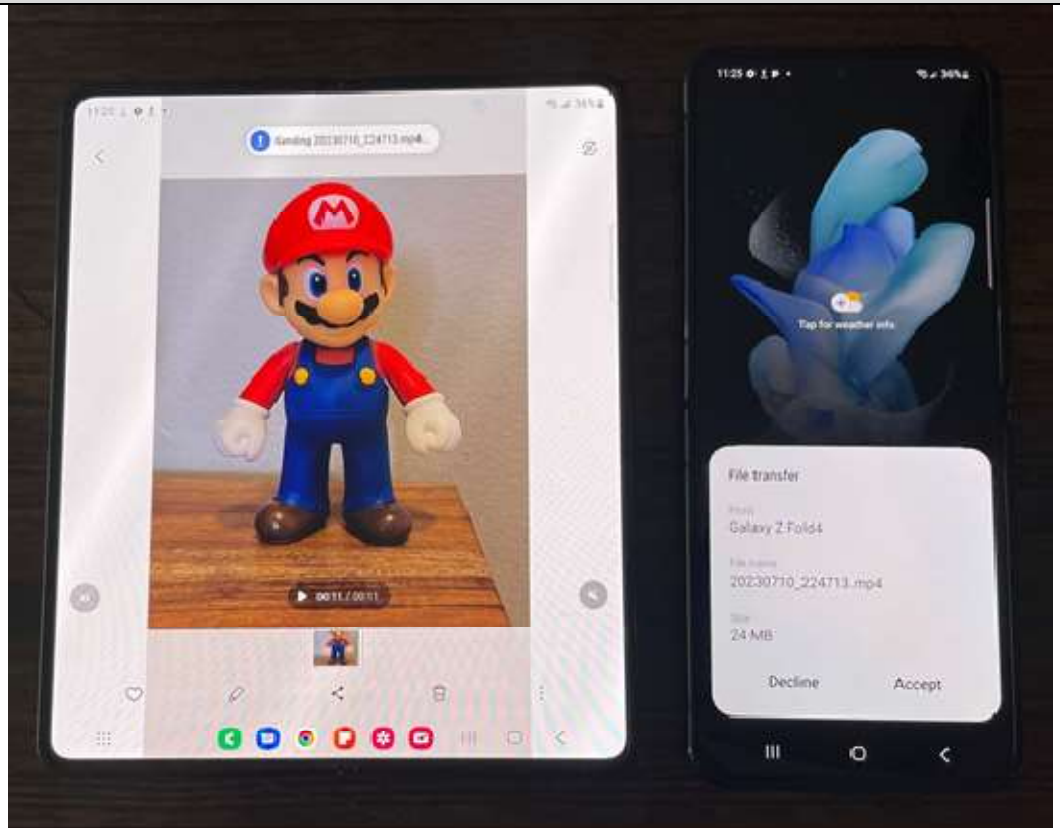
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

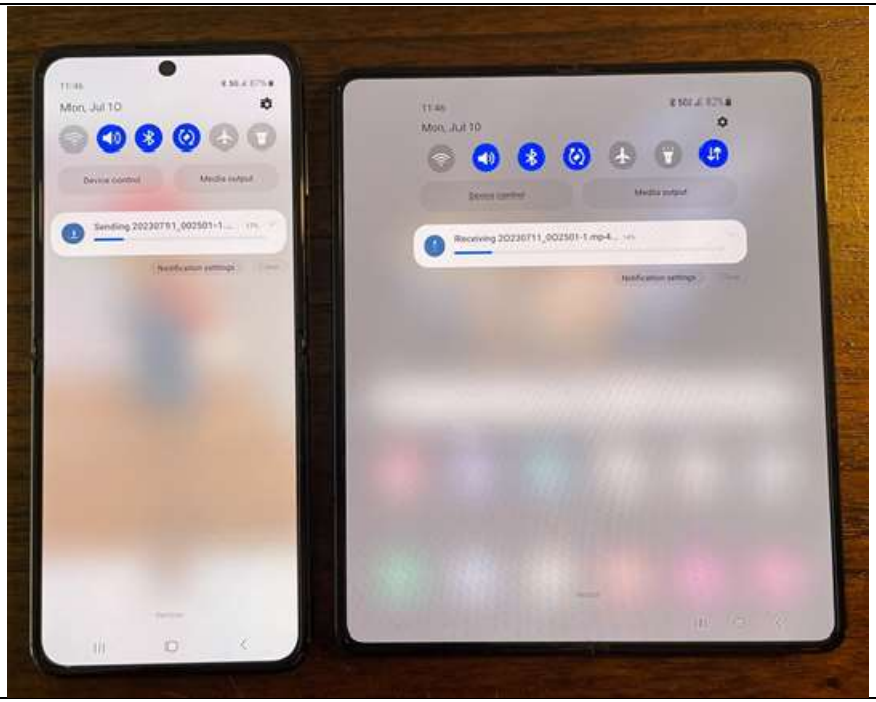
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 Galaxy Store Microsoft 23.2 MB Decline Accept	

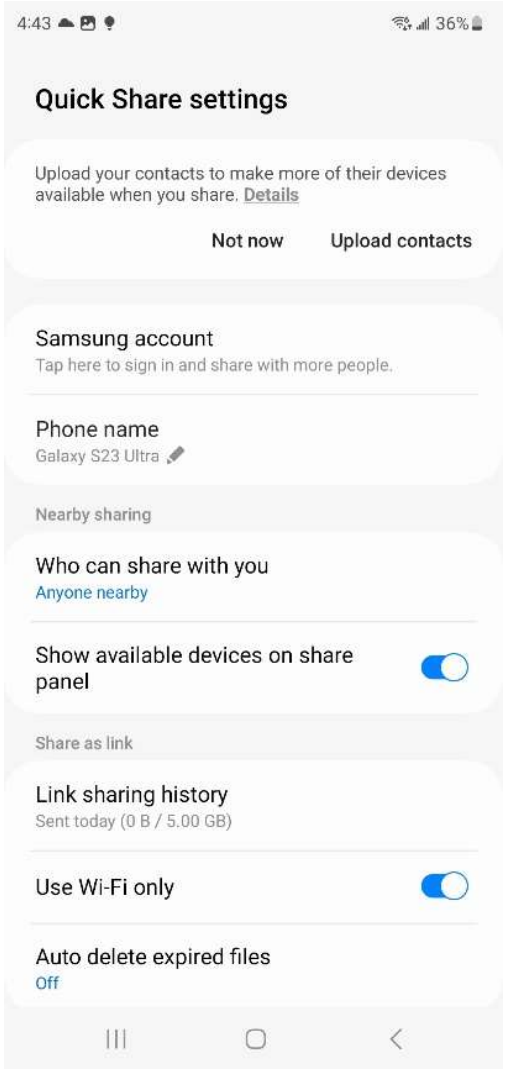

Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

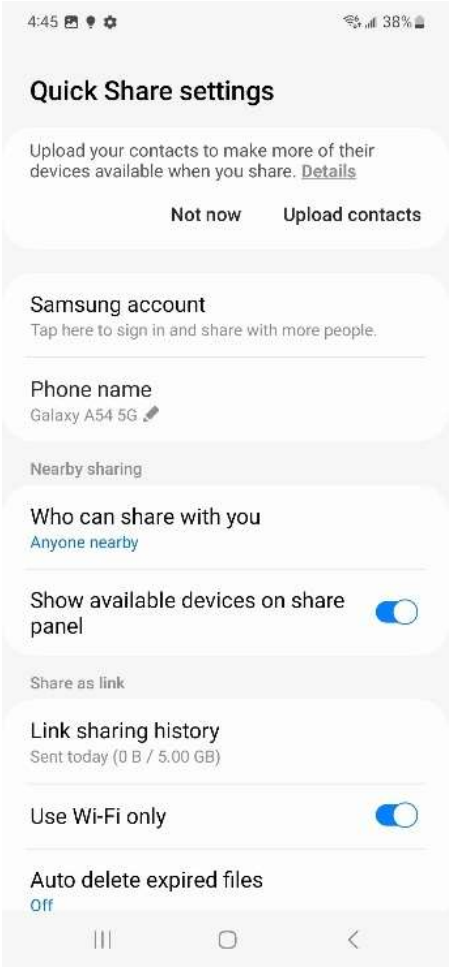
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a Wi-Fi chipset and Bluetooth chipset that transmits video information in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/.
[1.j] wherein the controller controls assignment of connection for each of the first and second radio	In each of the Accused Samsung '590 Products, the controller controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
communication circuit in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video information,	using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video. **First Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Wi-Fi and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the Wi-Fi communication circuit, the controller assigns a connection to the Wi-Fi communication circuit for transmitting the video by using Wi-Fi (e.g., Quick Share) to share files. For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share "Wi-Fi only" and then sending data through the Quick Share application. Also, "an indication" from a user to control assignment to the cellular communication chip is turning the cellular or Wi-Fi connection on/off from the quick menu. For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share to transmit video from the options under the share menu.

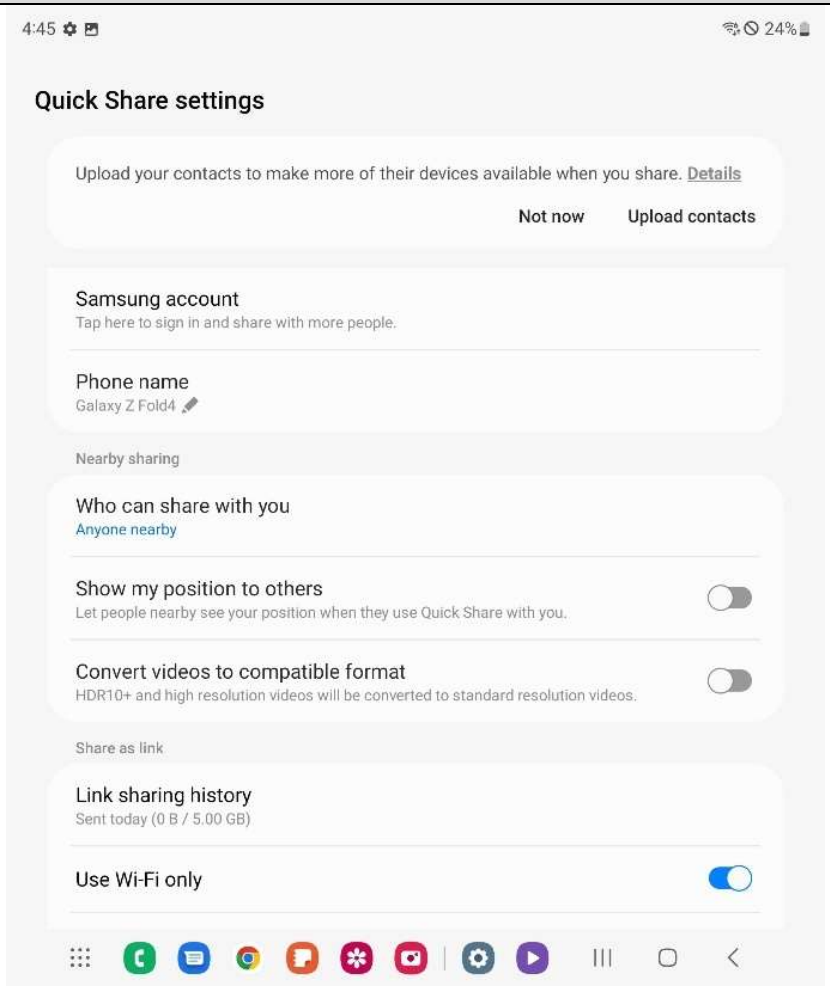
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ For example, the following screenshots show exemplary Accused Samsung '590 Products selecting Quick Share "Wi-Fi only" and then sending data through the Quick Share application:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy 23 Ultra: 

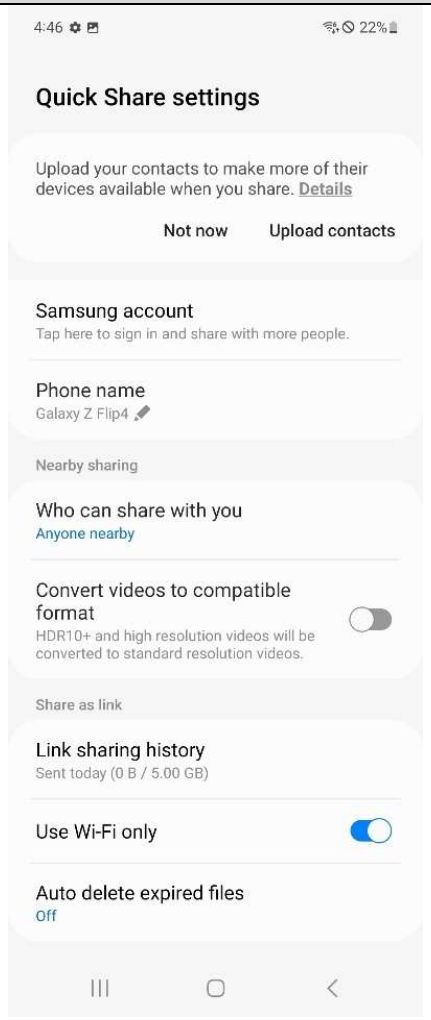
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Samsung Galaxy ZFlip 4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

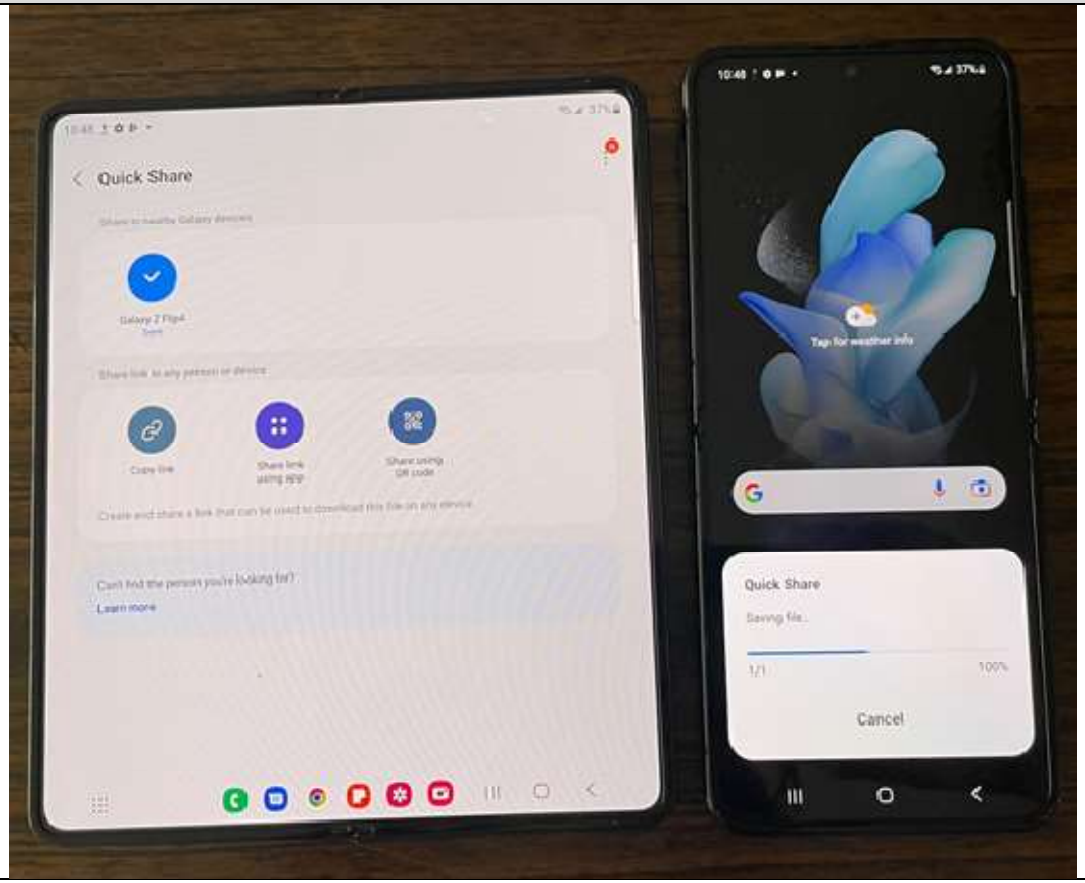
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

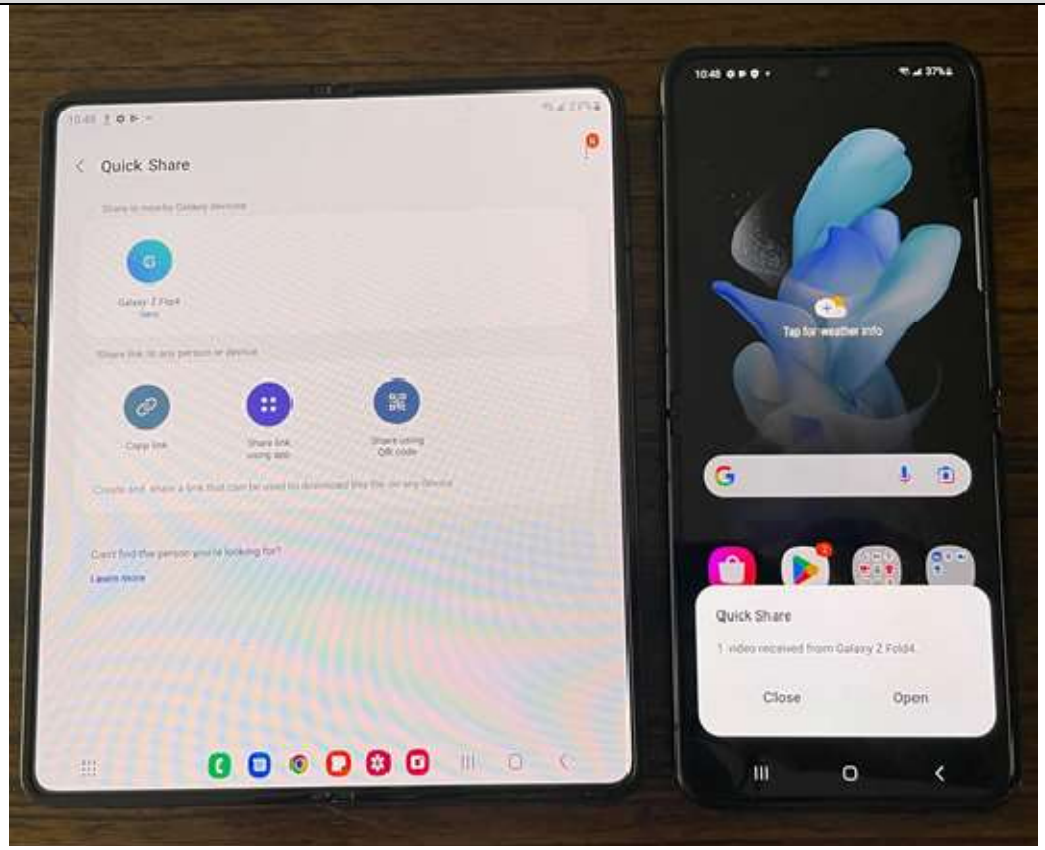
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
	Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)	

	 1 item Quick Share Bluetooth Drive Gmail LinkedIn Maps Meet Galaxy Store Play Store Google Microsoft	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

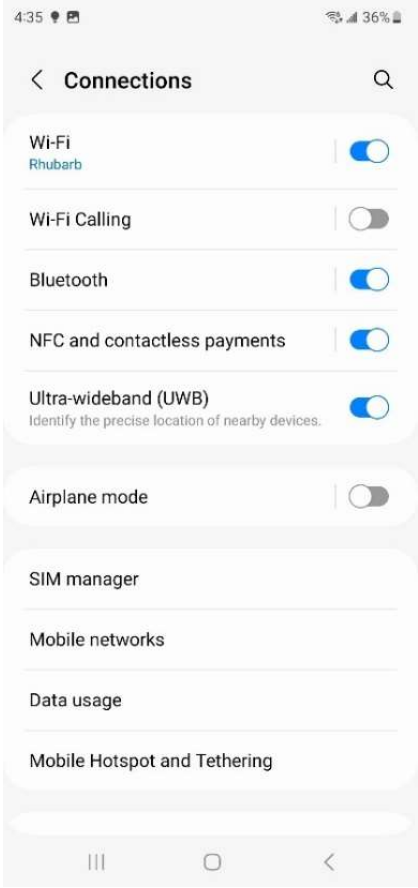
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

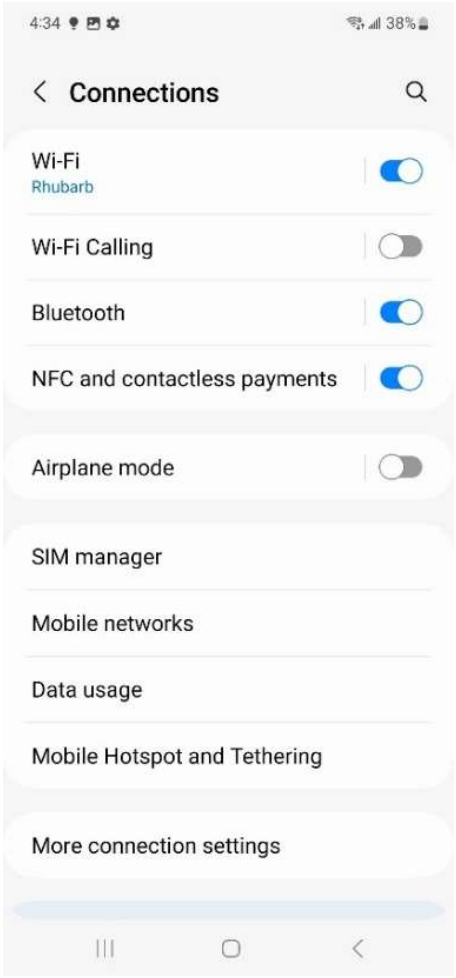
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

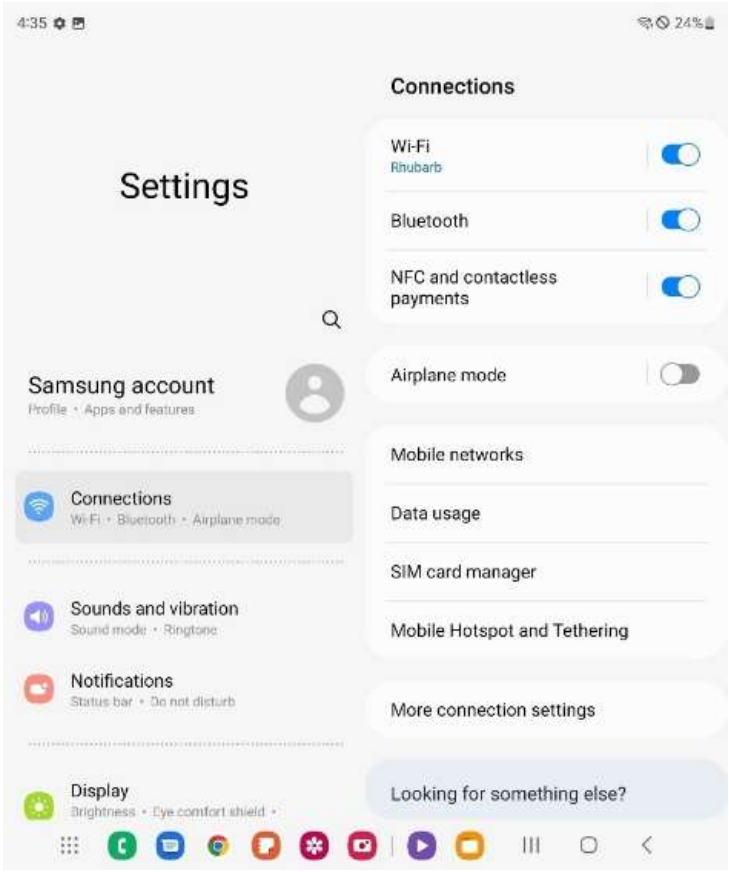
	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

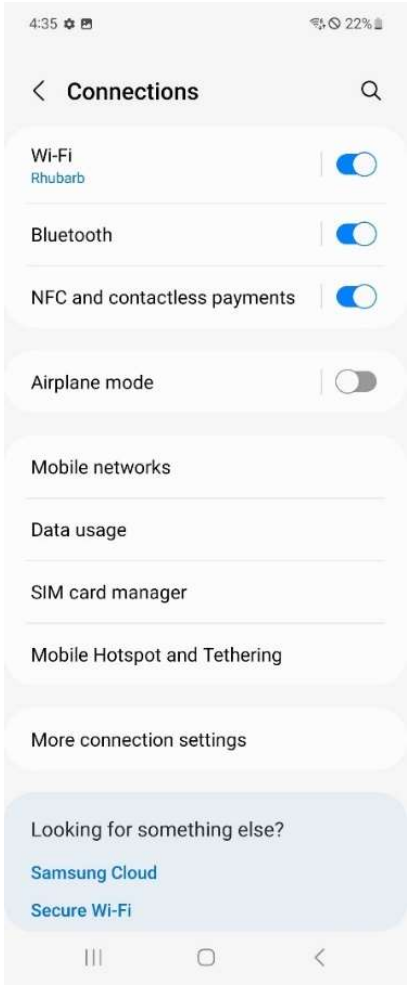
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 For example, the following screenshots show exemplary Accused Samsung '590 Products turning Wi-Fi on/off and cellular on/off (e.g., using the "Settings" and/or using quick menu options): User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

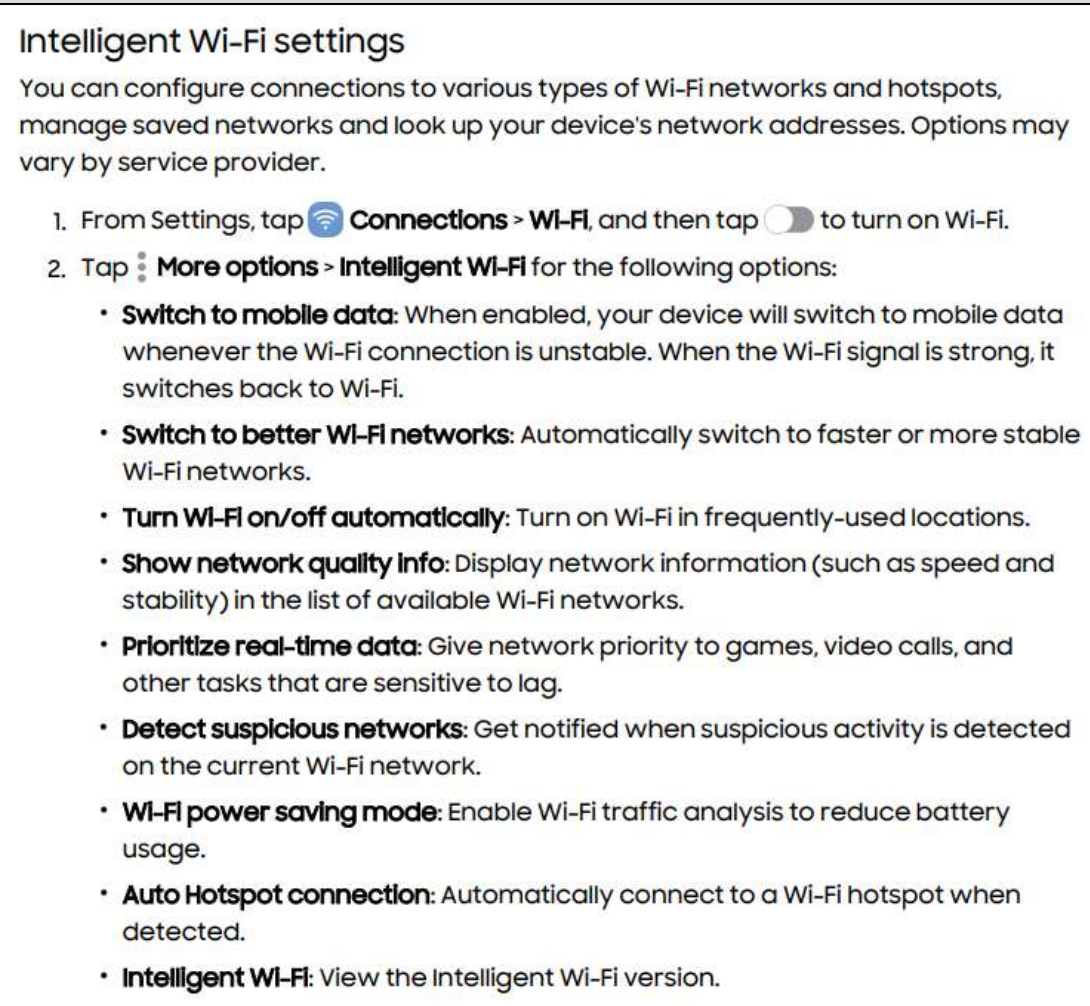
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

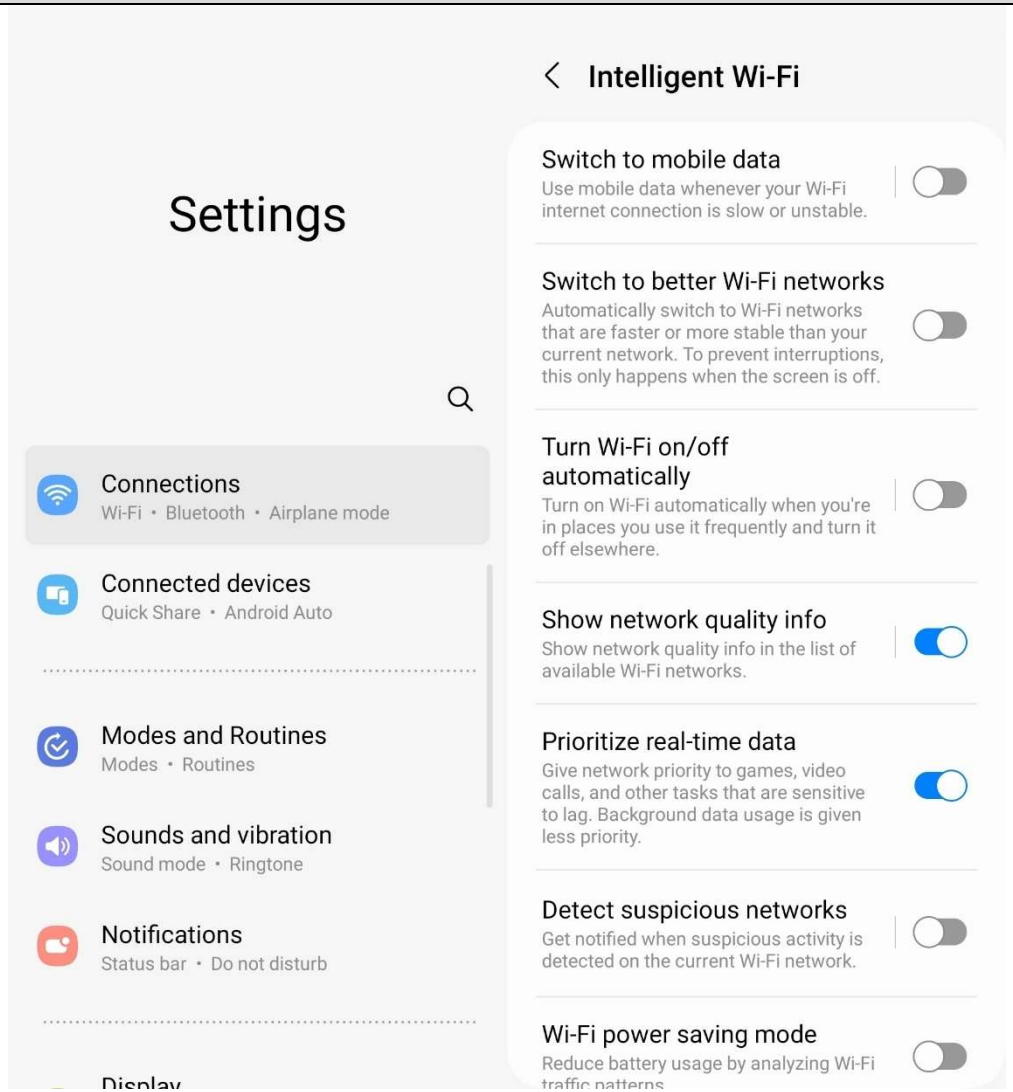
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of "an indication" from a user to control assignment, the user can turn Wi-Fi on and turn cellular connection off to indicate that the user wants to use Wi-Fi for communications. As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Wi-Fi off to indicate that the user wants to use cellular connection for communications. Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Switch to mobile data," under the Intelligent Wi-Fi tab, so the user is indicating to assign a connection to the cellular communication chip when the Wi-Fi connection is unstable. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 User Guide at pg. 122.

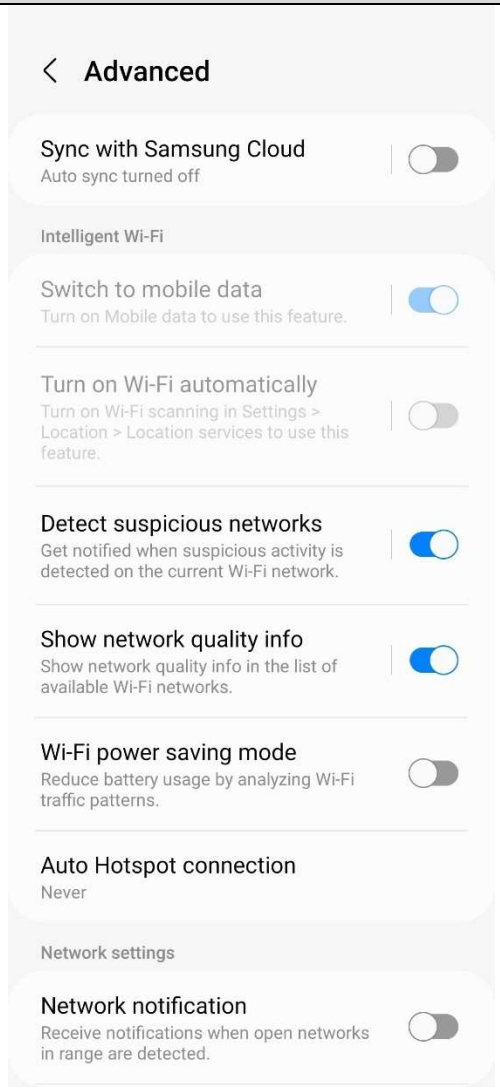
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. • **Prioritize real-time data**: Give network priority to games, video calls, and other tasks that are sensitive to lag. • **Detect suspicious networks**: Get notified when suspicious activity is detected on the current Wi-Fi network. • **Wi-Fi power saving mode**: Enable Wi-Fi traffic analysis to reduce battery usage. • **Auto Hotspot connection**: Automatically connect to a Wi-Fi hotspot when detected. • **Intelligent Wi-Fi**: View the Intelligent Wi-Fi version. Galaxy Z Flip4 User Guide at pg. 122.

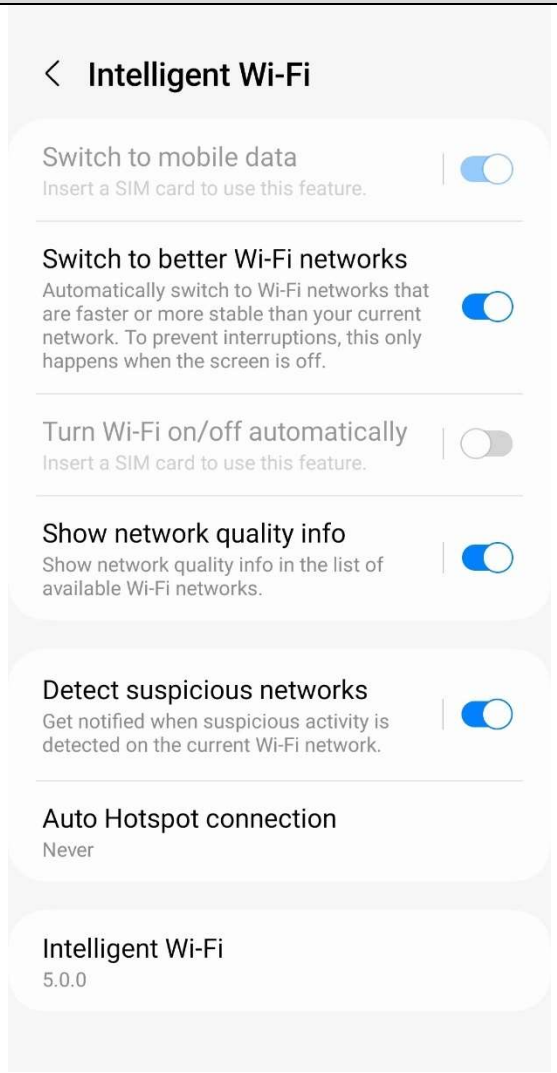
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. Galaxy A54 G User Guide at pg. 101.

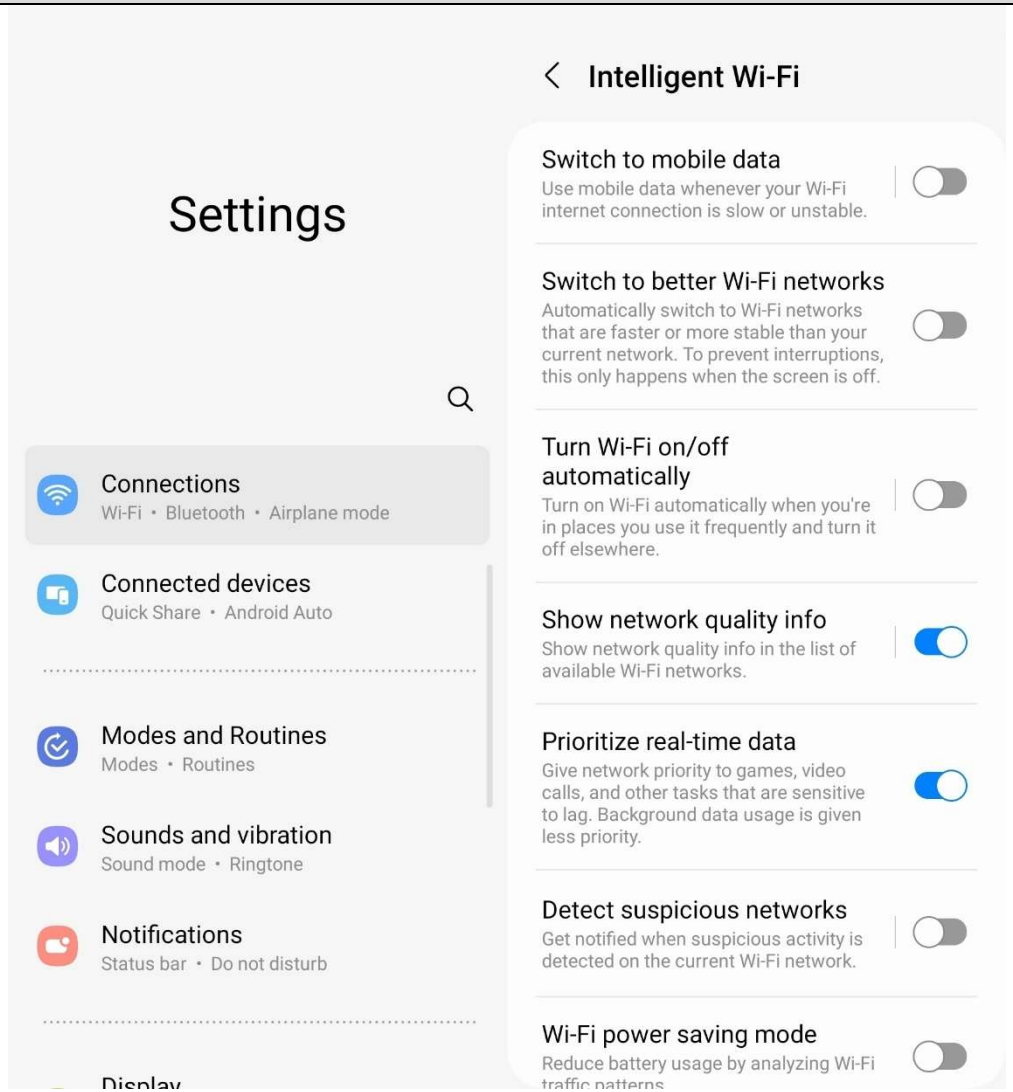
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



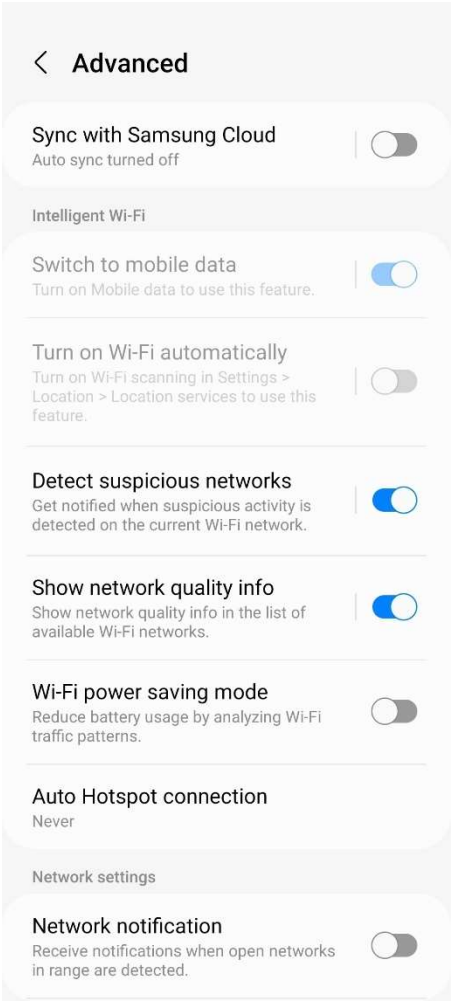
Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

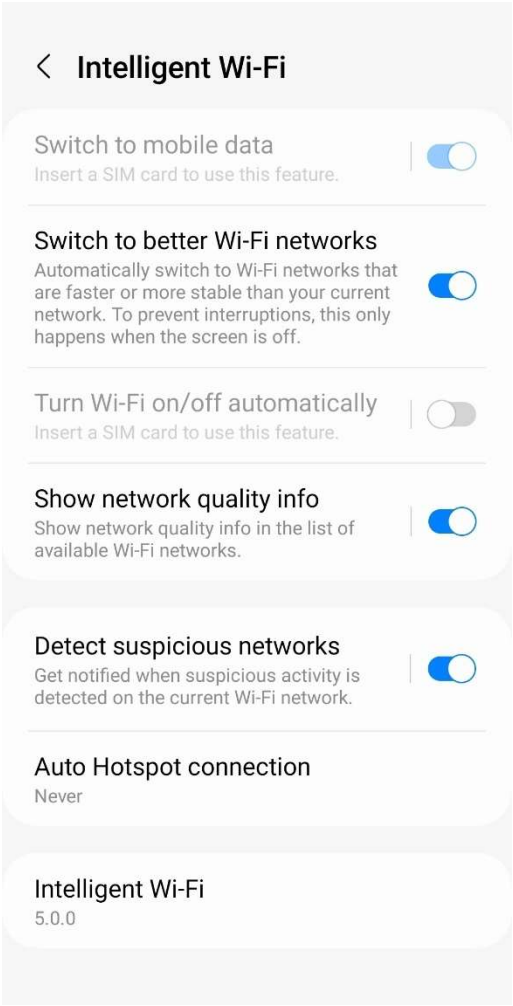
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Turn Wi-Fi on/off automatically," so the user is indicating to switch on Wi-Fi in frequently used areas. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

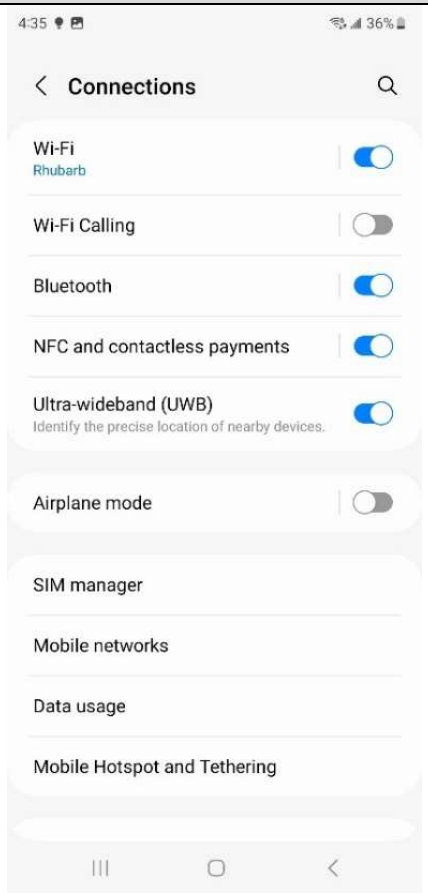


Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

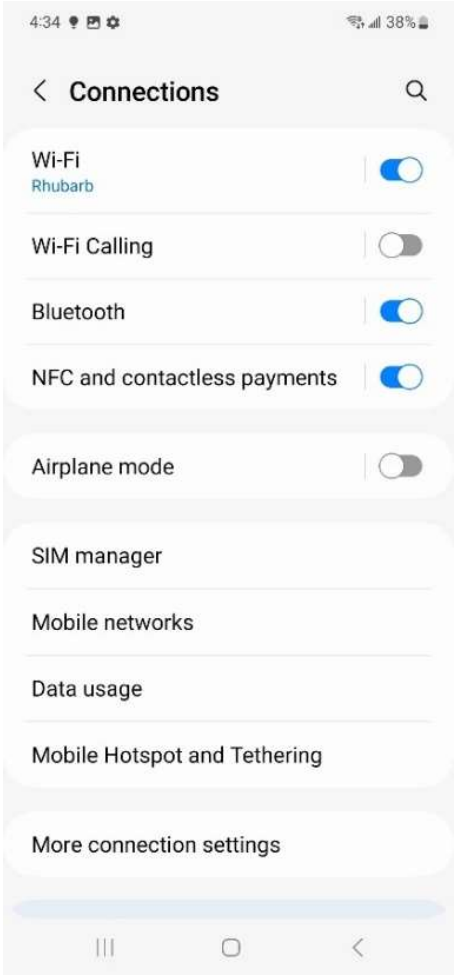
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

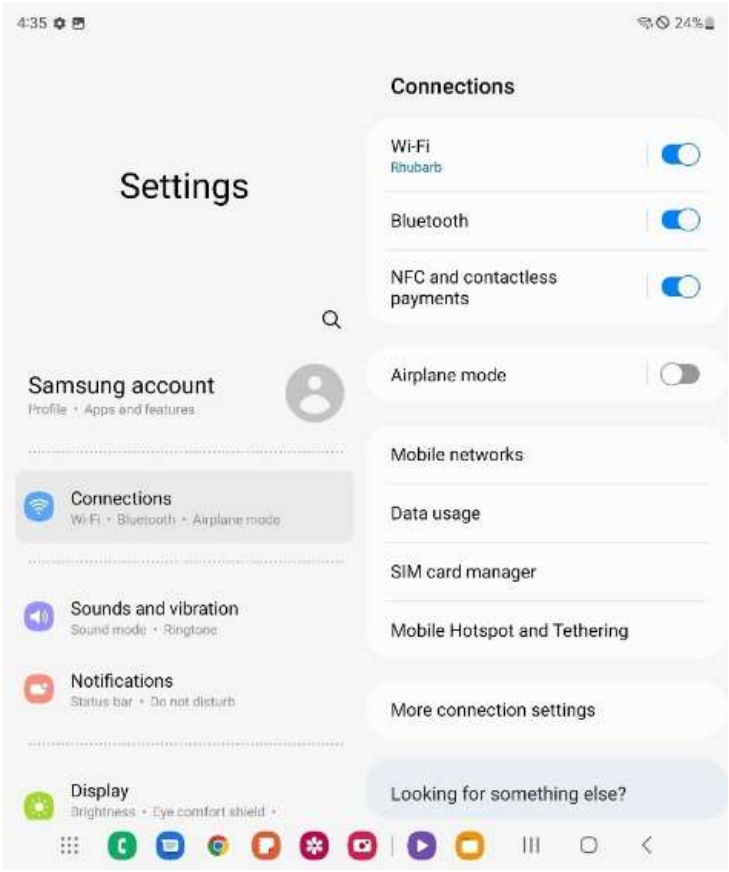
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting "Avoid bad Wi-Fi connections," so the user is indicating to assign a connection to the cellular communication chip when there are bad Wi-Fi connections. **Second Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Bluetooth and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the Bluetooth communication circuit, the controller assigns a connection to the Bluetooth communication circuit for transmitting the video by using Bluetooth to share files. For example, "an indication" from a user to control assignment to the Bluetooth communication chip is turning Bluetooth on/off, and "an indication" from a user to control assignment to the cellular communication chip is turning the cellular connection on/off from the quick menu. For example, the following screenshots show exemplary Accused Samsung '590 Products turning Bluetooth on/off and cellular on/off: User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

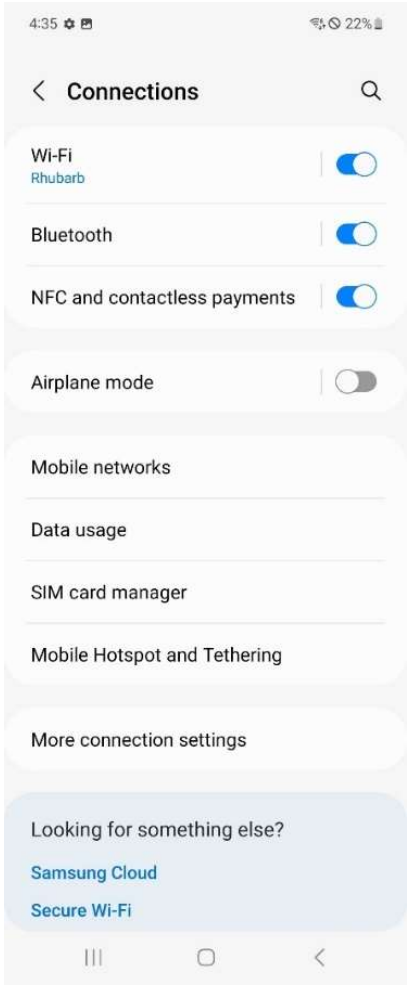
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>As an additional example of "an indication" from a user to control assignment, the user can turn Bluetooth on and turn cellular connection off to indicate that the user wants to use Bluetooth for communications.

As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Bluetooth off to indicate that the user wants to use cellular connection for communications.

Further, the user can provide an indication to transmit video information using the Bluetooth communication circuit by selecting "Bluetooth" share, and the controller then assigns a connection to the Bluetooth communication circuit for transmitting the video.

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

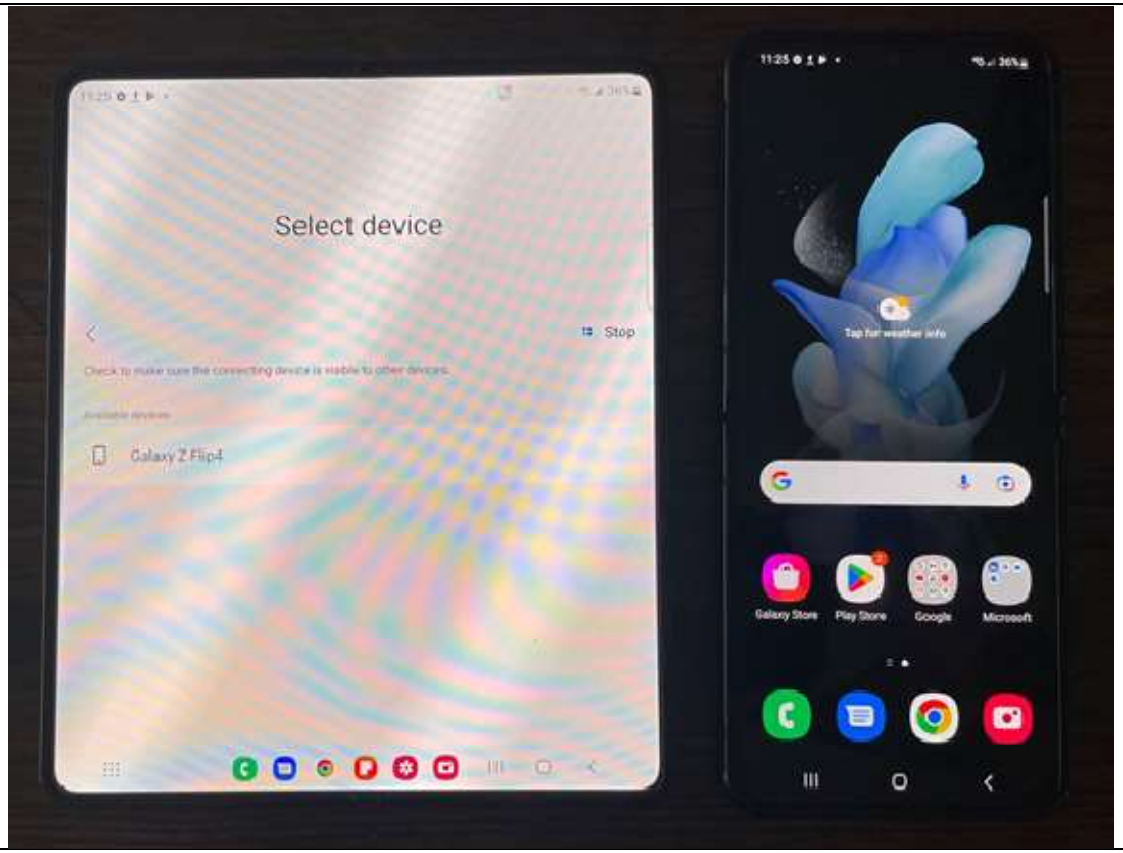
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

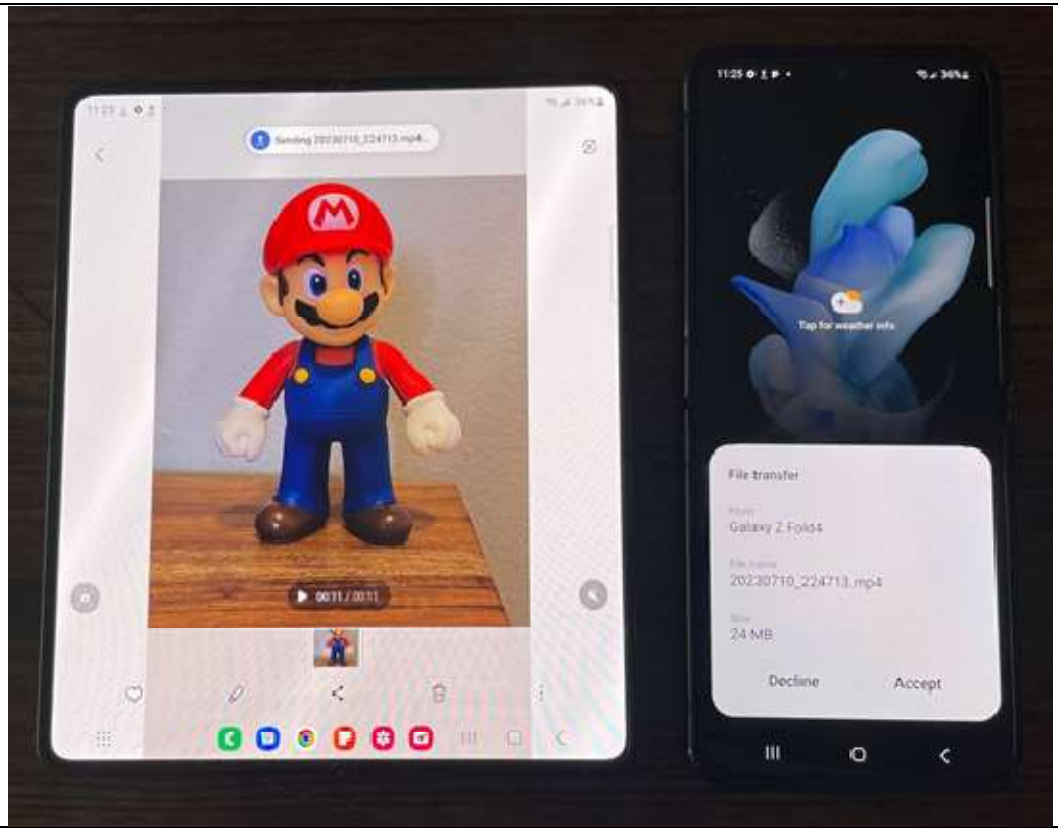
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	


Select device
Stop
Galaxy Z Flip4
Tap for weather info
Galaxy Store
Play Store
Google
Microsoft

		 Tap for weather info File transfer Galaxy Z Fold4 20230710_224713.mp4 24 MB Decline Accept

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



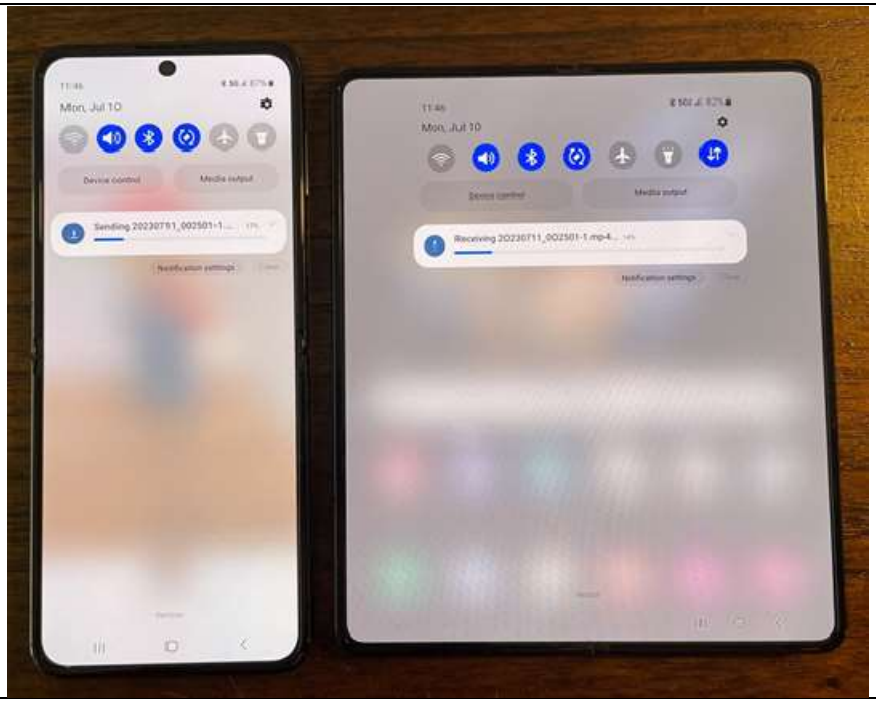
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 Galaxy Store Microsoft 23.2 MB Decline Accept	


Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls assignment of connection in response to a user selecting options via the touch interface (display) in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.
[1.k] wherein the controller controls each of the first and second radio communication circuit so that the first radio	In each of the Accused Samsung '590 Products, the controller controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously, and	information and the second radio communication circuit connects to the internet or the home network simultaneously. **First Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control the transmission of video information via the Wi-Fi communication chip (e.g., Quick Share) and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:** **1.7 Simultaneous Transmission Capabilities** According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

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60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network

Galaxy S23 Ultra User Guide, pg. 30.

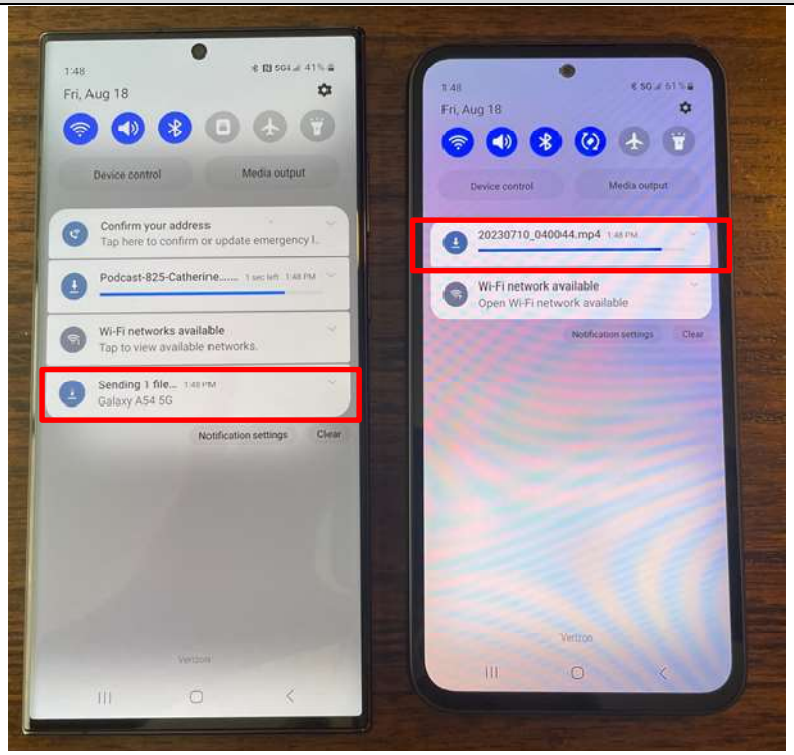
In addition, the Wi-Fi communication chip is used to transmit video information via "Quick Share" while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content over cellular network as Wi-Fi router is switched off indicating that data services are being provides simultaneously over cellular network. For example, the Accused Samsung '590 Products transmit video information over Quick Share while simultaneously connecting to the Internet over cellular network to send or receive emails/MMS, receive a stream of video, doing a video call and/or other services that require cellular data:

First theory:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

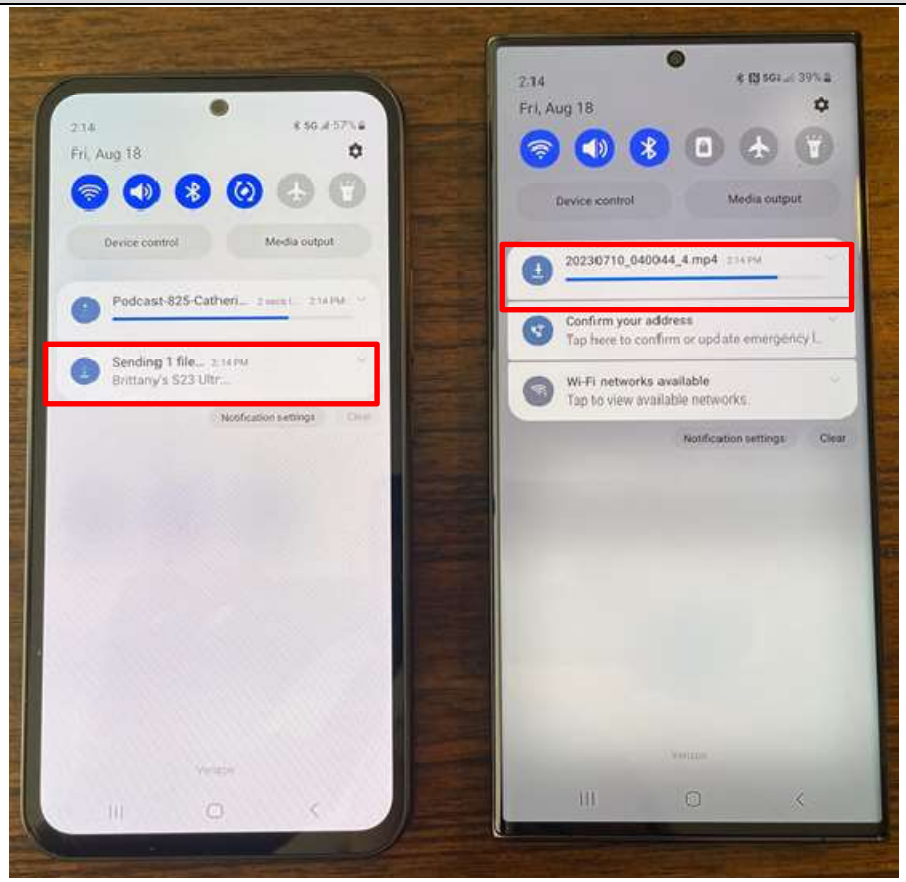
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

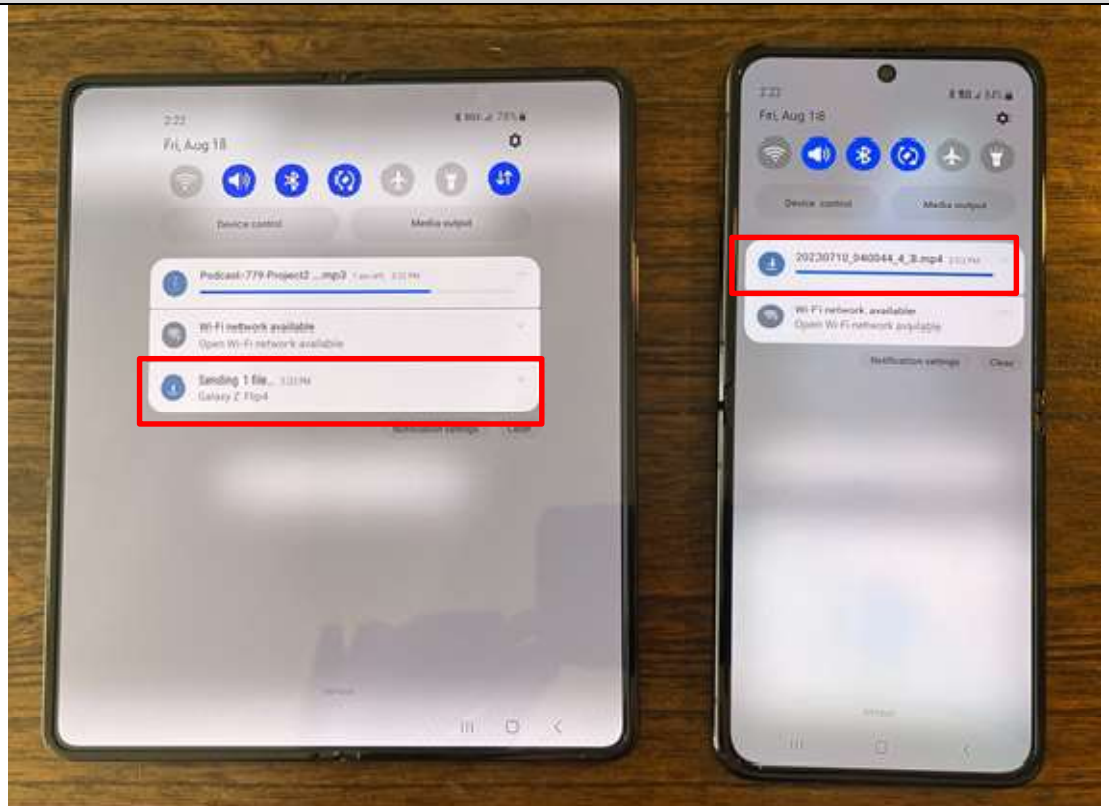


Video Information Transmitting Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

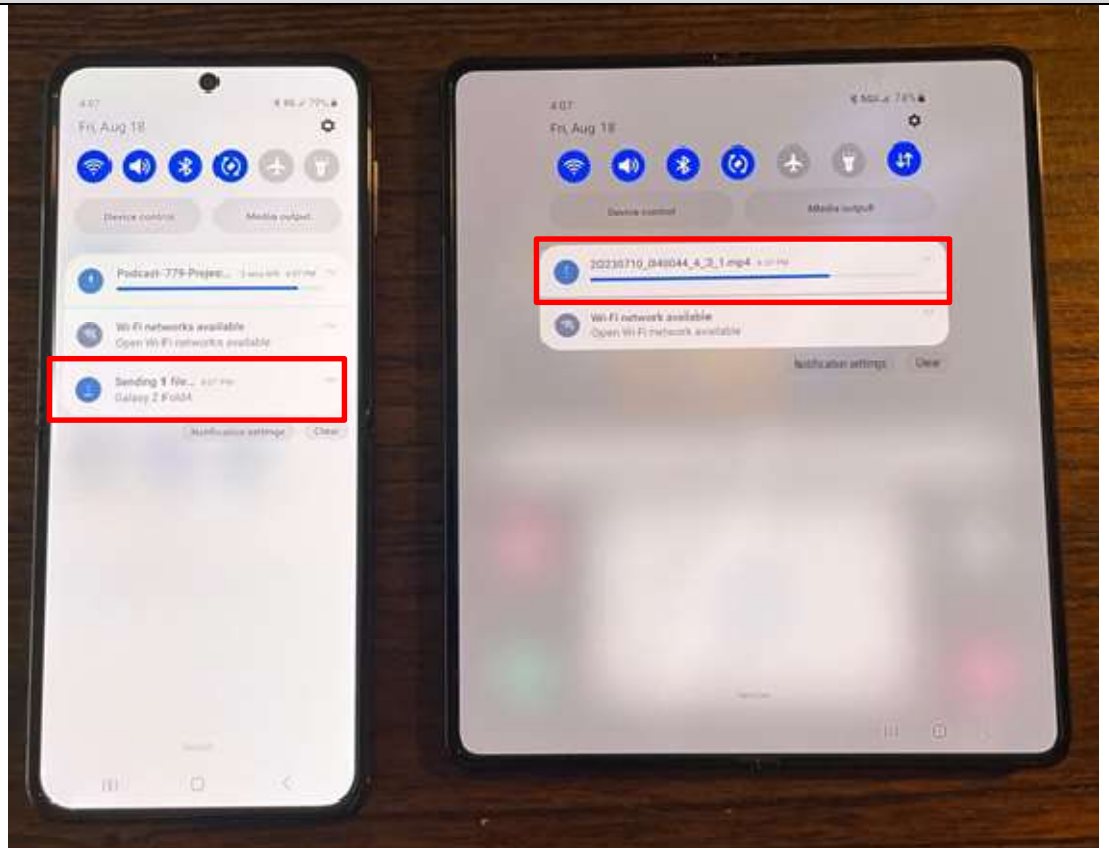
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control the transmission of video information via the Bluetooth communication chip and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	1.7 Simultaneous Transmission Capabilities According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

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60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

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Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

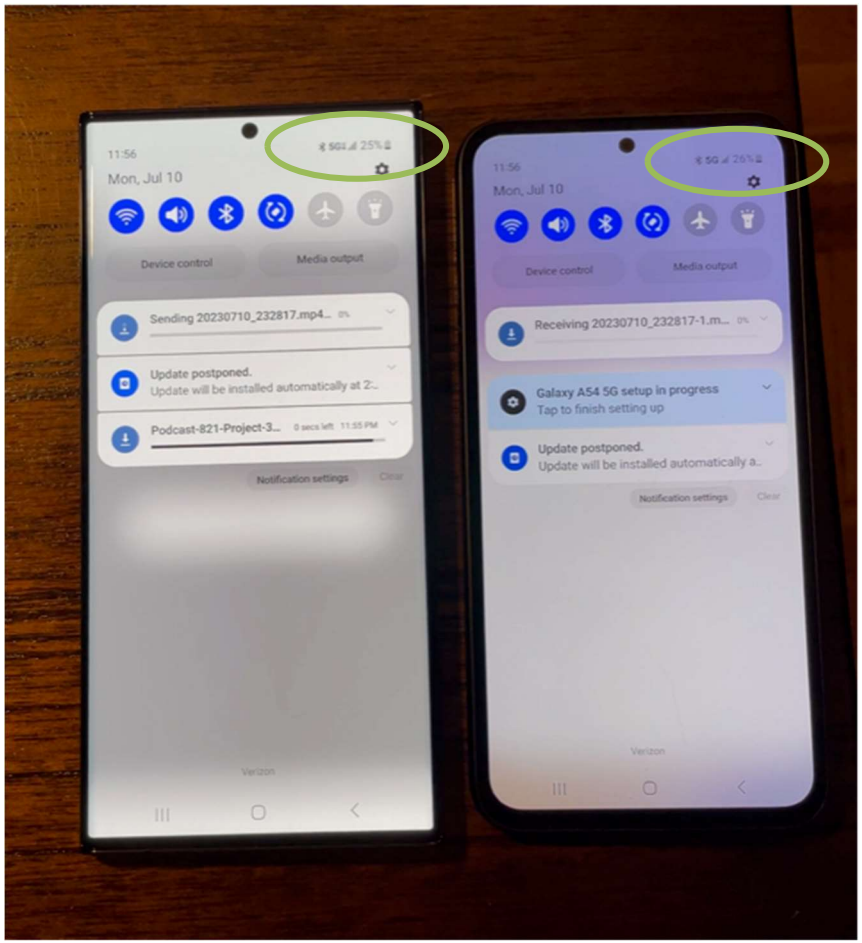
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network
	Wi-Fi connected
	Bluetooth feature turned on

Galaxy S23 Ultra User Guide, pg. 30.

The Bluetooth communication chip is used to transmit video information via Bluetooth file share while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content as Wi-Fi is switched off (similar functionality also applies to receiving e-mail or MMS or streaming video or doing a video call over a cellular network while transmitting a Bluetooth file simultaneously):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)



<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>
<table>
<tr><td>Video Information Transmitting Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)</td><td>Video Information Receiving Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)</td></tr>
</table>
</td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

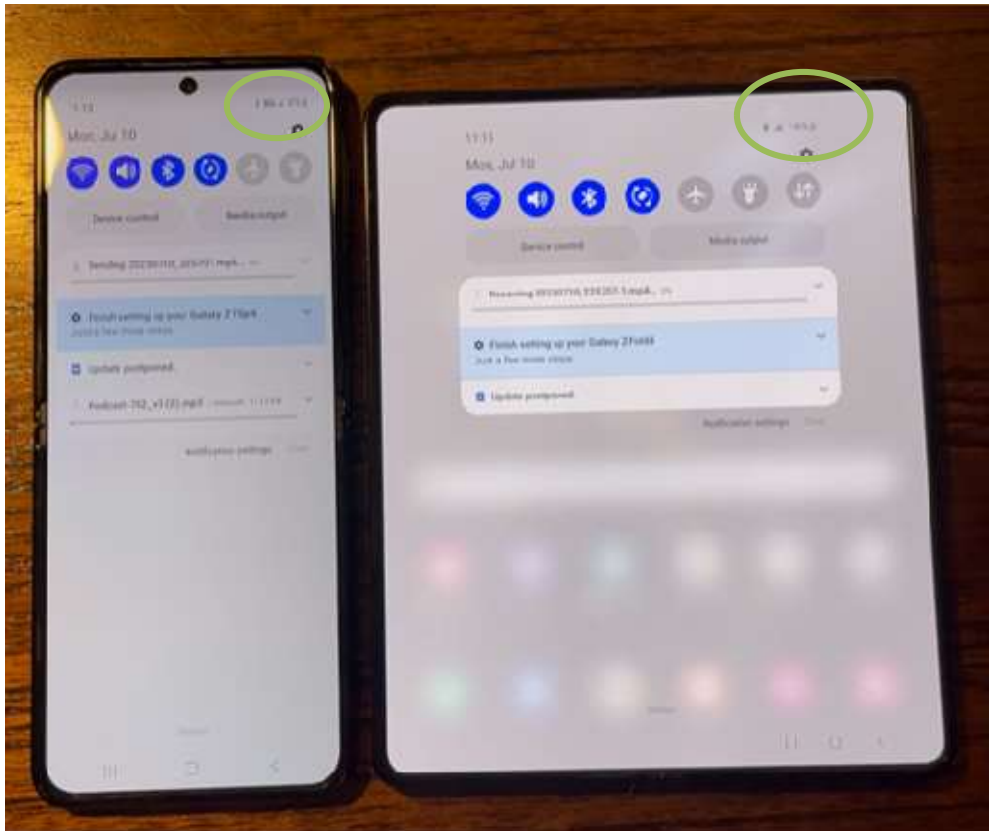


Video Information Transmitting Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls simultaneous communication by WiFi or Bluetooth and cellular circuits in a similar manner when implementing Samsung QuickShare/Bluetooth File Share and connecting to the Internet. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.

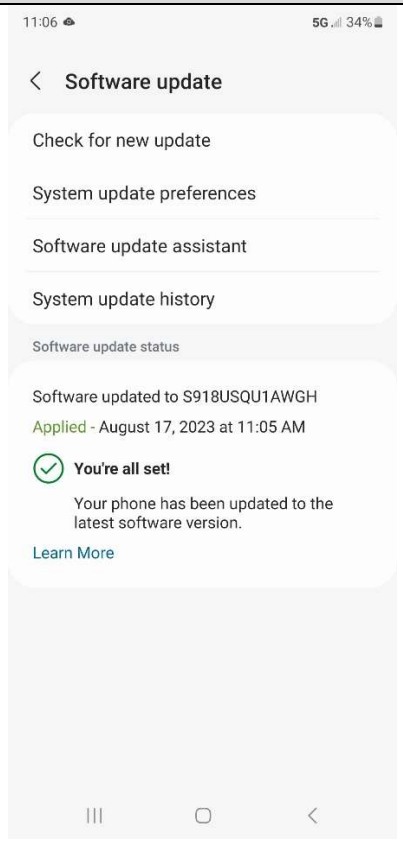
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Doctrine of Equivalents To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling each of the first and second radio communication circuit so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, the Accused Samsung '590 Products include an application processor/CPU which executes the operating system and source code for various applications to control Bluetooth, Wi-Fi, and cellular functionalities occurring simultaneous. The performance of this function achieves substantially the same result, for example, simultaneous transmission of video information with connection to the internet or home network.
[1.l] wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available, and the video processing apparatus executes an update process such that an updated operating system of the video processing apparatus is stored in the video processing apparatus	In each of the Accused Samsung '590 Products, the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available, and the video processing apparatus executes an update process such that an updated operating system of the video processing apparatus is stored in the video processing apparatus after execution of the update process. For example, the operating system can be updated by connecting to the Internet via cellular communication circuits. **Galaxy S23 Ultra:**

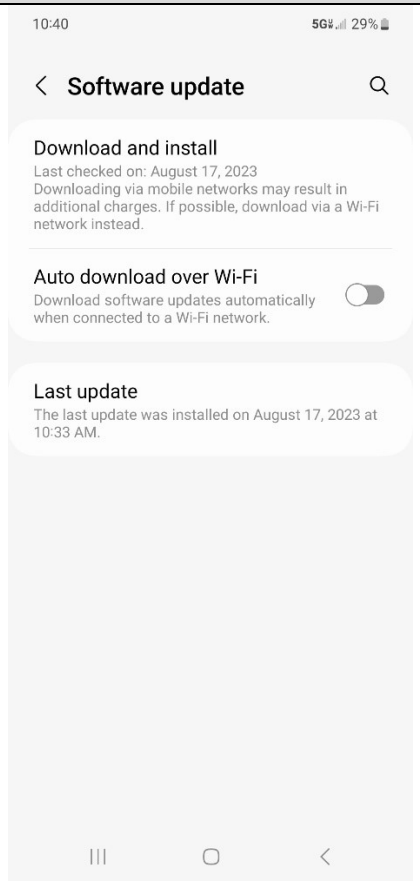
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
after execution of the update process.	 Galaxy S23 Series User Guide at pg. 163. **Galaxy Z Flip4:**

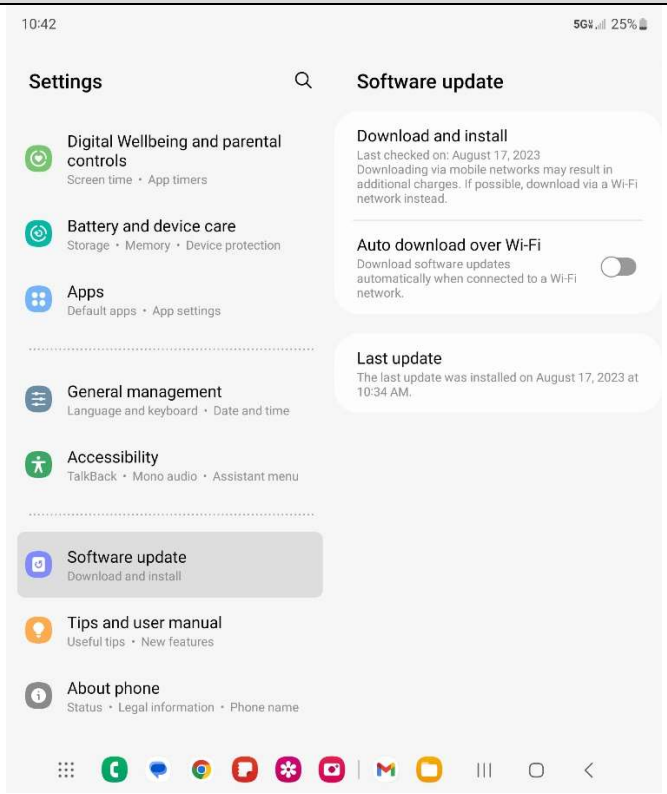
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy Z Fold4:**

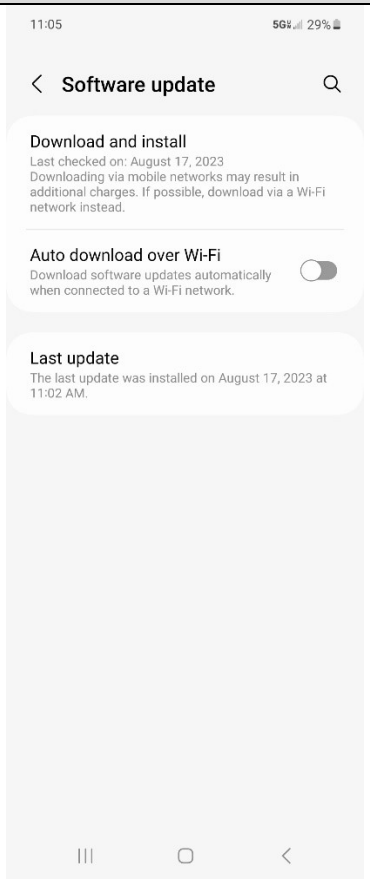
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy A54 5G:**

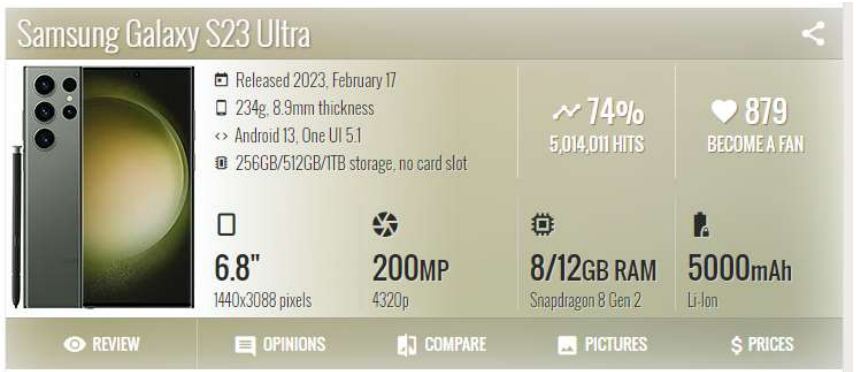
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Auto download over Wi-Fi**: Automatically download software updates when the device is connected to a Wi-Fi network. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy A54 User Guide at pg. 146. For example, the following screenshots show exemplary Accused Samsung '590 Products using the second radio communication circuits ("Download and install" option) to receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available: Galaxy S23 Ultra:

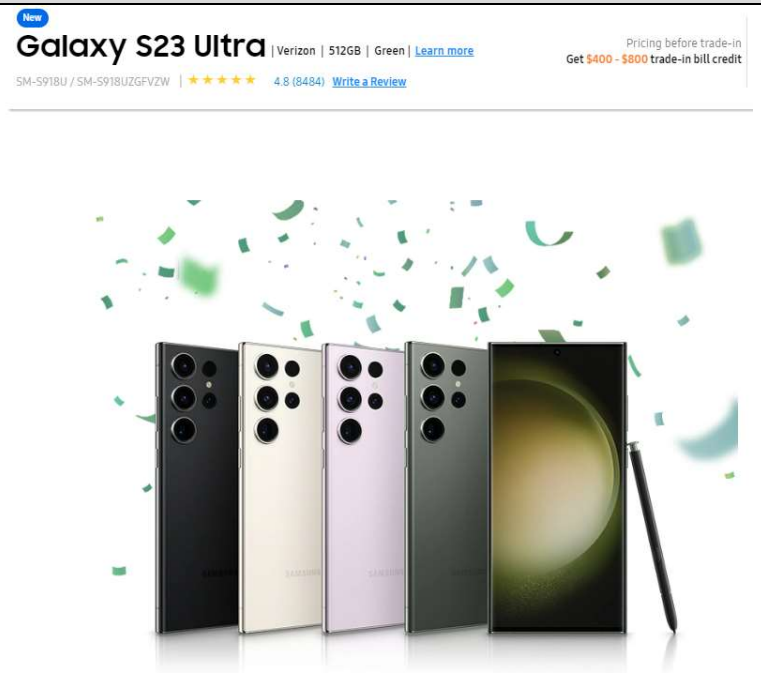
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy ZFold4:

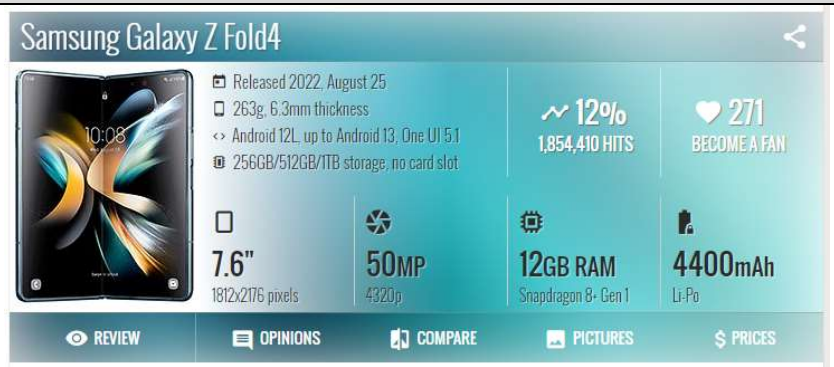
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy ZFlip 4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for receiving a signal from the Internet and updating the operating system in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00077582/.
[5. preamble] A display apparatus, comprising:	To the extent the preamble is construed as a limitation, each of the Accused Samsung '590 Products is a display apparatus. *See e.g.*, Technical Specifications of each of the Accused Samsung

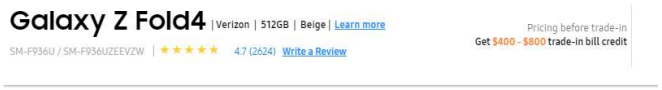
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	'590 show that each of the phones incorporates a display, *e.g.*, an OLED, LED, Retina, or LCD display, together with a processor(s), and is thus a display apparatus. *See*, for example: **Galaxy S23 Ultra:**  DISPLAY Type: Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (HBM), 1750 nits (peak) Size: 6.8 inches, 114.7 cm^2 (~89.9% screen-to-body ratio) Resolution: 1440 x 3088 pixels, 19.3:9 ratio (~500 ppi density) Protection: Corning Gorilla Glass Victus 2 Always-on display

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

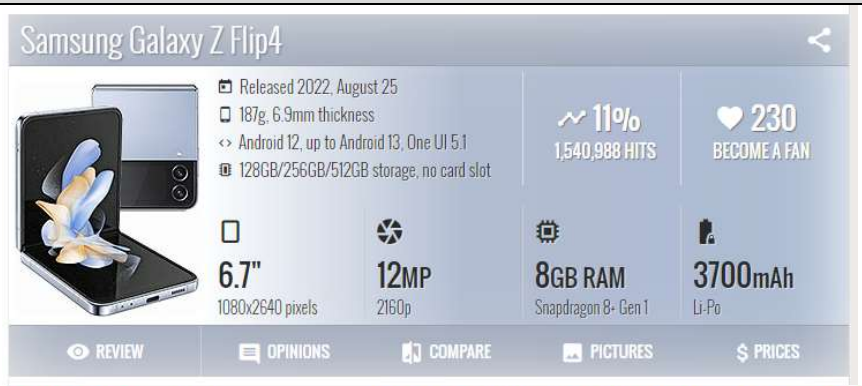


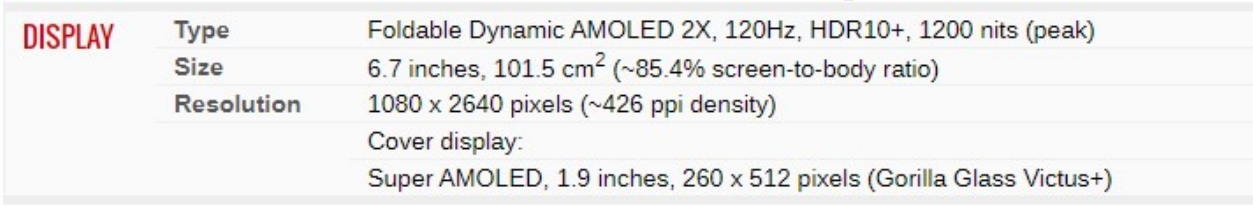
DISPLAY	Type	Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak)
	Size	7.6 inches, 183.2 cm^2 (~90.9% screen-to-body ratio)
	Resolution	1812 x 2176 pixels (~373 ppi density)
		Cover display:
		Dynamic AMOLED 2X, 120Hz, Corning Gorilla Glass Victus+
		6.2 inches, 904 x 2316 pixels, 23.1:9 ratio

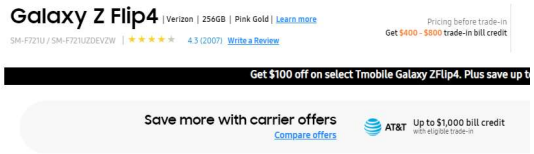
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php **Galaxy Z Flip4:**

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

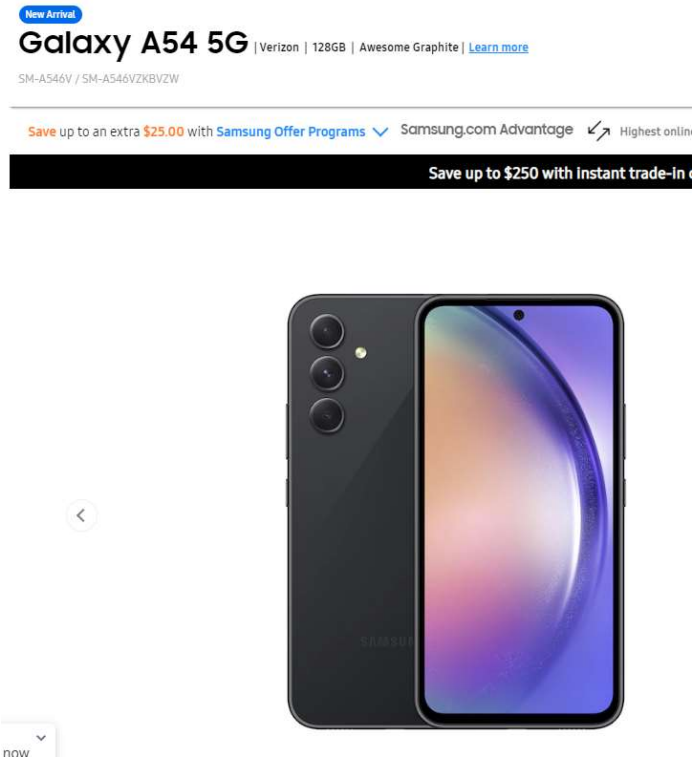








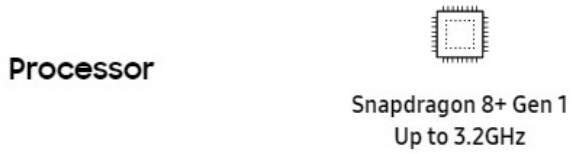
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php **Galaxy Z Fold4:**  DISPLAY Type: Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak) Size: 7.6 inches, 183.2 cm^2 (~90.9% screen-to-body ratio) Resolution: 1812 x 2176 pixels (~373 ppi density) Cover display: Dynamic AMOLED 2X, 120Hz, Corning Gorilla Glass Victus+ 6.2 inches, 904 x 2316 pixels, 23.1:9 ratio

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a54/buy/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

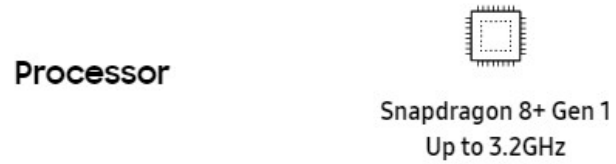
PLATFORM		
	OS	Android 13, One UI 5.1
	Chipset	Qualcomm SM8550-AC Snapdragon 8 Gen 2 (4 nm)
	CPU	Octa-core (1x3.36 GHz Cortex-X3 & 2x2.8 GHz Cortex-A715 & 2x2.8 GHz Cortex-A710 & 3x2.0 GHz Cortex-A510)
	GPU	Adreno 740

Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

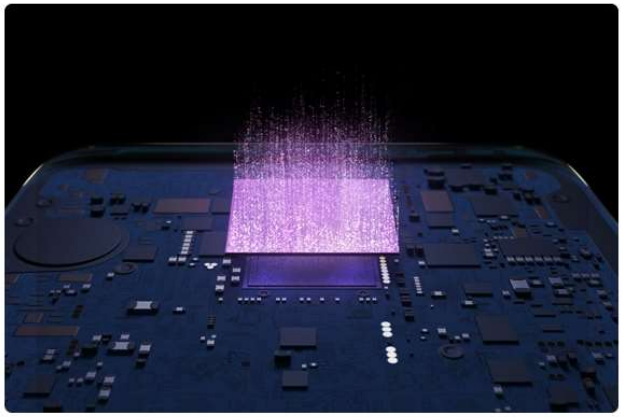


PLATFORM		
	OS	Android 12L, upgradable to Android 13, One UI 5.1
	Chipset	Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm)
	CPU	Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510)
	GPU	Adreno 730

Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.



PLATFORM		
	OS	Android 12, upgradable to Android 13, One UI 5.1
	Chipset	Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm)
	CPU	Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510)
	GPU	Adreno 730

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. Processor **CPU Type** — **CPU Speed** Octa-Core — 2.4GHz,2GHz **Performance**  **Impressive speed. Powerful processor** The powerful Octa-core processor opens up a new range of possibilities with heightened performance and capacity. PLATFORM OS: Android 13, One UI 5.1 Chipset: Exynos 1380 (5 nm) CPU: Octa-core (4x2.4 GHz Cortex-A78 & 4x2.0 GHz Cortex-A55) GPU: Mali-G68 MP5

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php. *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a display for displaying video, and one or more processors (*e.g.*, a CPU, ISP, and/or DSP) with image and video processing capability. *See* https://www.samsung.com/us/support/answer/ANS00089063/.
[5.a] a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit capable of receiving video information by radio or transmitting information by radio using the first transmission frequency band;	Each of the Accused Samsung '590 Products includes a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band. **First Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the Wi-Fi communication chip capable of receiving video information via Wi-Fi communications (e.g., Quick Share) using the first transmission frequency band.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

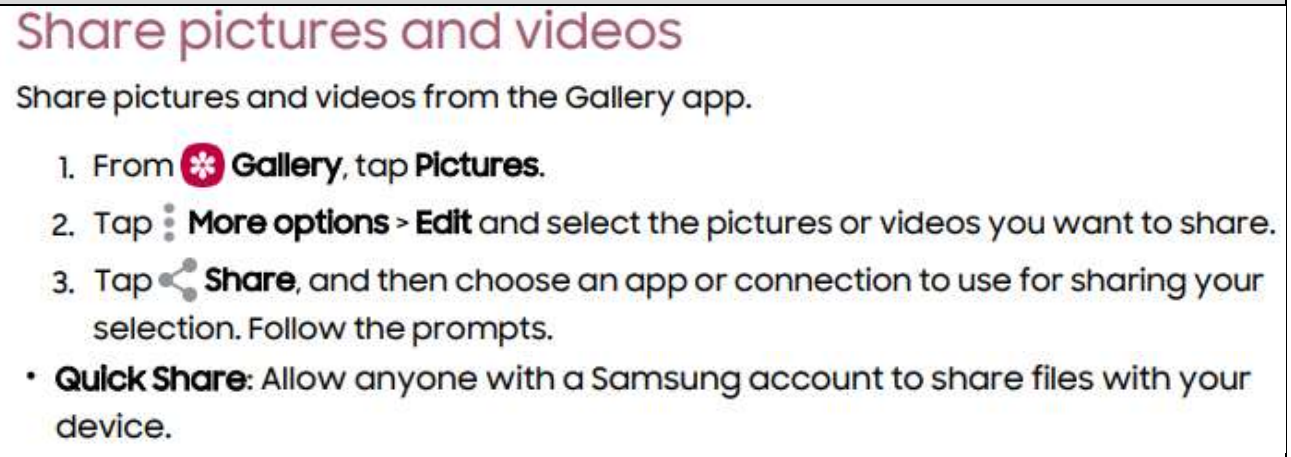
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Sharing content Share content by using various sharing options. The following actions are an example of sharing images. 1 Open the **Gallery** app and select an image. 2 Tap and select a sharing method you want. You may incur additional charges when sharing files through the mobile network. **Quick Share** Sharing content with nearby devices Share content with nearby devices through Wi-Fi Direct or Bluetooth, or with some SmartThings supported devices. 1 Open the **Gallery** app and select an image. 2 On the other device, open the notification panel, swipe downwards, and then tap (**Quick Share**) to turn it on. If you cannot find (**Quick Share**) on the quick panel, tap and drag the button over to add it.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3 Tap → **Quick Share** and select a device to receive the image. 4 Accept the file transfer request on the other device. This feature does not support sharing videos with TVs or SmartThings supported devices. To watch videos on TV, use the Smart View feature. **Setting who can find your phone** Set who is allowed to find and send content to your phone. 1 Open the notification panel, swipe downwards, and then tap (**Quick Share**). 2 Select an option. • **No one**: Do not allow others to find your phone. • **Contacts only**: Only allow Samsung users in your contacts to share with your phone. • **Anyone nearby**: Allow any nearby devices to share with your phone. **Sharing through Web link** Upload large files to the Samsung storage server and share them with others through Web link. 1 Open the **Gallery** app and select an image. 2 Tap → **Quick Share** and select an option you want under **Share to any device**. • **Copy link**: Share the link copied to the clipboard. • **Share link using app**: Share the link by selecting an app. • **Share using QR code**: Share the link with the created QR code. Galaxy S23 Series User Guide at pg. 111-112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

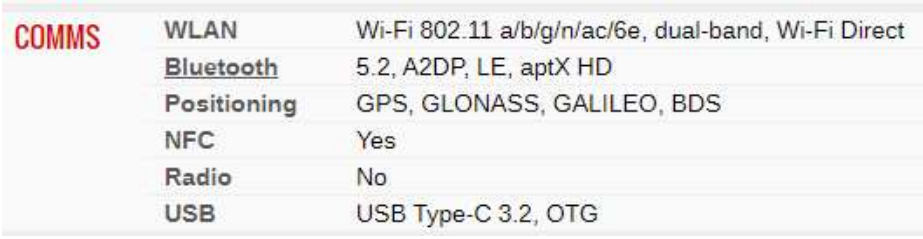
Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

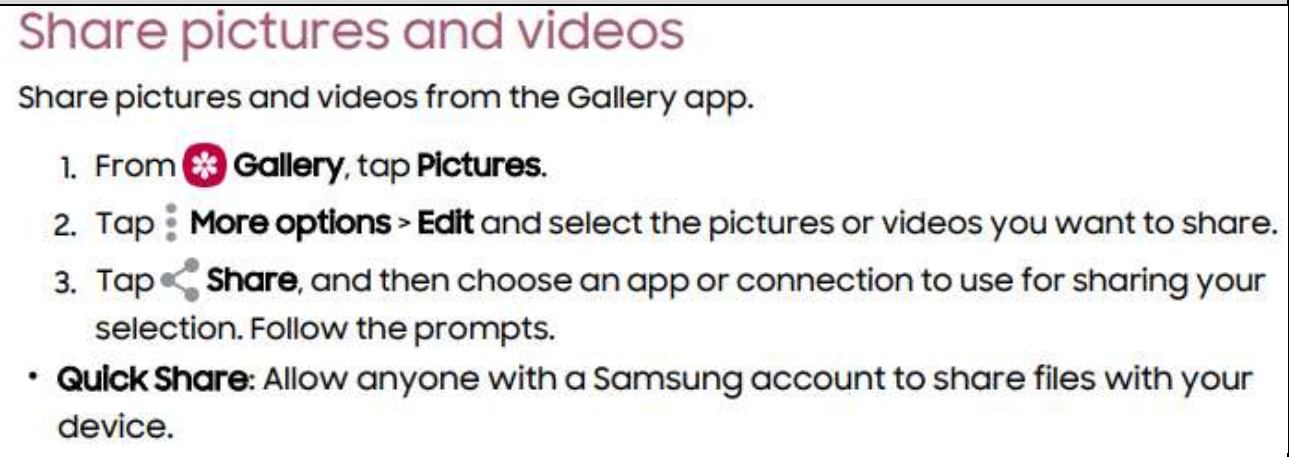
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
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LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
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NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
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U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

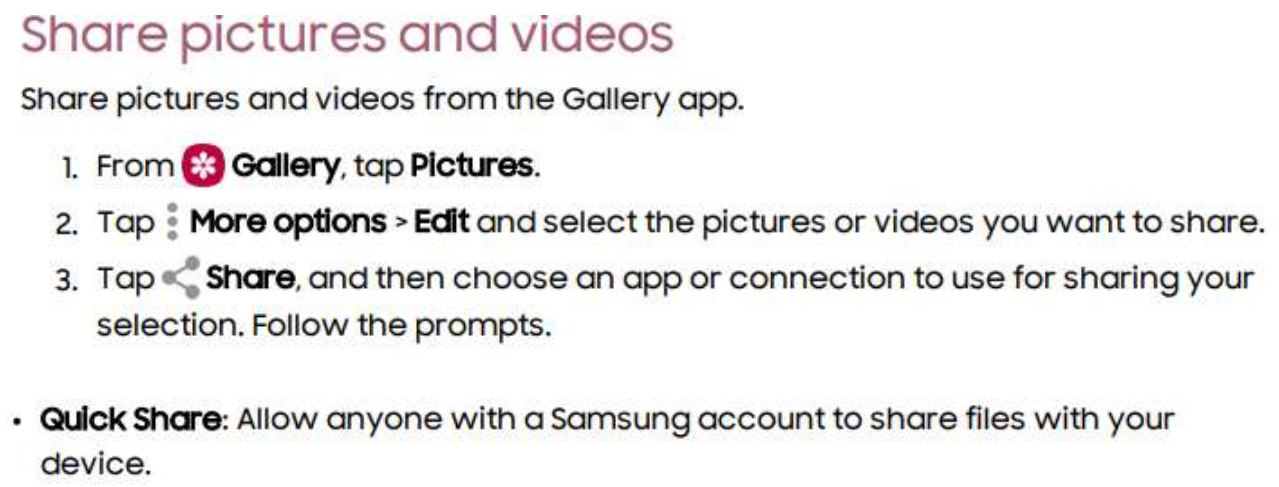
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

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GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
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LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
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LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
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NR Band n38	Voice/Data	2575 - 2615 MHz
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NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
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U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes (market/region dependent) Radio: No USB: USB Type-C 2.0, OTG Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 49, 112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

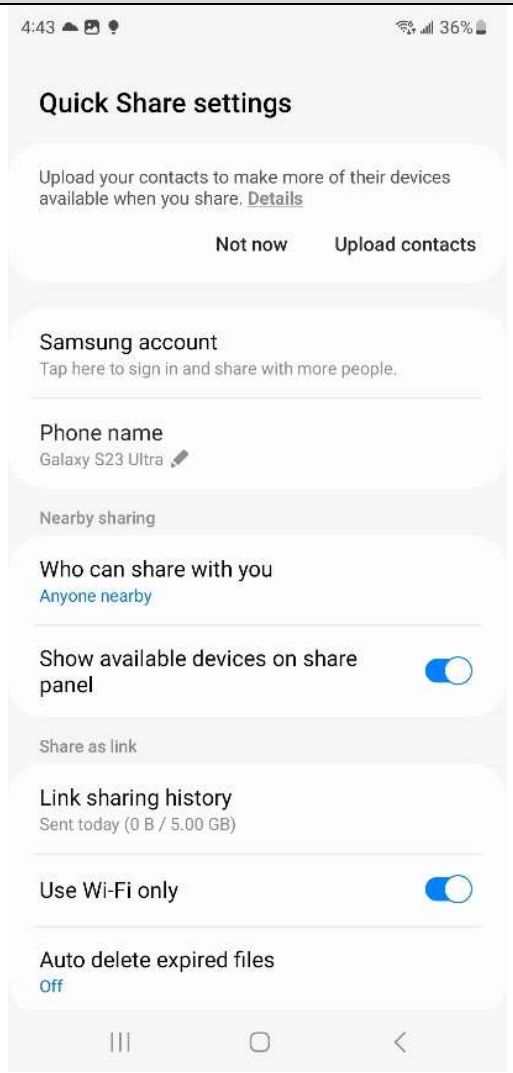
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

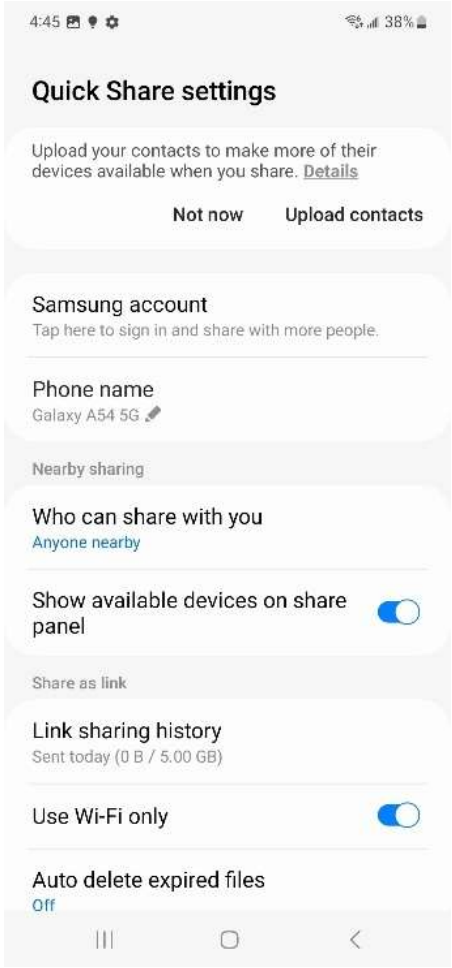
	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

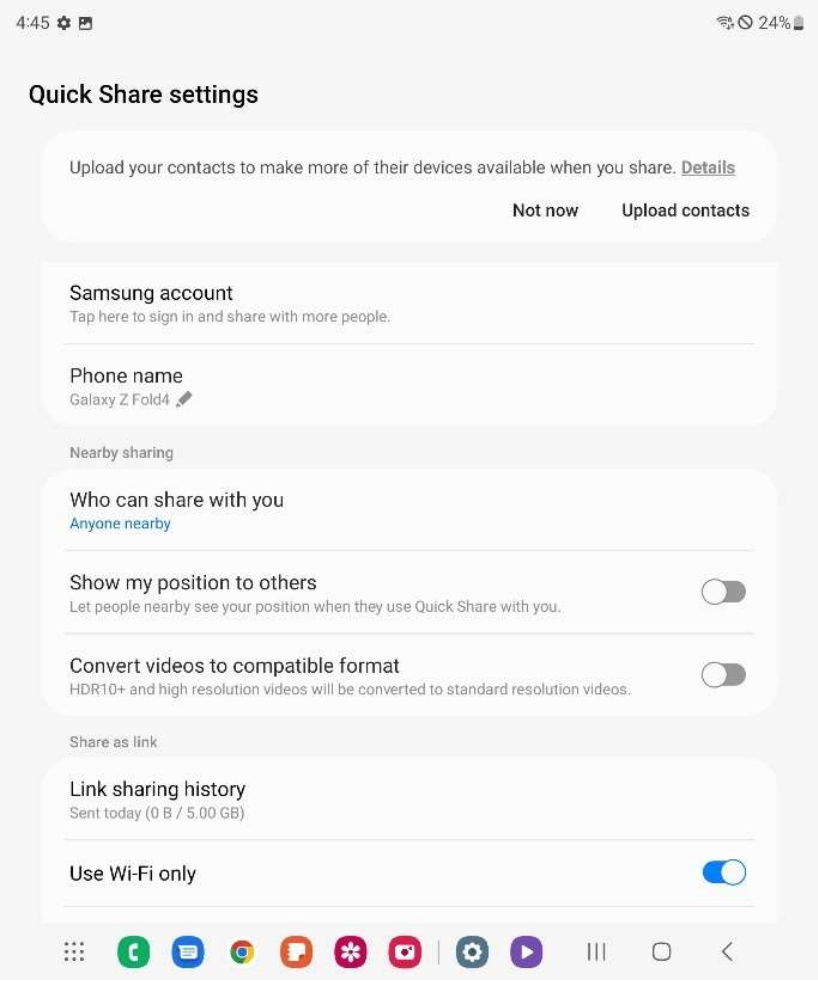
See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

For example, the following screenshots show exemplary Accused Samsung '590 Products using a Wi-Fi communication chip to receive video information by using Quick Share app:

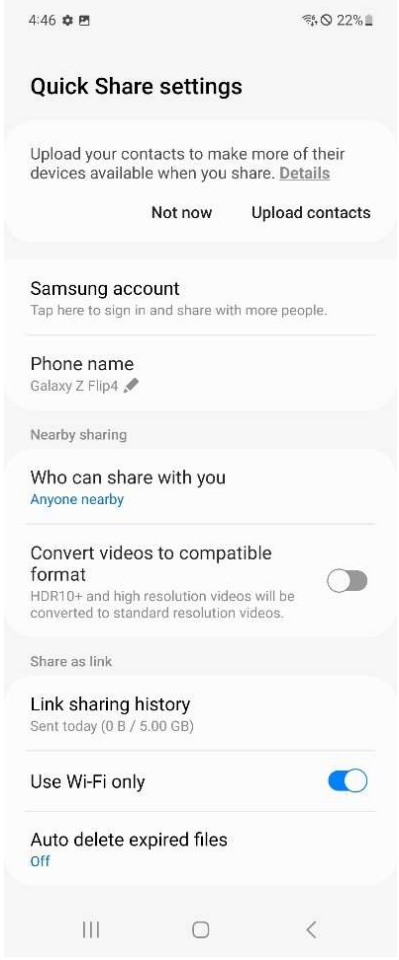
Samsung Galaxy 23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



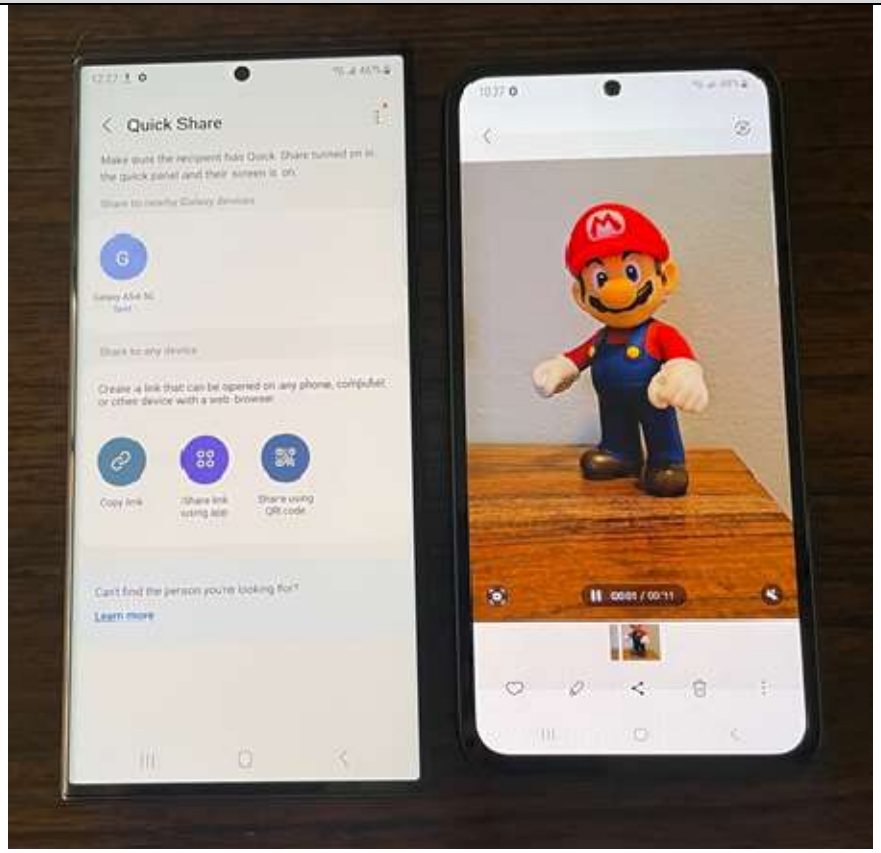
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

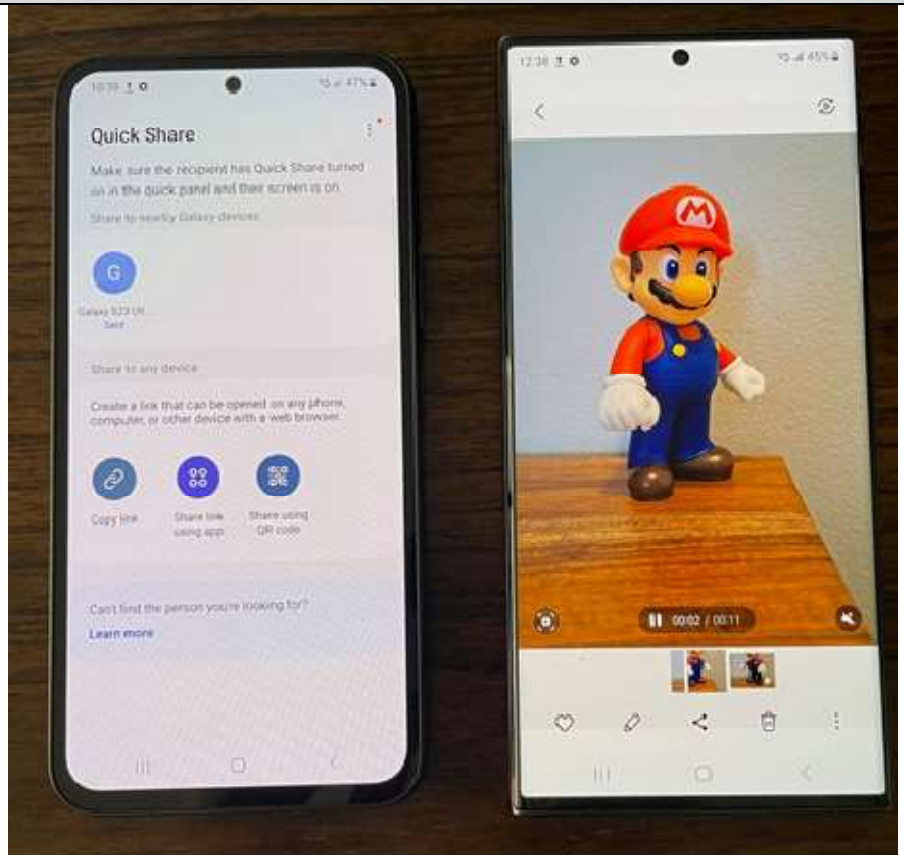
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



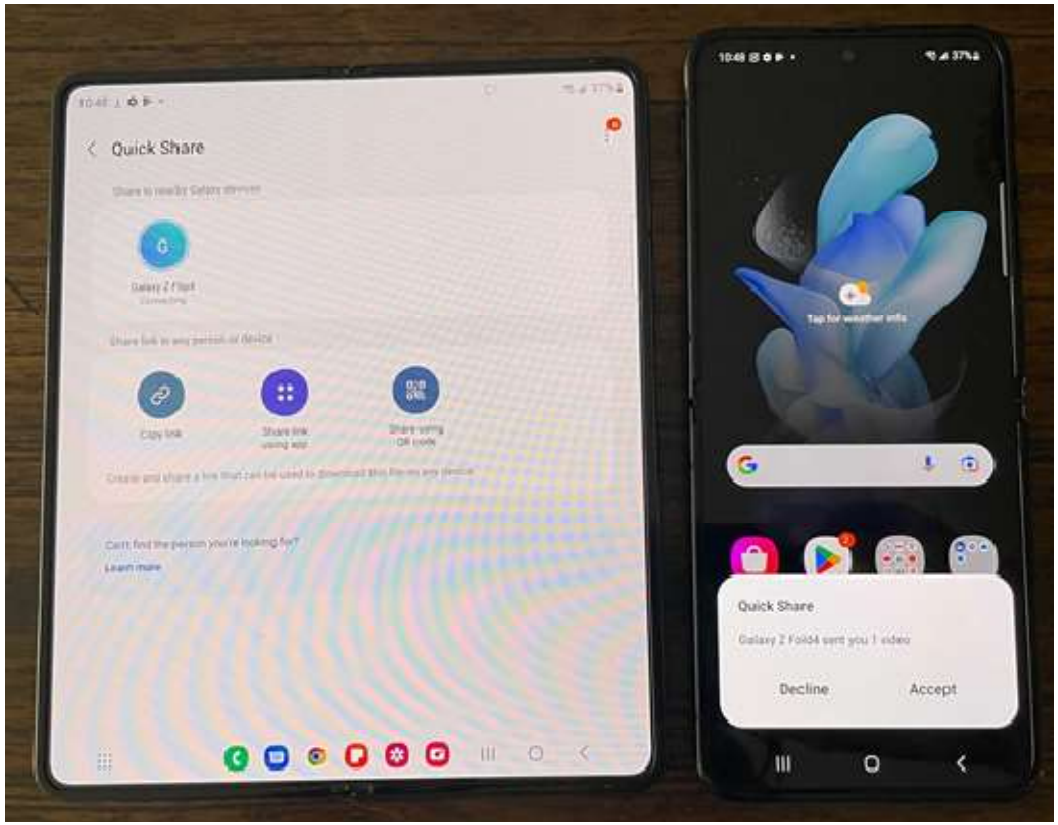
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

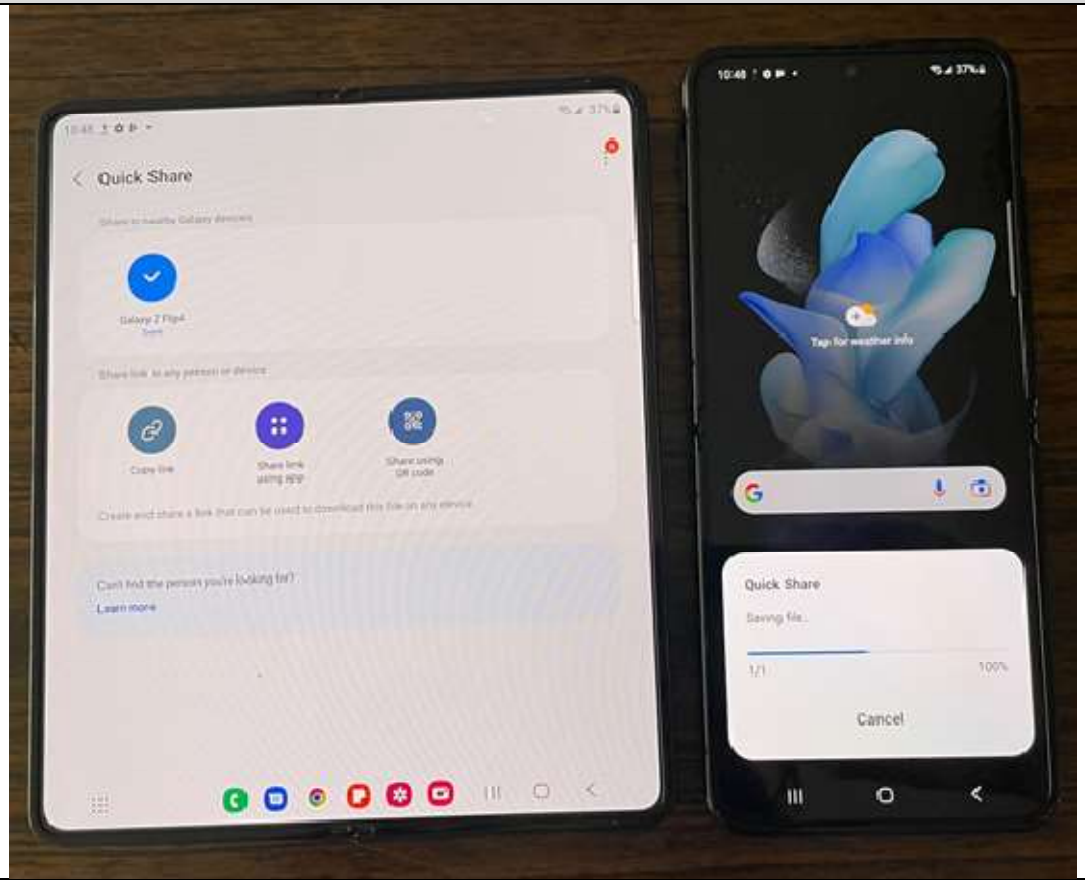
	

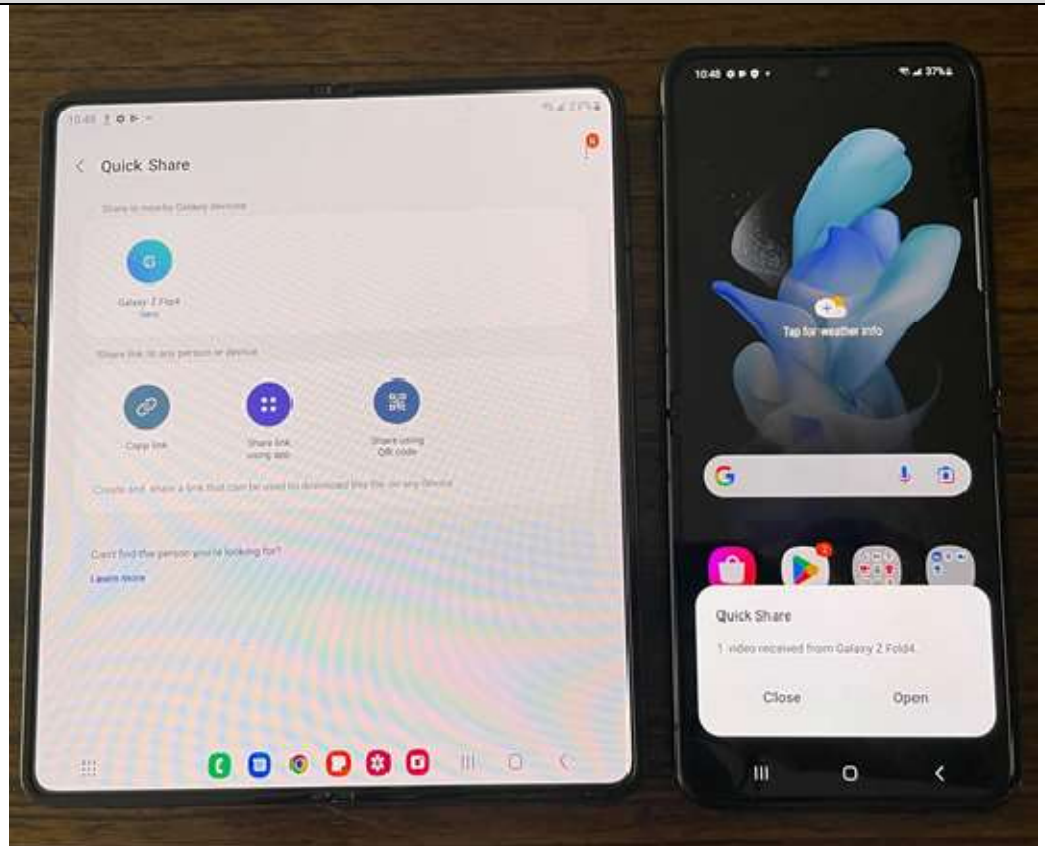

1 item
Galaxy Store
Play Store
Google
Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

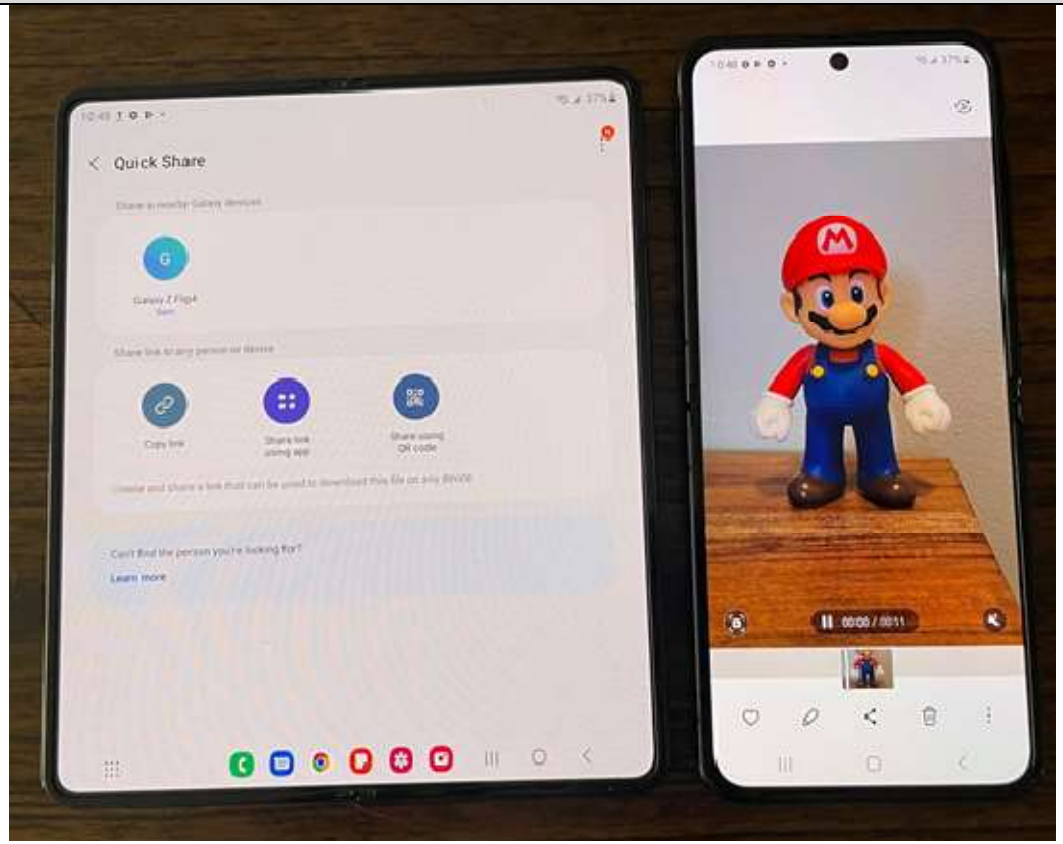
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

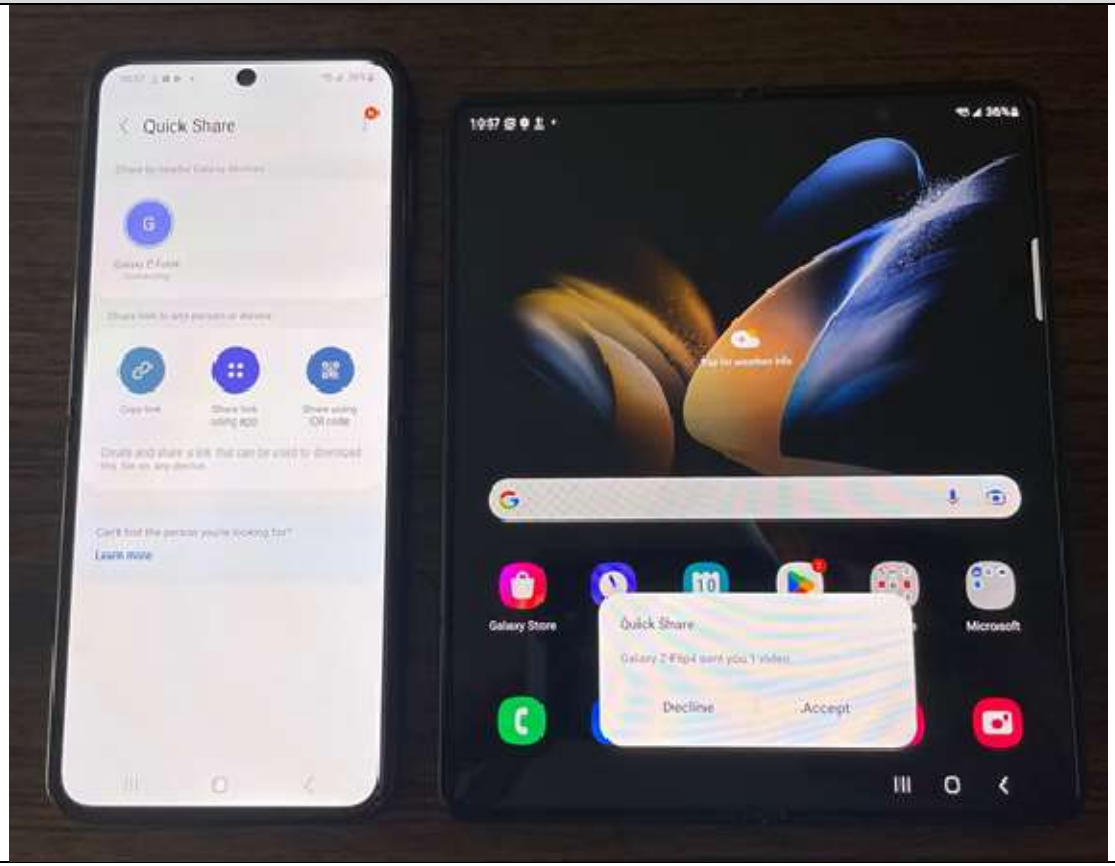


Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

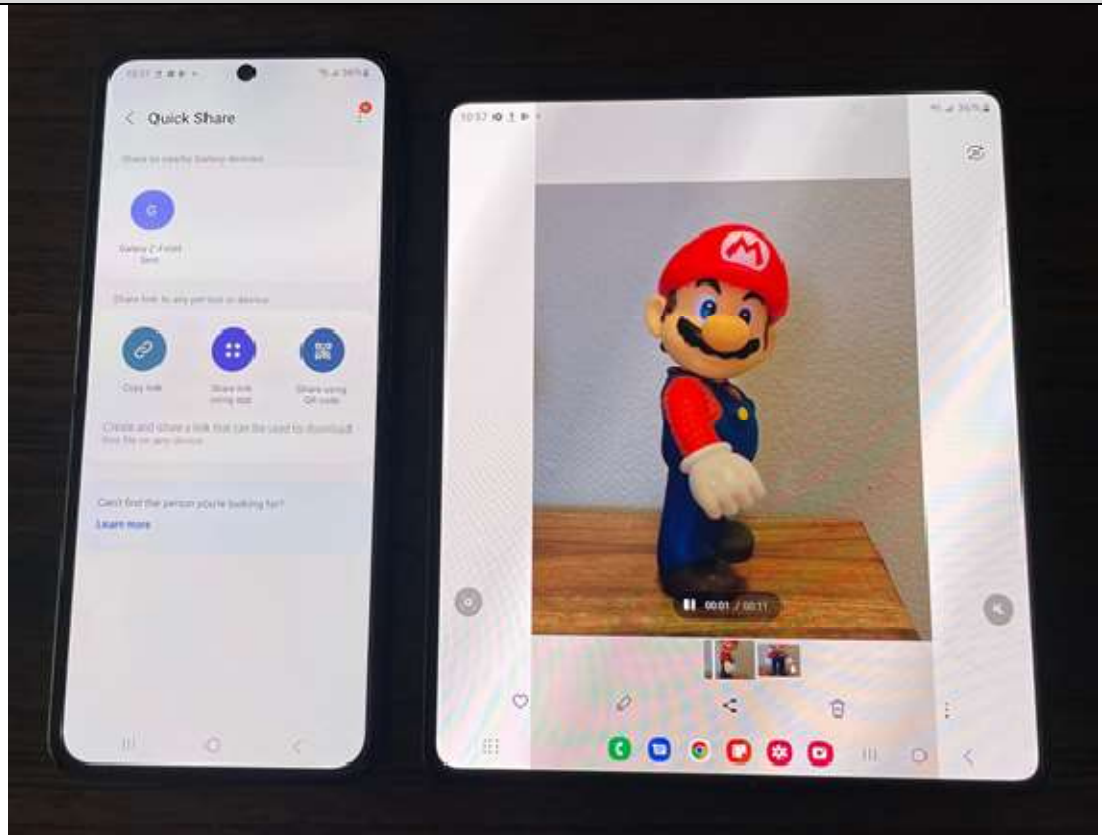
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

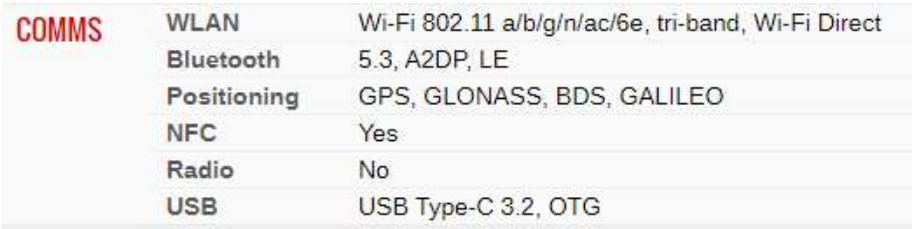
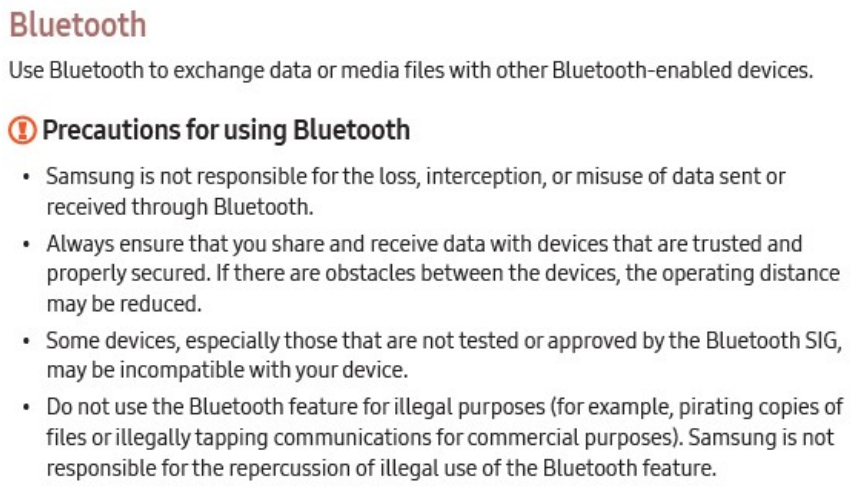
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Quick Share Galaxy Store Microsoft Quick Share Close Open

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Wi-Fi communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/. **Second Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip implementing a first transmission scheme having a first modulation scheme and a first

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	transmission frequency band, the Bluetooth communication chip capable of receiving video information via Bluetooth communications using the first transmission frequency band. **Galaxy S23 Ultra:**  COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.  Bluetooth Use Bluetooth to exchange data or media files with other Bluetooth-enabled devices. Precautions for using Bluetooth • Samsung is not responsible for the loss, interception, or misuse of data sent or received through Bluetooth. • Always ensure that you share and receive data with devices that are trusted and properly secured. If there are obstacles between the devices, the operating distance may be reduced. • Some devices, especially those that are not tested or approved by the Bluetooth SIG, may be incompatible with your device. • Do not use the Bluetooth feature for illegal purposes (for example, pirating copies of files or illegally tapping communications for commercial purposes). Samsung is not responsible for the repercussion of illegal use of the Bluetooth feature.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Pairing with other Bluetooth devices 1 On the Settings screen, tap **Connections** → **Bluetooth** and tap the switch to turn it on. The detected devices will be listed. 2 Select a device to pair with. If the device you want to pair with is not on the list, set the device to enter Bluetooth pairing mode. Refer to the other device's user manuals. Your phone is visible to other devices while the Bluetooth settings screen is open. 3 Accept the Bluetooth connection request on your phone to confirm. The devices will be connected when the other device accepts the Bluetooth connection request. To unpair the devices, tap next to the device name to unpair and tap **Unpair**. **Sending and receiving data** Many apps support data transfer through Bluetooth. You can share data, such as contacts or media files, with other Bluetooth devices. The following actions are an example of sending an image to another device. 1 Open the **Gallery** app and select an image. 2 Tap → **Bluetooth** and select a device to receive the image. If the device you want to pair with is not in the list, turn on its visibility option. 3 Accept the Bluetooth connection request on the other device. Galaxy S23 Series User Guide at pg. 124-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

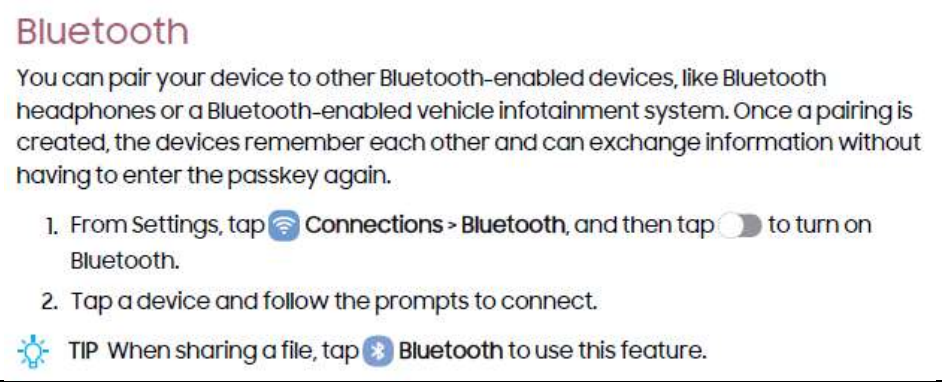
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power [dBm]	Avg Conducted Power [mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power [dBm]	Peak Conducted Power [mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

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	Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. TIP When sharing a file, tap Bluetooth to use this feature.

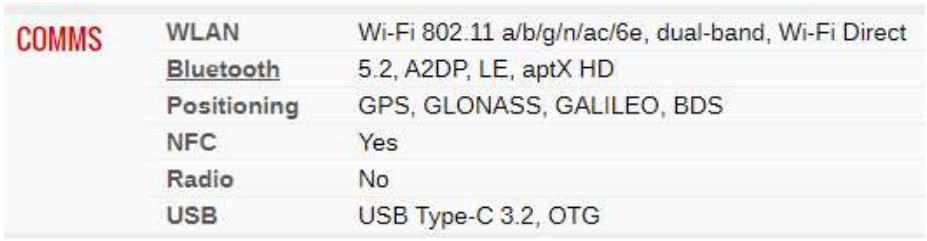
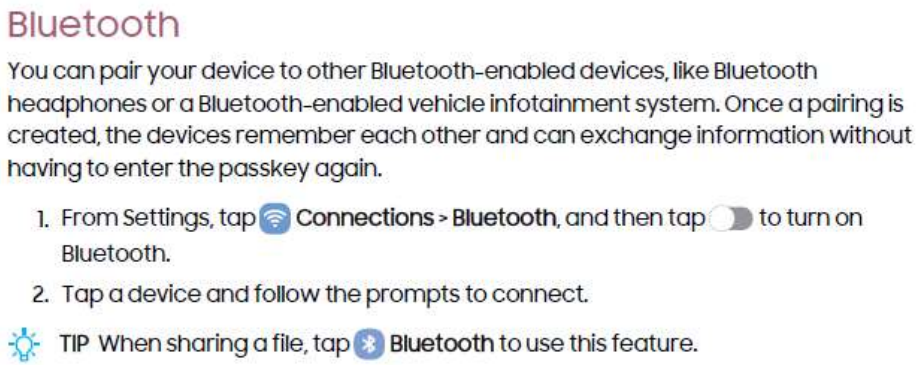
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-  11737.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. • To disconnect from a paired device, tap Disconnect. Tap Connect to reconnect. TIP When sharing a file, tap Bluetooth to use this feature. Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap Settings next to the device name, and then tap Rename. 3. Enter a new name, and tap Rename.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Unpair from a Bluetooth device When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Phone name:** Change the name of your device for Bluetooth connections. • **Received files:** View a list of files received using Bluetooth. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy A54 User Guide at pg. 103-105.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>For example, the following screenshots show exemplary Accused Samsung '590 Products using a Bluetooth communication chip to transmit and/or receive video information by using Bluetooth file sharing:<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

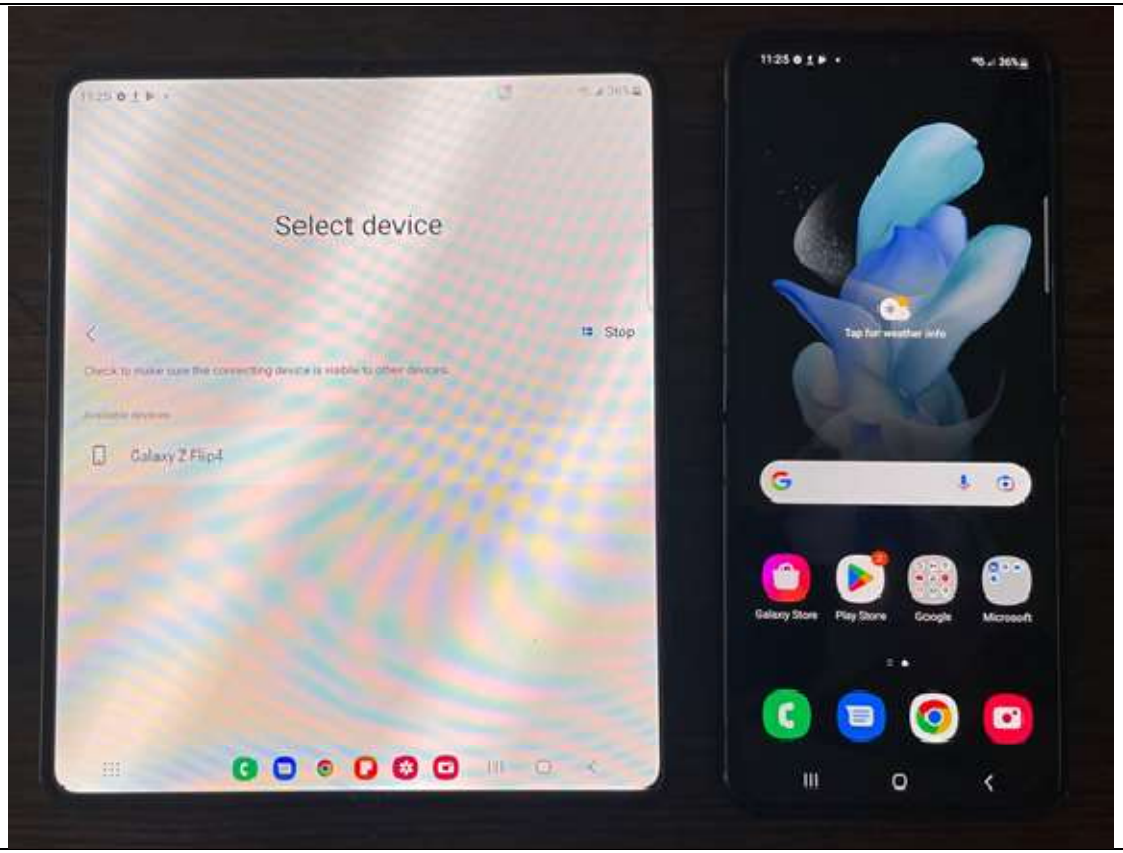
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

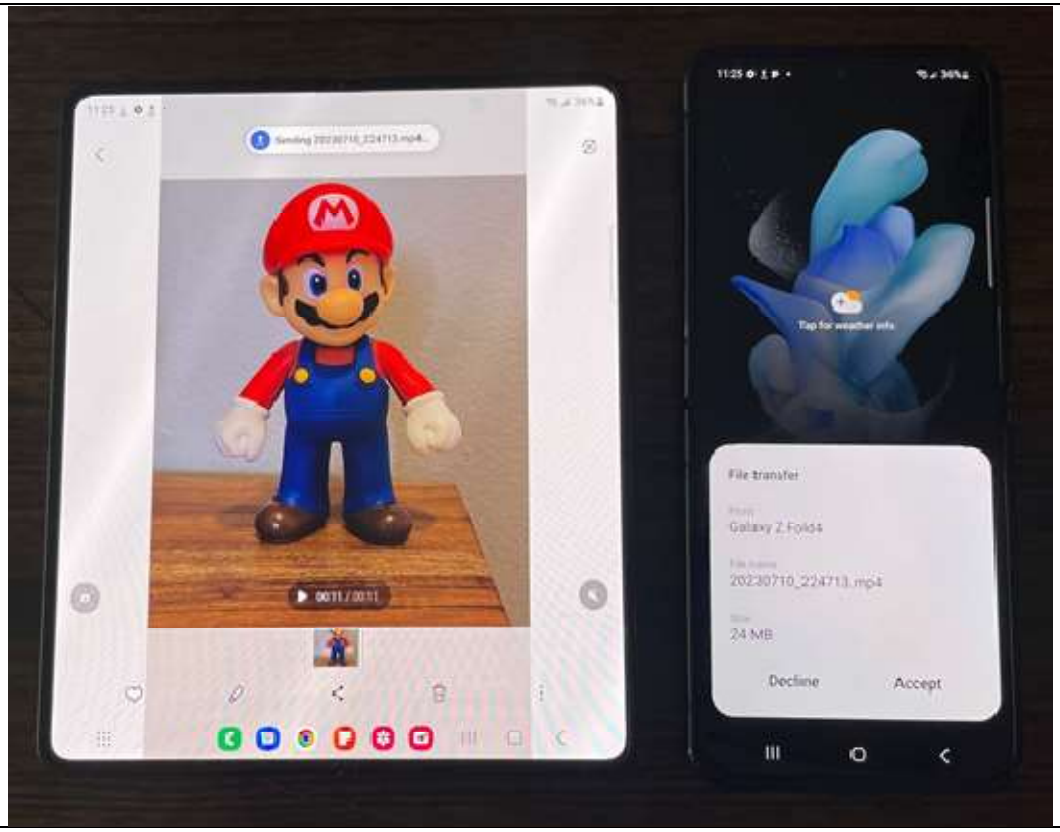


Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft


Tap for weather info
File transfer
Galaxy Z Fold4
20230710_224713.mp4
24 MB
Decline
Accept

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

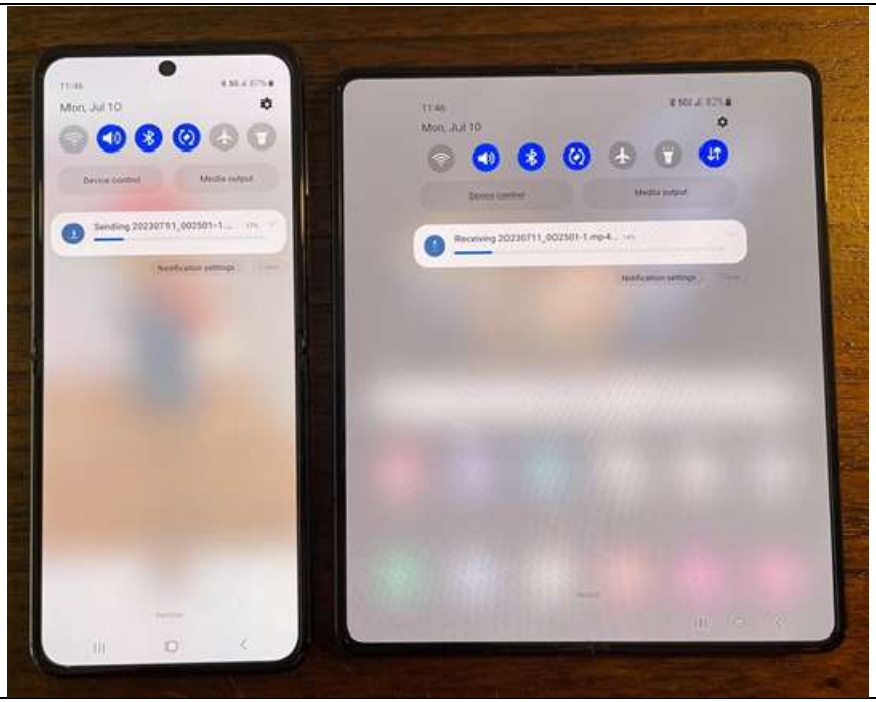
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	


Galaxy Store
Microsoft
Decline
Accept


Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Bluetooth communication chip and operate in a similar manner.
[5.b] a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a	Each of the Accused Samsung '590 Products includes a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;	For example, each of Accused Samsung '590 Products includes a cellular communication chip implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the cellular communication chip capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band. Specifically, the Accused Samsung '590 Products use a cellular communication chip configured to operate in one or more of 2G/3G/LTE/5G protocols to connect to the external display apparatus (*e.g.*, connect to another smartphone via email/MMS/phone call/Internet) accessing to an internet or a home network (*e.g.*, connect to the internet via cellular data services), and receiving digital information (*e.g.*, receiving digital information via the Internet, email, and/or MMS by using cellular data services). **Galaxy S23 Ultra:** For example, the Galaxy S23 Ultra is configured for at least one or more of GSM, 3G, 4G LTE, and 5G cellular communications in order to connect to another device, access the Internet, and receive digital information by using cellular data services. For example, the Galaxy S23 Ultra comprises a cellular communication chip and processor and/or CPU that is capable of these functions (*e.g.*, via a multi media message (MMS) or email over cellular network). NETWORK Technology: GSM / CDMA / HSPA / EVDO / LTE / 5G (COLLAPSE) 2G bands: GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only) CDMA 800 / 1900 & TD-SCDMA 3G bands: HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 CDMA2000 1xEV-DO 4G bands: 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA 5G bands: 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International 1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA Speed: HSPA, LTE-A (up to 7CA), 5G Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
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UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
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LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
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LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
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LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-20

LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

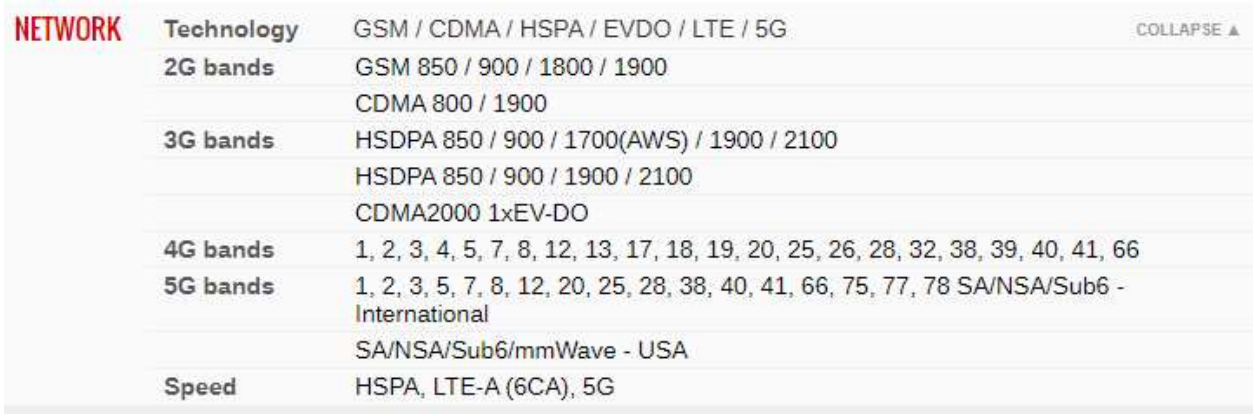
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

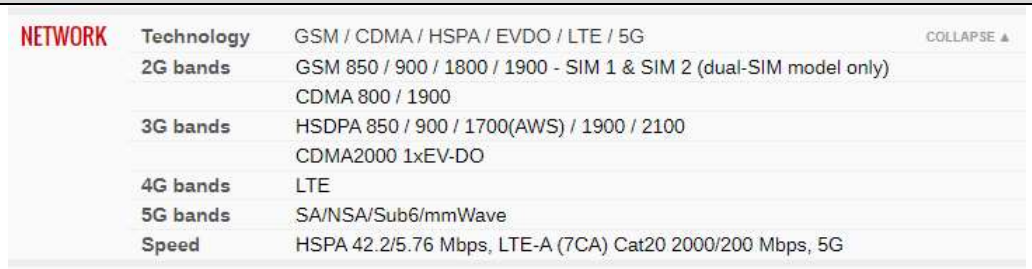
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

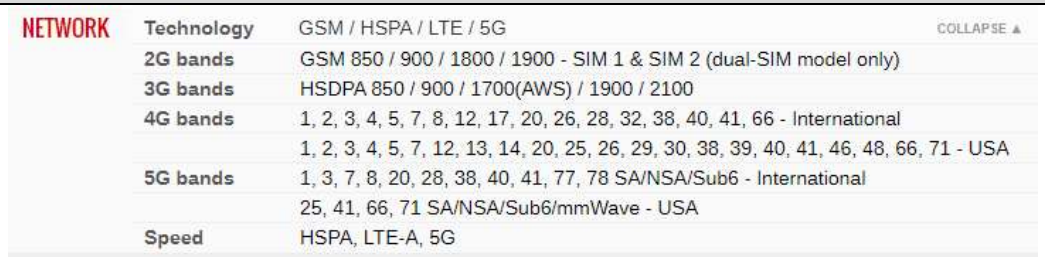
Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



NETWORK		
	Technology	GSM / HSPA / LTE / 5G COLLAPSE ▲
	2G bands	GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (dual-SIM model only)
	3G bands	HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100
	4G bands	1, 2, 3, 4, 5, 7, 8, 12, 17, 20, 26, 28, 32, 38, 40, 41, 66 - International
		1, 2, 3, 4, 5, 7, 12, 13, 14, 20, 25, 26, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA
	5G bands	1, 3, 7, 8, 20, 28, 38, 40, 41, 77, 78 SA/NSA/Sub6 - International
		25, 41, 66, 71 SA/NSA/Sub6/mmWave - USA
	Speed	HSPA, LTE-A, 5G

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **Cellular Frequency Bandwidth and Modulation/Demodulation Method:** ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **2G:**

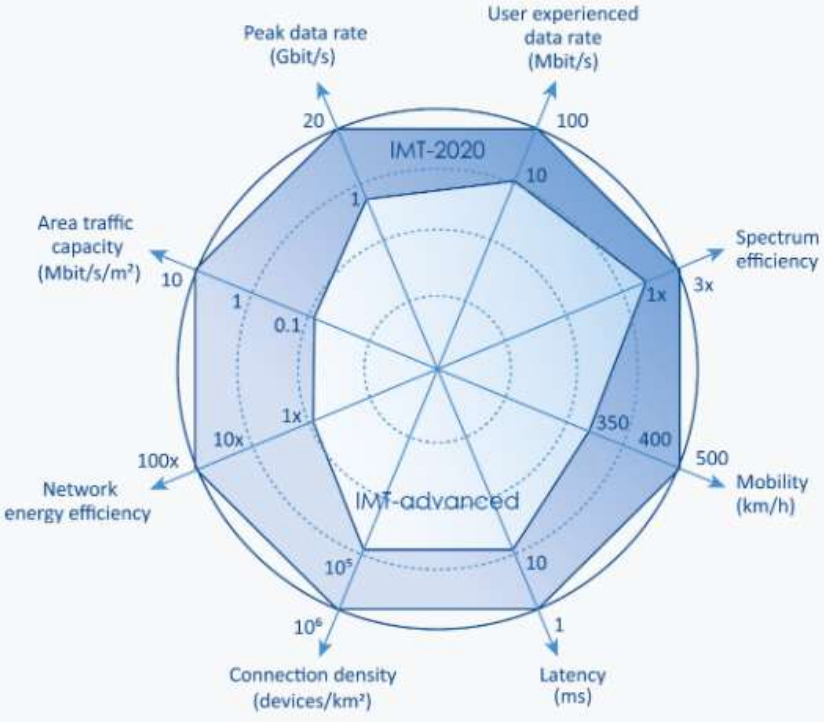
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Global System for Mobile communication (GSM) The technology behind the Global System for Mobile communication (GSM™) uses Gaussian Minimum Shift Keying (GMSK) modulation a variant of Phase Shift Keying (PSK) with Time Division Multiple Access (TDMA) signalling over Frequency Division Duplex (FDD) carriers. The physical layer is specified in 3GPP TS 45.001 and the logical channels in 3GPP TS 45.002. The channel coding is specified in 3GPP TS 45.003 and the modulation is specified in 3GPP TS 45.004. Although originally designed for operation in the 900 MHz band, it was soon adapted for 1800 MHz. The introduction of GSM into North America meant further adaptation to the 800 and 1900 MHz bands. Over the years, the versatility of GSM has resulted in the specifications being adapted to many more frequency bands to meet niche markets. A full list can be found in 3GPP TS 45.005. GSM has a channel spacing of 200kHz and was designed principally for voice telephony, but a range of bearer services was defined (a subset of those available for fixed line Integrated Services Digital Networks, ISDN), allowing circuit-switched data connections at up to 9600 bits/s. At the time of the original system design, this rate compared favourably to those available over fixed connections. However, with the passage of time, fixed connection data rates increased dramatically. The GSM channel structure and modulation technique did not permit faster rates, and thus the High Speed Circuit-Switched Data (HSCSD) service was introduced in the GSM Phase 2+. **Enhanced Data rates for Global Evolution (EDGE)** As its name suggests, EDGE (Enhanced Data rates for Global Evolution) is an enhancement of the GSM™ radio access technology to provide faster bit rates for data applications, both circuit- and packet-switched. As an enhancement of the existing GSM physical layer, EDGE is realized via modifications of the existing layer 1 3GPP specifications TS 45.000 rather than by separate, stand-alone specifications. The increased data rate is accomplished by a new modulation technique (8PSK as opposed to GSM/GPRS's GMSK, yielding a three-fold increase in bit rate for an identical symbol rate) coupled with new channel coding, resulting in improved spectral efficiency. This is important, because it allows EDGE to be introduced piecemeal into existing GSM networks without disrupting the frequency reuse plan of the existing deployment.

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	By way of illustration, the General Packet Radio Service (GPRS) can offer a data rate of 115 (and a theoretical data rate of 171) kbit/s whereas EDGE on top of GPRS can increase this theoretical data rate to 384 kbit/s. This is comparable with the rate for early implementations of Wideband Code Division Multiple Access (W-CDMA) of the 3rd generation of UMTS and a reason why EDGE is considered to be the bridge between the 2nd and the 3rd generation of mobile communication systems. https://www.etsi.org/technologies/mobile/2g **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111): • **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h • **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h • **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h

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	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

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	LONG TERM EVOLUTION (LTE) Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

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	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example: • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM • LTE DL 4 Rx antenna ports https://www.etsi.org/technologies/mobile/4g **5G:**

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	So 5G should deliver significantly increased operational performance (e.g. increased spectral efficiency, higher data rates, low latency), as well as superior user experience (near to fixed network but offering full mobility and coverage). 5G needs to cater for massive deployment of Internet of Things, while still offering acceptable levels of energy consumption, equipment cost and network deployment and operation cost. It needs to support a wide variety of applications and services. Comparison of key capabilities of IMT-Advanced (4th generation) with IMT-2020 (5th generation) according to ITU-R M.2083: 

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The minimum requirements:

- for peak data rate: Downlink: 20 Gbit/s, Uplink: 10 Gbit/s
- for peak spectral efficiencies: Downlink: 30 bit/s/Hz, Uplink: 15 bit/s/Hz
- user plane latency (single user, small packets): 4 ms for eMBB, 1 ms for URLLC
- control plane latency (idle => active): 10-20ms

Other requirements:

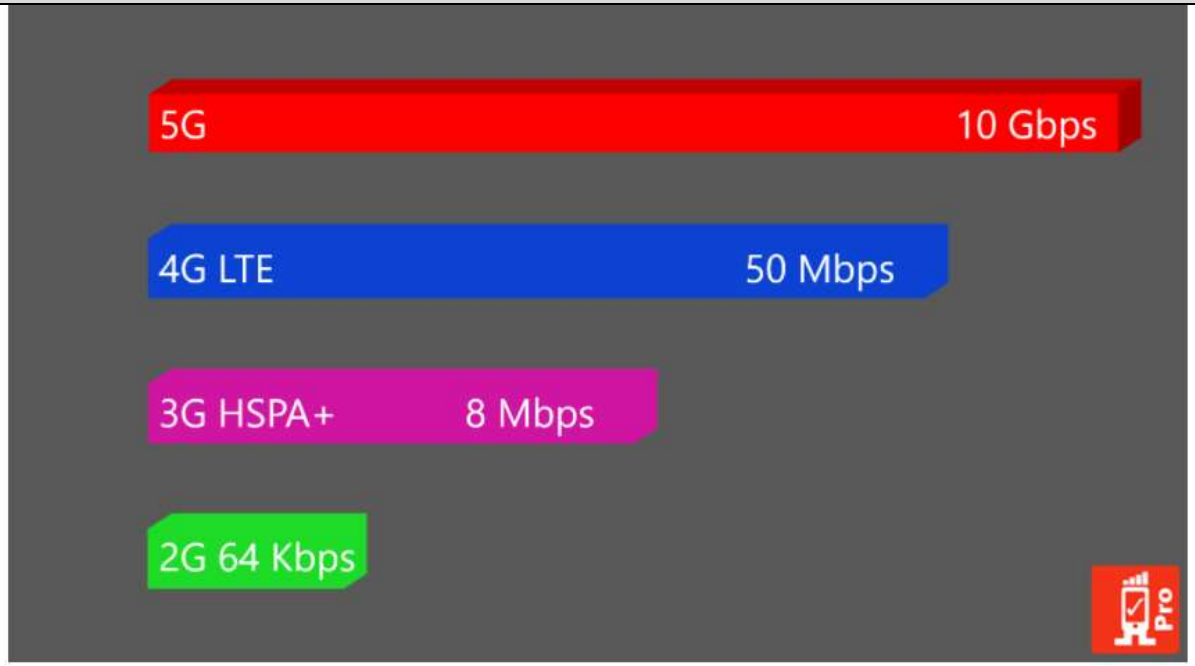
- maximum aggregated system bandwidth: at least 100 MHz, up to 1GHz in higher frequency bands (above 6GHz)
- mobility: up to 500km/h in rural eMBB

- Add support of NR DL 256QAM for frequency range 2 (FR2)

https://www.etsi.org/technologies/mobile/5g

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

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https://rantcell.com/comparison-of-2g-3g-4g-5g.html

Further, AIDA64 reports confirm that the Accused Samsung '590 Products include one or more processors to connect to an external display apparatus, access the Internet, and receive digital information (*e.g.*, via MMS protocol over cellular network and/or via email or phone call):

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

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For example, the following screenshots show exemplary Accused Samsung '590 Products using a cellular communication chip to transmit and receive digital video information via MMS and similar functionality also applies to transmitting and receiving digital video via e-mail:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) – WiFi off	Video Information Receiving Device (Samsung Galaxy A54 5G) – WiFi off



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G) – WiFi off	Video Information Receiving Device (Samsung Galaxy S23 Ultra) – WiFi off



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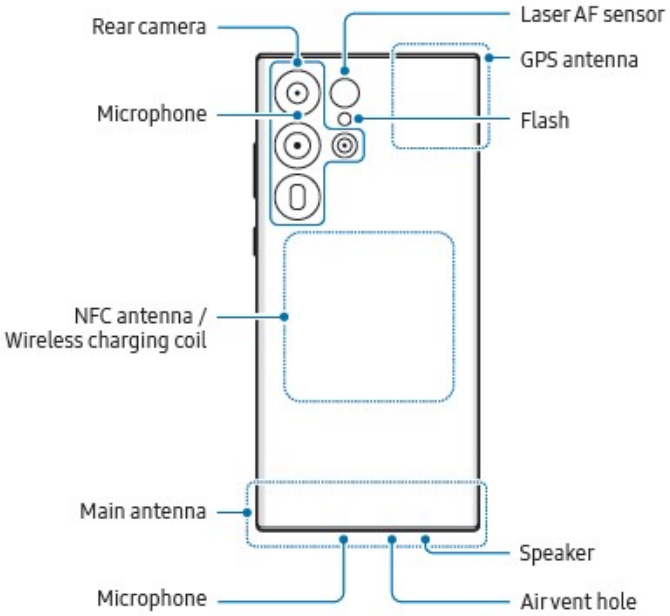
Video Information Transmitting Device (Samsung Galaxt ZFold 4) – WiFi off	Video Information Receiving Device (Samsung Galaxy ZFlip 4) – WiFi off



Video Information Transmitting Device (Samsung Galaxy ZFlip 4) – WiFi off	Video Information Receiving Device (Samsung Galaxt ZFold 4) – WiFi off

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a cellular chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/. **Doctrine of Equivalents:** To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a second radio communication circuit, each

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	of these products include software, hardware, or a combination of the two that perform the equivalent functions of connecting by radio to the external display apparatus, accessing to an internet or a home network, and receiving digital information. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, they use an integrated Bluetooth/Wi-Fi chipset and/or cellular communication chipset to perform these functions by using wireless transmissions. The performance of this function achieves substantially the same result, for example, connecting to an external display apparatus, accessing to an internet or a home network, and receiving digital information.
[5.c] a third radio communication circuit capable of transmitting information and using a third transmission frequency band;	Each of the Accused Samsung '590 Products includes a third radio communication circuit capable of transmitting information and using a third transmission frequency band. For example, each of the Accused Samsung '590 Products includes a NFC communication chip capable of transmitting information (*e.g.*, Samsung Pay and/or Samsung Wallet) and using a third transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Series User Guide at pg. 6 (Galaxy S23 Ultra device layout). **NFC and contactless payments** You can use your phone to read near field communications tags (NFC) that contain information about products. You can also use this feature to make payments and buy tickets for transportation or events after downloading the required apps. The device contains a built-in NFC antenna. Handle the device carefully to avoid damaging the NFC antenna.

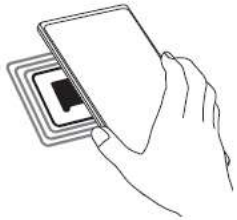
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Reading information from NFC tags

Use the NFC feature to read product information from NFC tags.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

2 Place the NFC antenna area on the back of your device near an NFC tag.
The information from the tag appears.



Ensure that the device's screen is turned on and unlocked. Otherwise, the device will not read NFC tags or receive data.

Making payments with the NFC feature

Before you can use the NFC feature to make payments, you must register for a mobile payment service. To register or get more information about services, contact your service provider.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

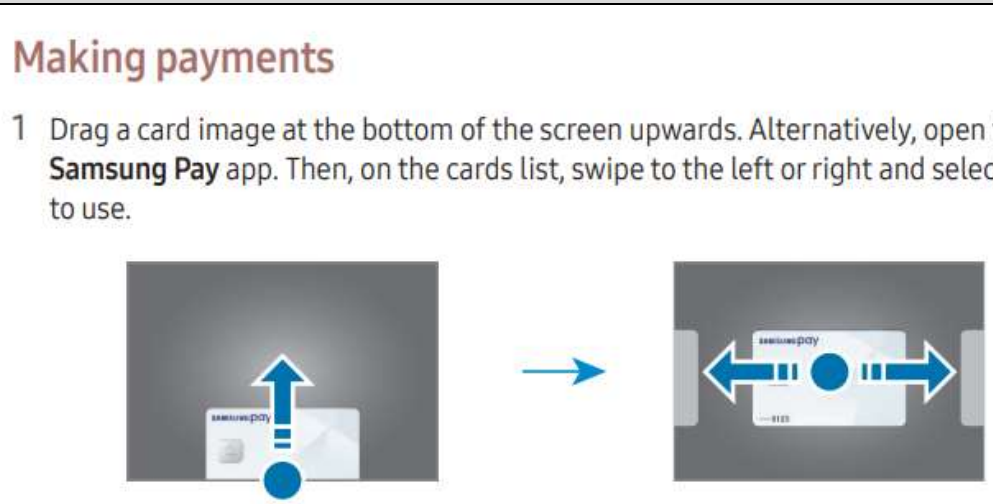
2 Touch the NFC antenna area on the back of your device to the NFC card reader.

To set the default payment app, open the Settings screen and tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment**, and then select an app.

- The payment services list may not include all available payment apps.
- If you update the payment app or install a new one, the payment services that you used before may not work properly. If that is the case, on the Settings screen, tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment** or **Others**, and then select another app instead of the updated or newly installed app. Or, deselect the selected app.

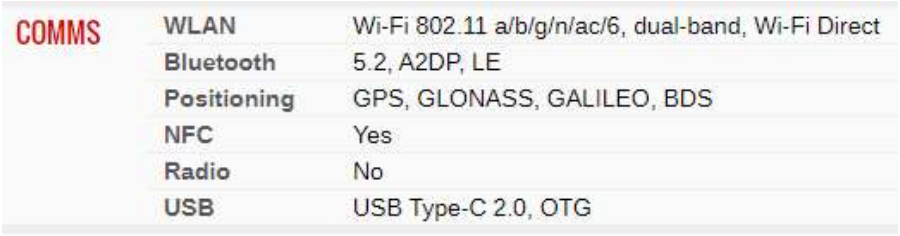
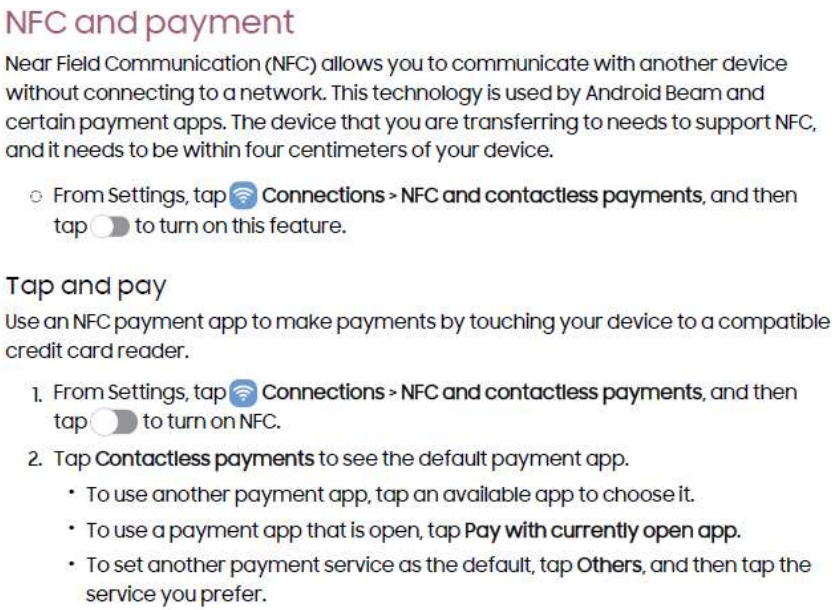
Galaxy S23 Series User Guide at pgs. 125-126.

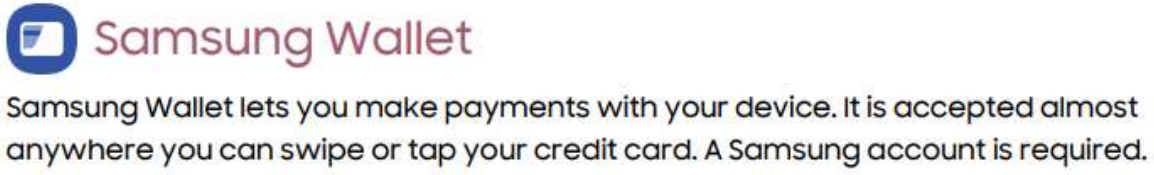
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Setting up Samsung Pay When running this app for the first time or restarting it after performing a data reset, follow the on-screen instructions to complete the initial setup. 1 Open the **Samsung Pay** app. 2 Sign in to your Samsung account and read and agree to the terms and conditions. 3 Register your fingerprint and a PIN to use when making payments. This PIN will be used to verify various actions in Samsung Pay, such as making payments and unlocking the app. **Registering cards** Open the **Samsung Pay** app and follow the on-screen instructions to complete your card registration.

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	 Galaxy S23 Series User Guide at pgs. 94-95.

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Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

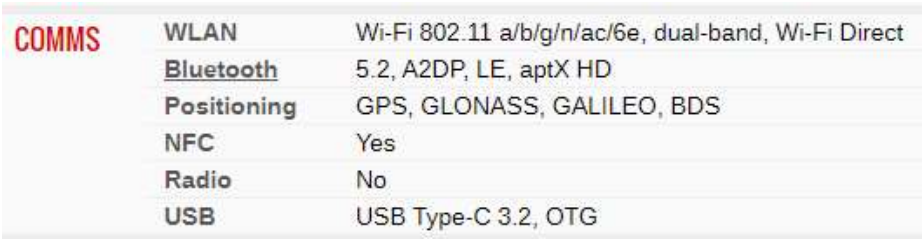
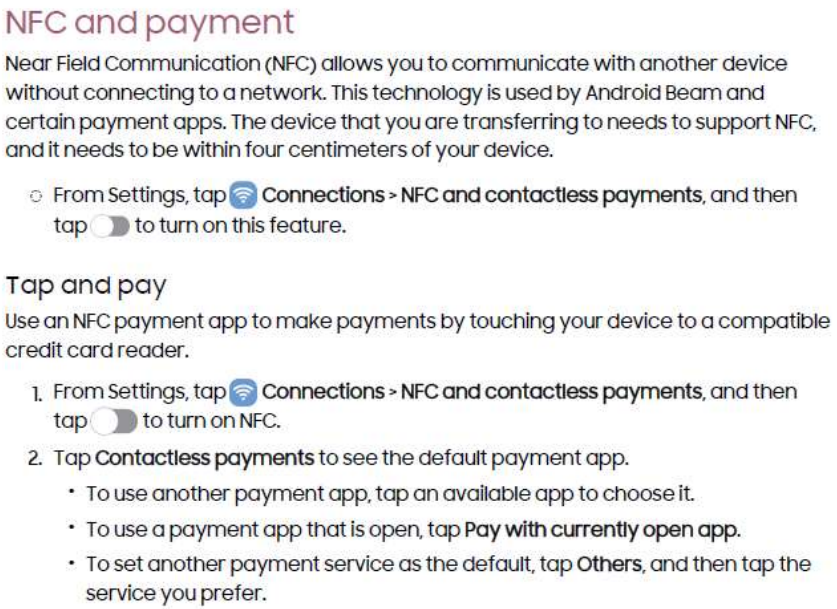
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	Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:**  Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

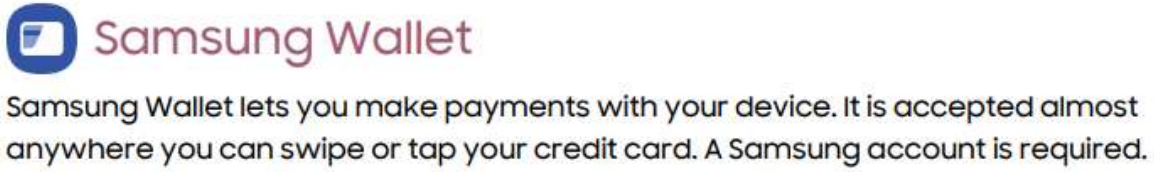
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

NFC and payment

Near Field Communication (NFC) allows you to communicate with another device without connecting to a network. This technology is used by Android Beam and certain payment apps. The device that you are transferring to needs to support NFC, and it needs to be within four centimeters of your device.

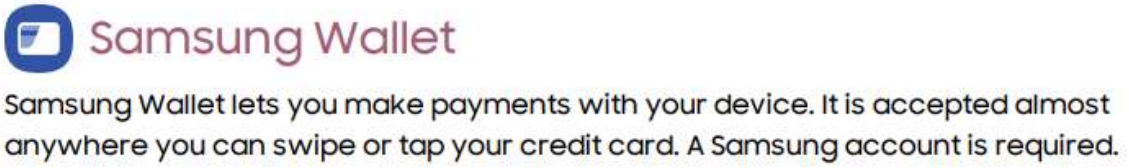
- From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on this feature.

Tap and pay

Use an NFC payment app to make payments by touching your device to a compatible credit card reader.

1. From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on NFC.
2. Tap **Contactless payments** to see the default payment app.
   - To use another payment app, tap an available app to choose it.
   - To use a payment app that is open, tap **Pay with currently open app**.
   - To set another payment service as the default, tap **Others**, and then tap the service you prefer.

Galaxy A54 User Guide at pg. 105.

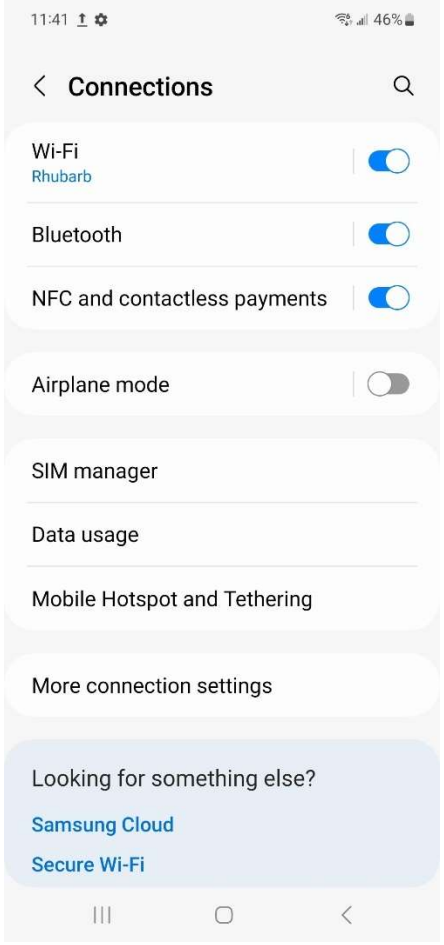
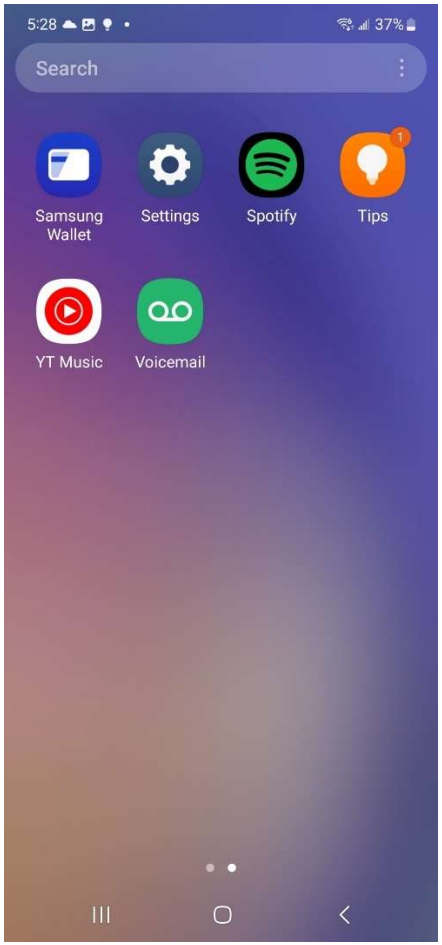
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 57.

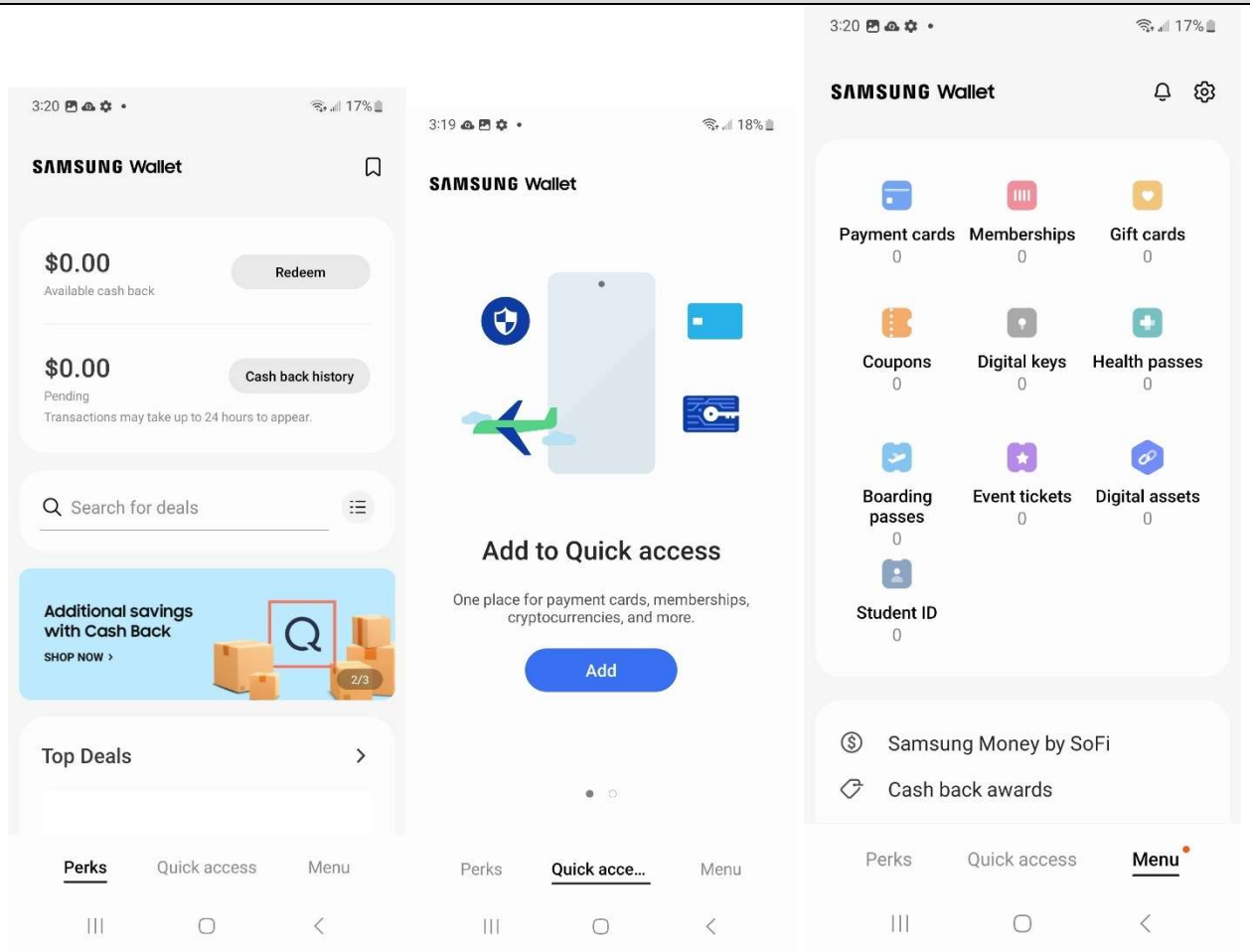
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■ QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf For example, the following screenshots show exemplary Accused Samsung '590 Products using a NFC communication chip to transmit information by using Samsung Pay and/or Samsung Wallet applications: **Samsung Galaxy A54 5G:**

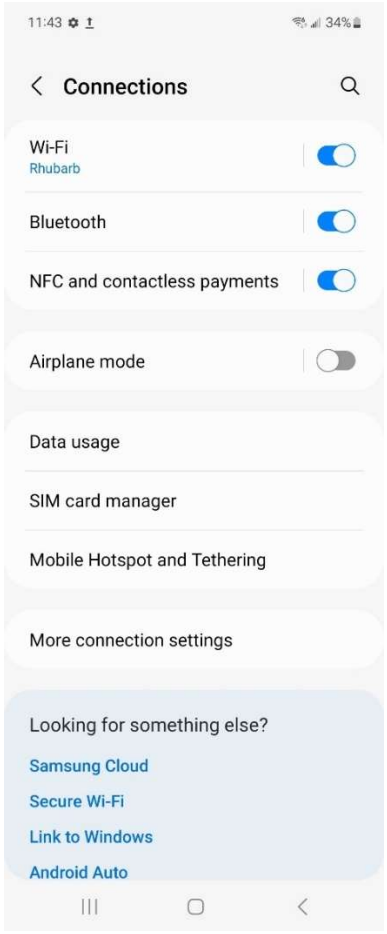
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

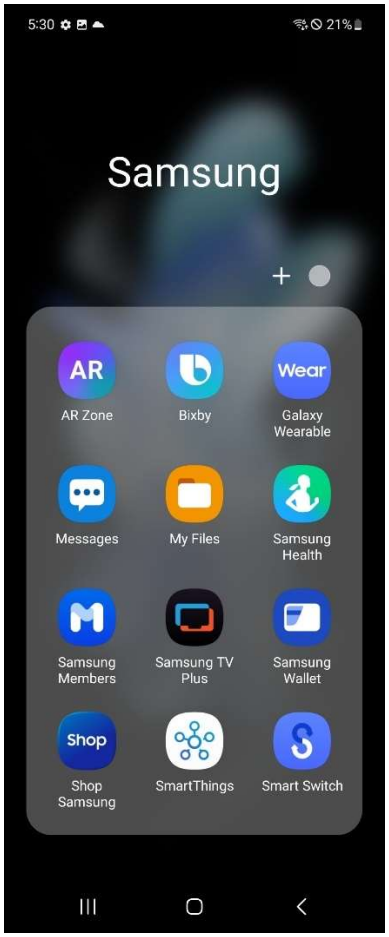
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Samsung Galaxy ZFlip 4:

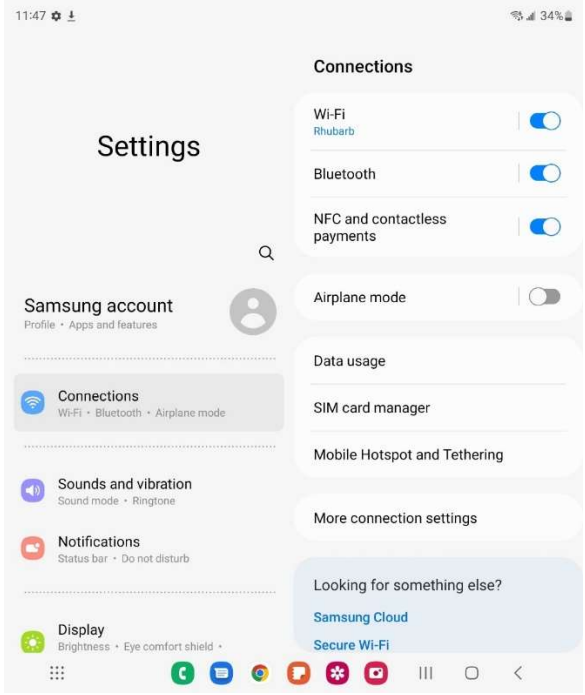


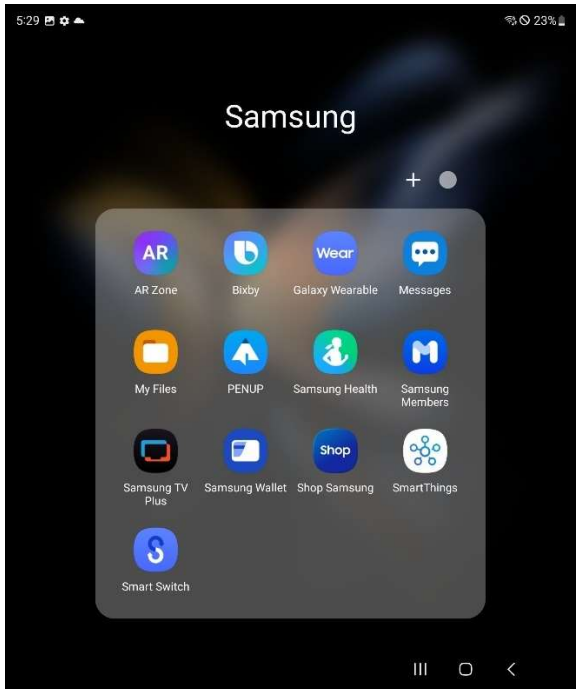


Samsung Galaxy ZFold 4:

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

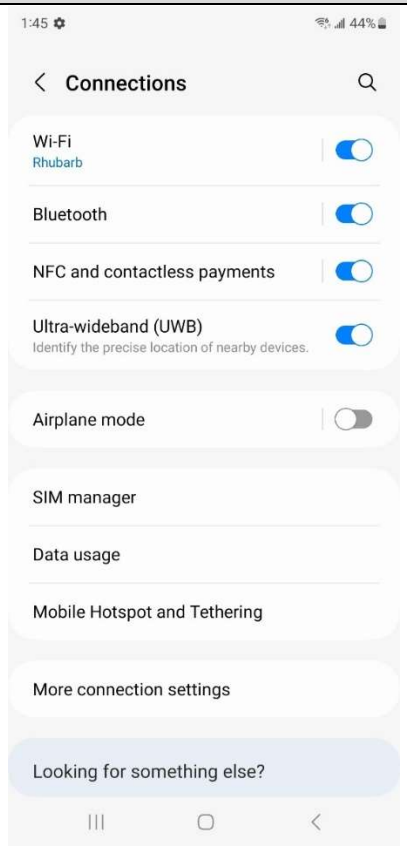
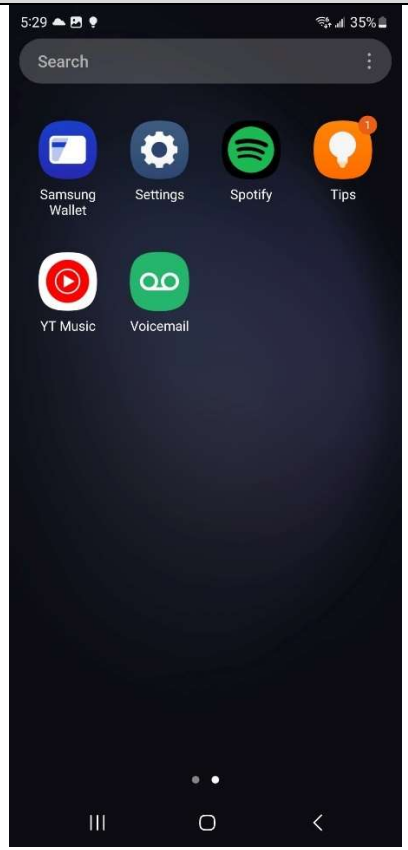
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



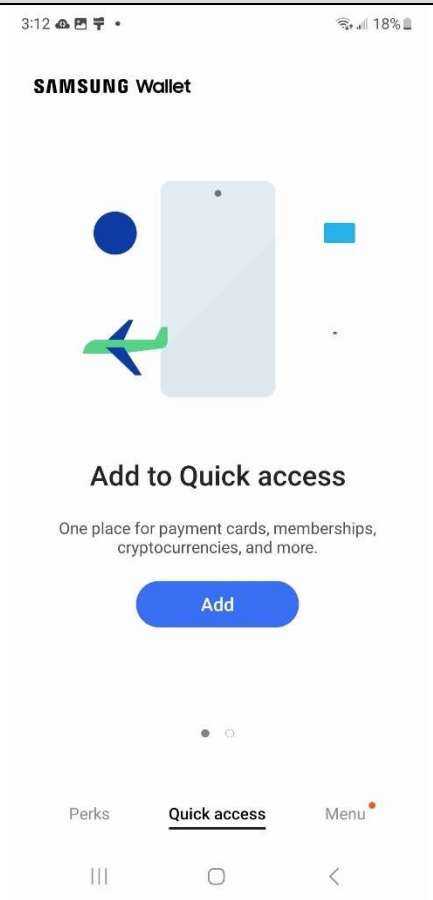


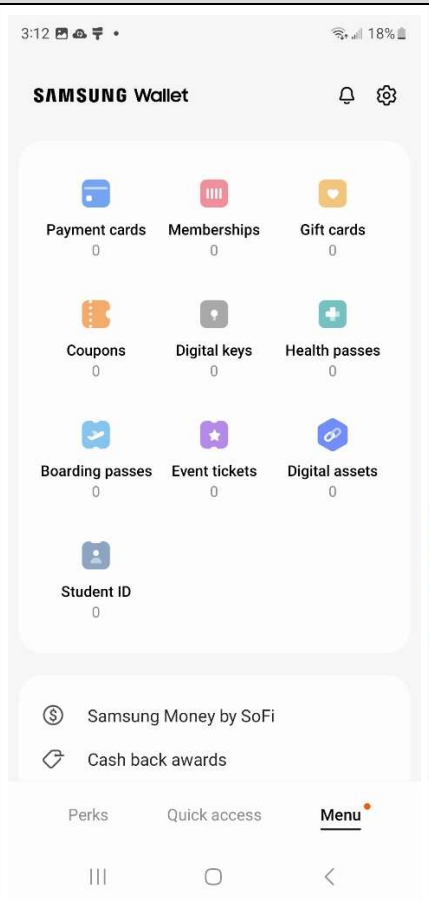
Samsung Galaxy S23 Ultra:

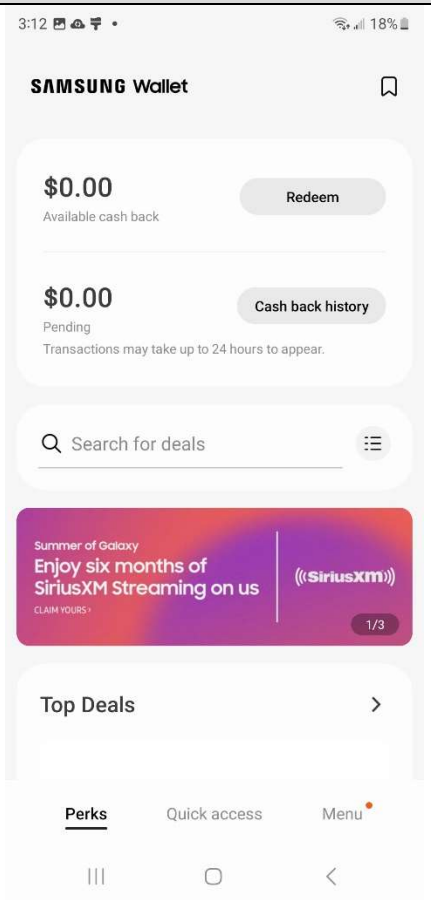
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement







See also Appendix 8 showing that the remaining Accused Samsung '590 Products include a NFC communication chip and operate in a similar manner. *See* https://www.samsung.com/us/samsung-pay/.

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td>[5.d] a compression circuit capable of implementing a plurality of compression schemes including a first compression scheme, the compression circuit compressing the video information received by the first radio communication circuit using the first compression scheme;</td><td>Each of the Accused Samsung '590 Products includes a compression circuit capable of implementing a plurality of compression schemes including a first compression scheme, the compression circuit compressing the video information received by the first radio communication circuit using the first compression scheme.

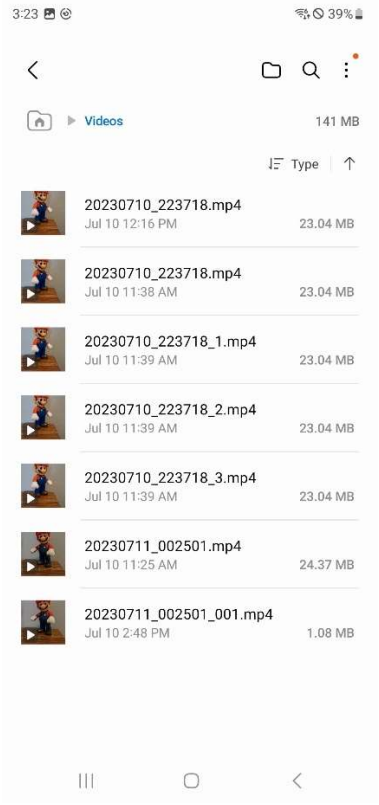
First Infringement Theory:

For example, each of the Accused Samsung '590 Products includes a compression circuit compressing the video information received by the Wi-Fi communication chip via at least the MPEG-4 compression scheme.

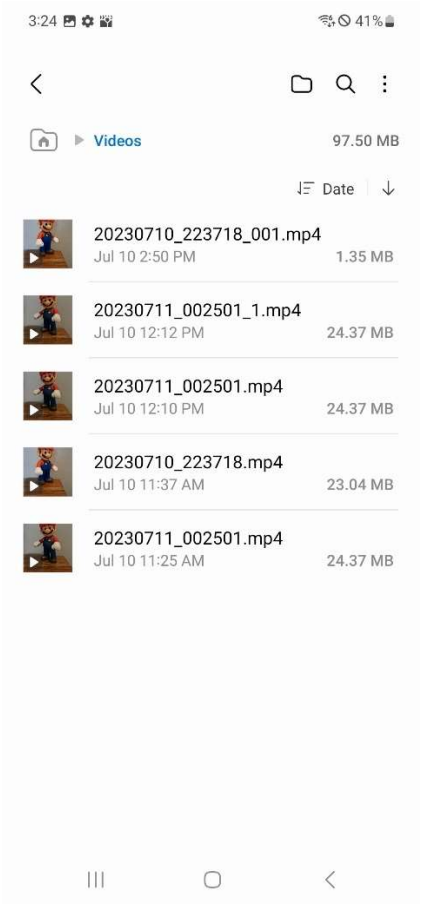
For example, the following screenshots show exemplary Accused Samsung '590 Products using a compression circuit compressing the video information received by the Wi-Fi communication chip via at least the MPEG-4 compression scheme:

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy A54 5G)</td><td>Video Information Receiving Device (Samsung Galaxy S23 Ultra)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension

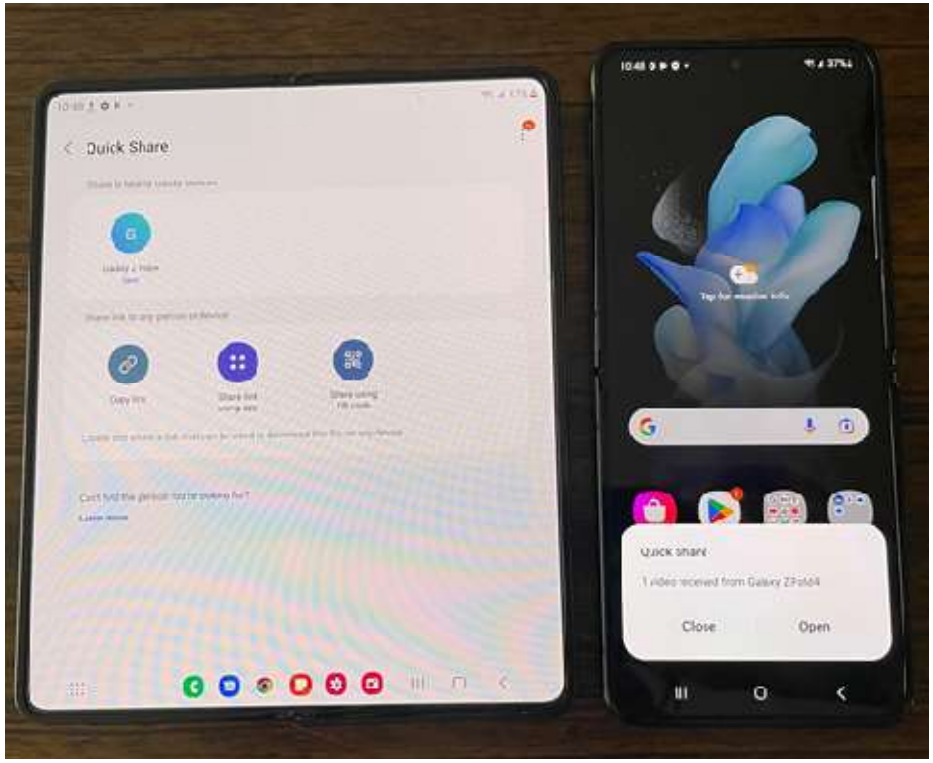
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(Samsung Galaxy S23 Ultra)  Video Information Transmitting Device (Samsung Galaxy S23 Ultra) | Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Video information using a ".mp4" file extension (Samsung Galaxy A54 5G) 

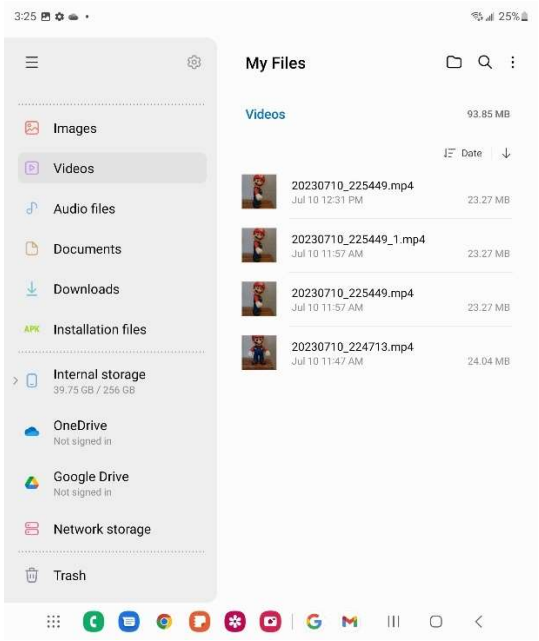
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)



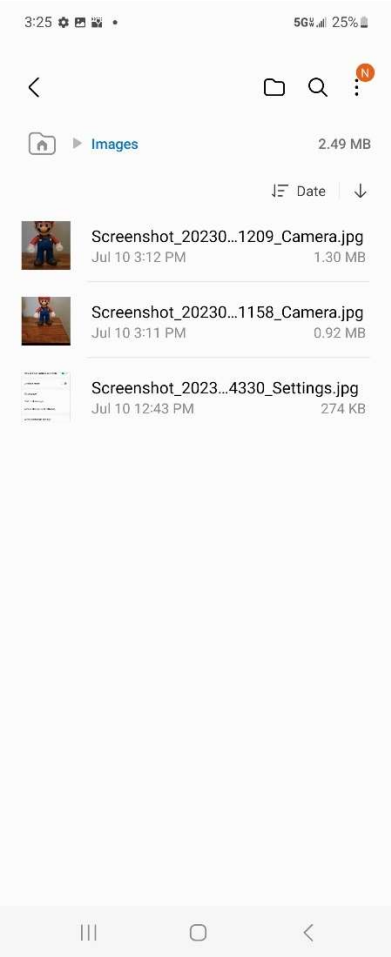
Video information using a ".mp4" file extension (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:**

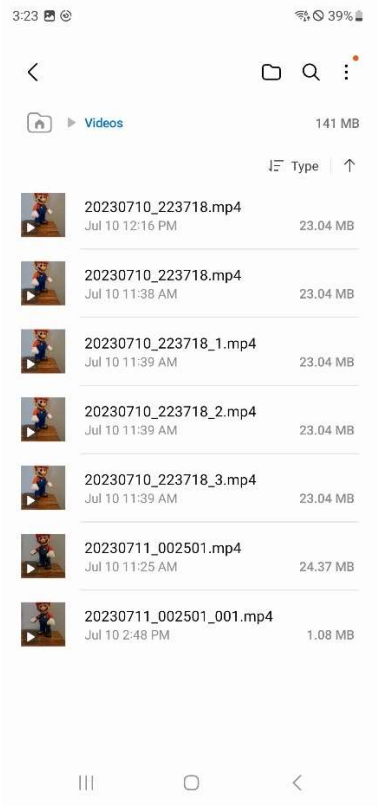
<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>For example, each of the Accused Samsung '590 Products includes a compression circuit compressing the video information received by the Bluetooth communication chip via at least the MPEG-4 compression scheme.

For example, the following screenshots show exemplary Accused Samsung '590 Products using a compression circuit compressing the video information received by the Bluetooth communication chip via at least the MPEG-4 compression scheme:

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy A54 5G)</td><td>Video Information Receiving Device (Samsung Galaxy S23 Ultra)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy S23 Ultra)

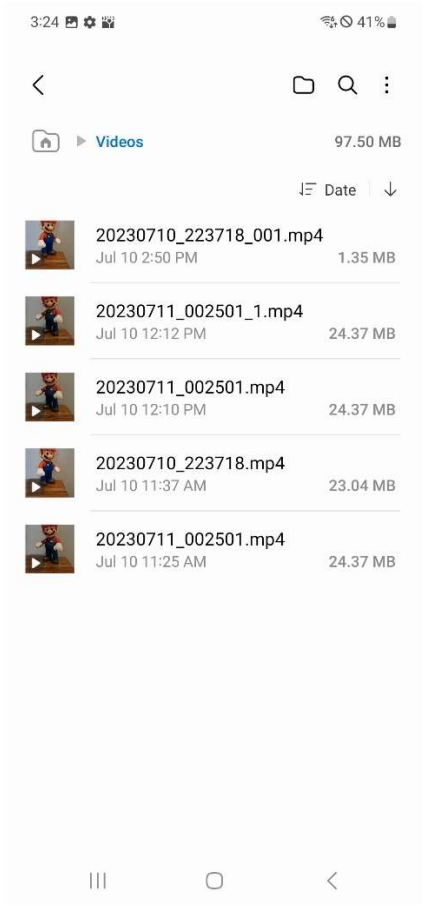
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy A54 5G)

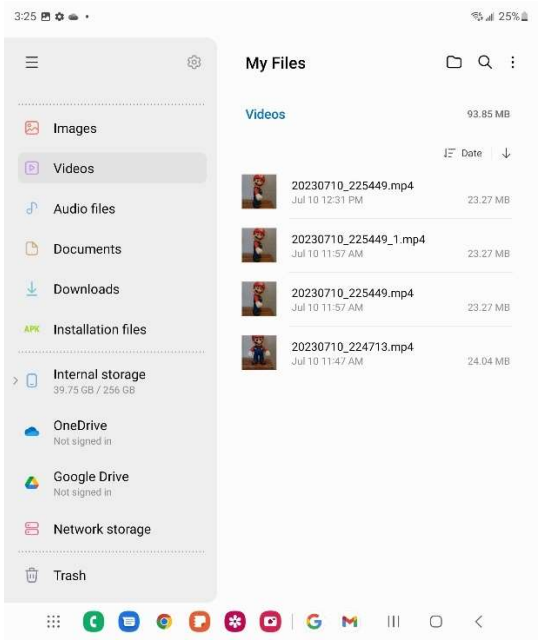
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

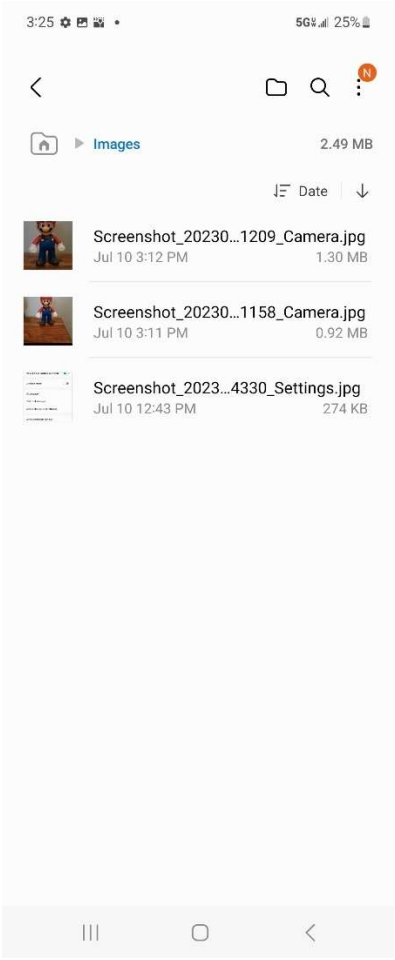
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy ZFlip 4)

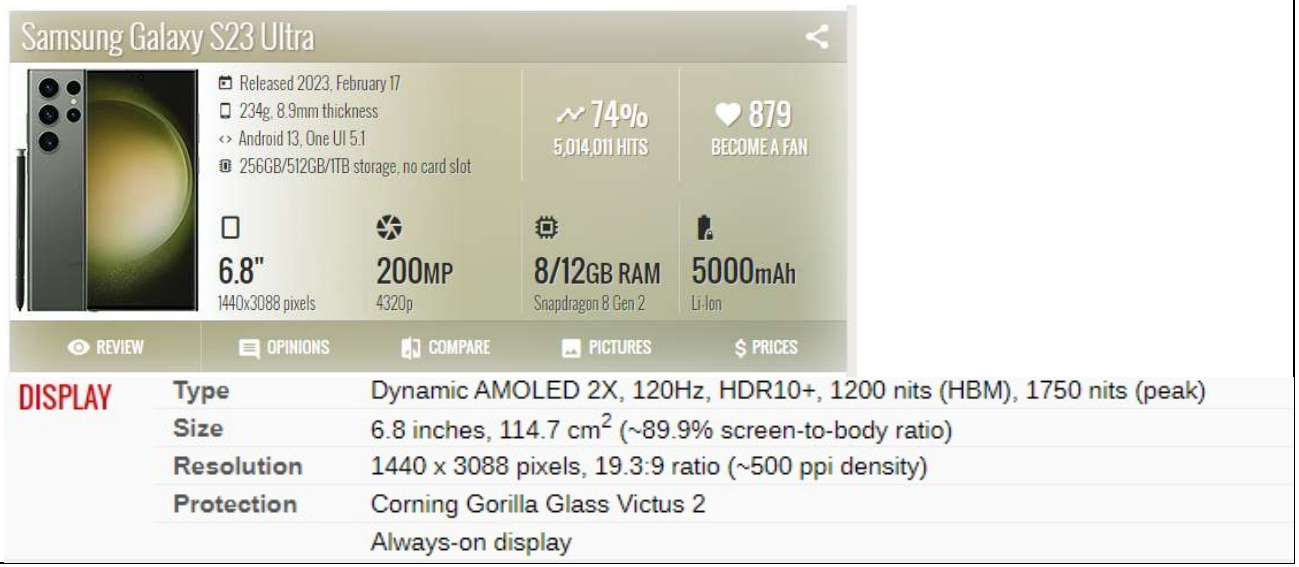
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

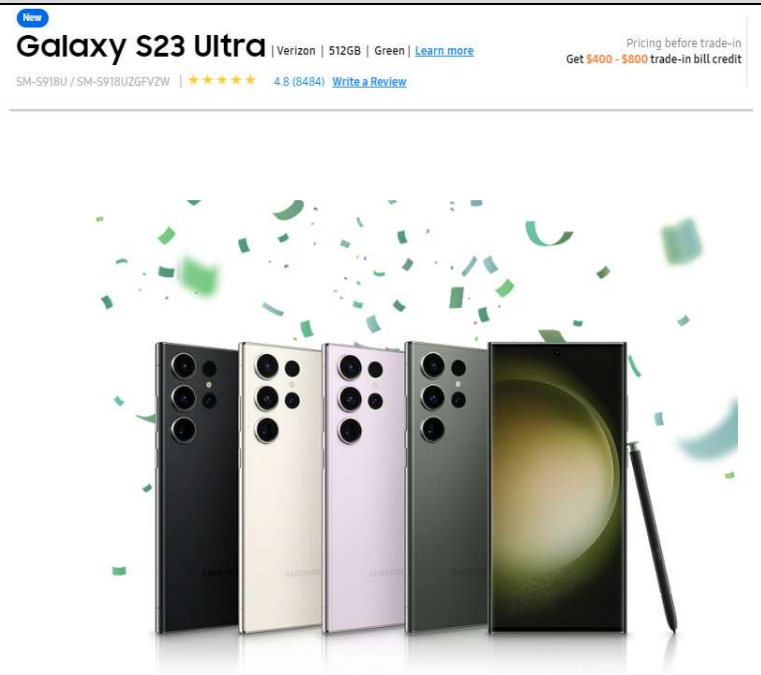


Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

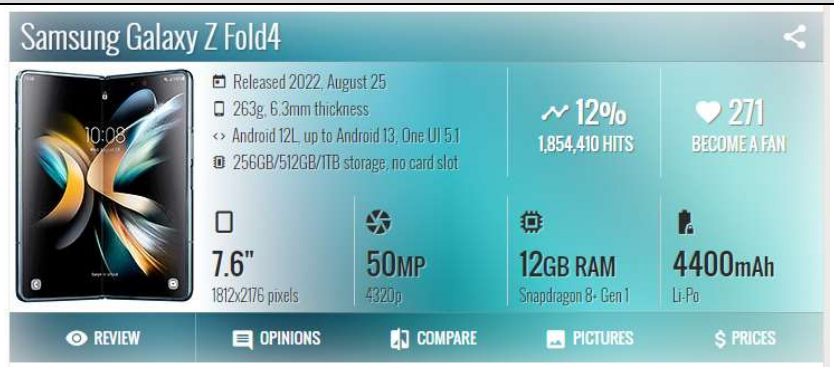
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include similar compressions circuit. *See* https://www.samsung.com/us/support/answer/ANS00089063/; *see also* https://www.samsung.com/us/support/answer/ANS00079026/.

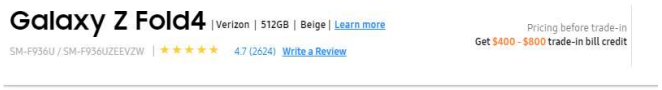
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[5.e] a display capable of displaying the information received by the first radio communication circuit or the second radio communication circuit; and	Each of the Accused Samsung '590 Products includes a display capable of displaying the information received by the first radio communication circuit or the second radio communication circuit. For example, the display of each of the Accused Samsung '590 Products capable of displaying the information received by the Bluetooth (e.g., via Bluetooth File Share as shown above), Wi-Fi (*e.g.*, via QuickShare, email or MMS as shown above), or Cellular communication chip (*e.g.*, via email or MMS as shown above). **Galaxy S23 Ultra:** 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

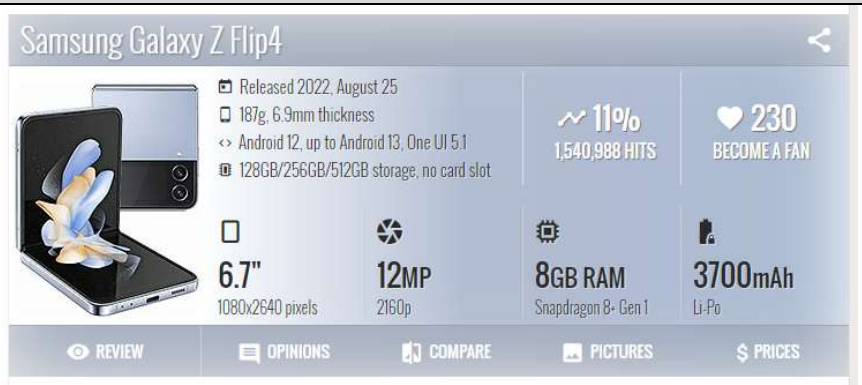


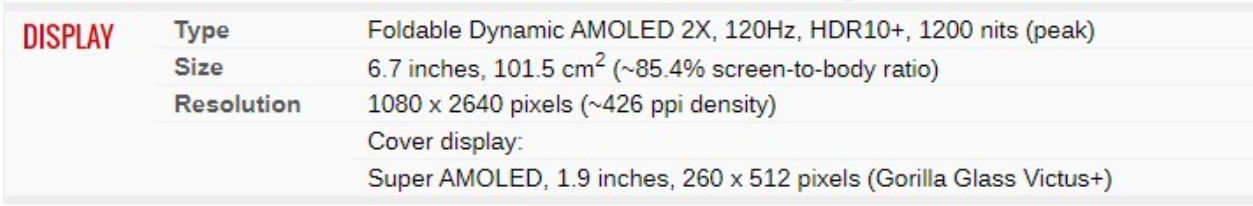
DISPLAY	Type	Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak)
	Size	7.6 inches, 183.2 cm^2 (~90.9% screen-to-body ratio)
	Resolution	1812 x 2176 pixels (~373 ppi density)
		Cover display:
		Dynamic AMOLED 2X, 120Hz, Corning Gorilla Glass Victus+
		6.2 inches, 904 x 2316 pixels, 23.1:9 ratio

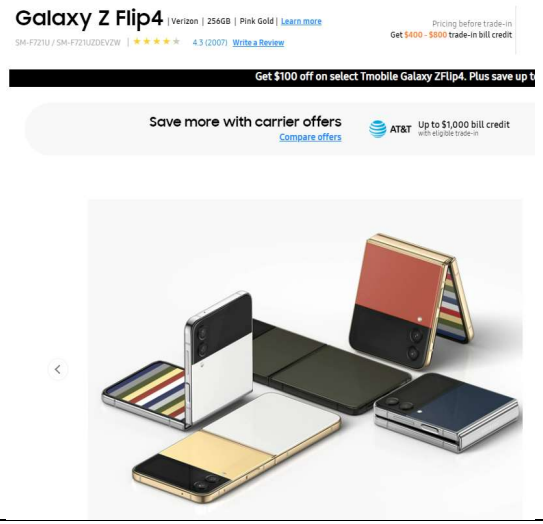
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php **Galaxy Z Flip4:**

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

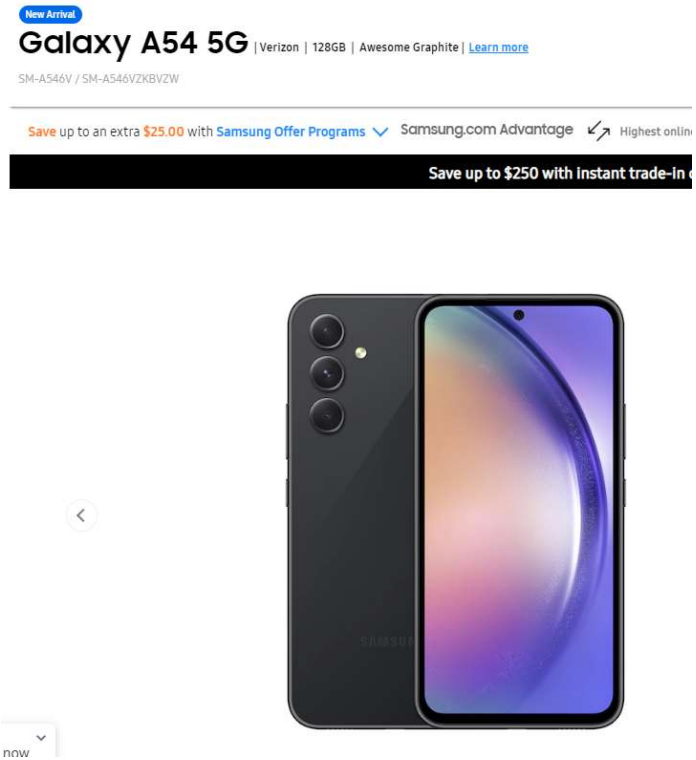
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement





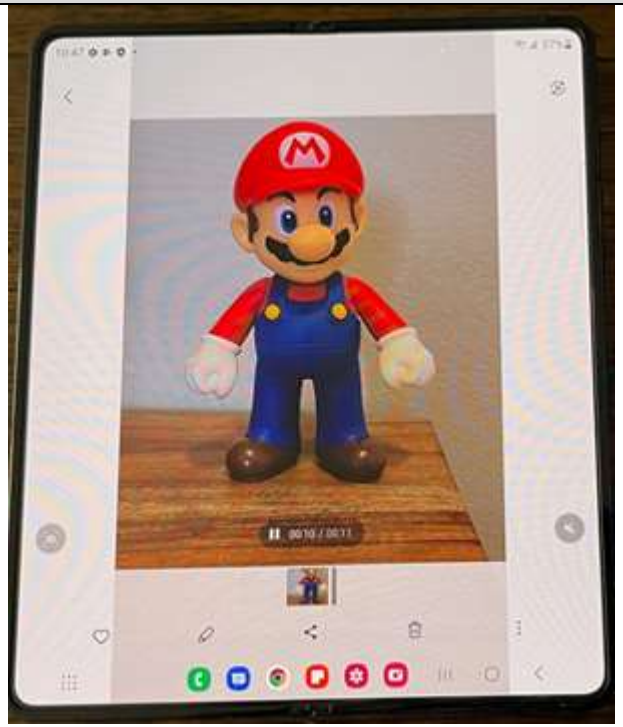


U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php **Galaxy Z Fold4:**  DISPLAY Type: Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak) Size: 7.6 inches, 183.2 cm^2 (~90.9% screen-to-body ratio) Resolution: 1812 x 2176 pixels (~373 ppi density) Cover display: Dynamic AMOLED 2X, 120Hz, Corning Gorilla Glass Victus+ 6.2 inches, 904 x 2316 pixels, 23.1:9 ratio

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a54/buy/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php For example, the following screenshots show exemplary Accused Samsung '590 Products using a display to play videos received via the Bluetooth communication chip: Samsung Galaxy S23 Ultra:

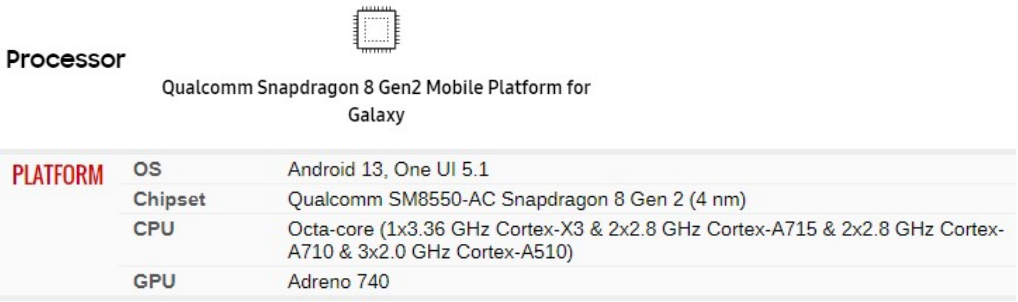
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip 4:

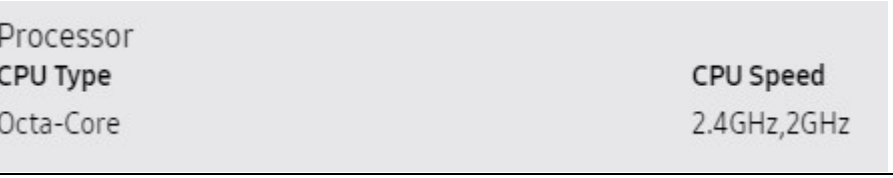
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold 4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a similar input device (e.g., a display with touch interface).
[5.f] a controller controlling assignment of connection of each of the first, second, and third radio communication circuits,	Each of the Accused Samsung '590 Products includes a controller controlling assignment of connection of each of the first, second, and third radio communication circuits. For example, each of the Accused Samsung '590 Products includes a chipset that includes one or more processors (*e.g.*, CPU) that executed the operating system source code to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits for

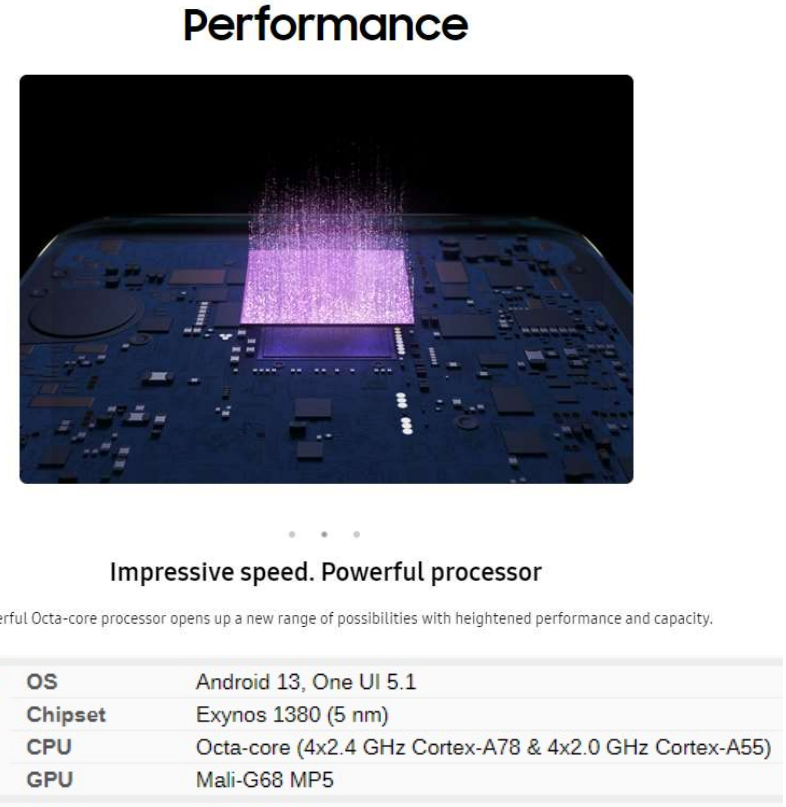
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	various functions and/or applications (*e.g.*, Quickshare, Bluetooth file share, email, MMS, Samsung Wallet). **How to use Quick Share feature on Galaxy device** Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

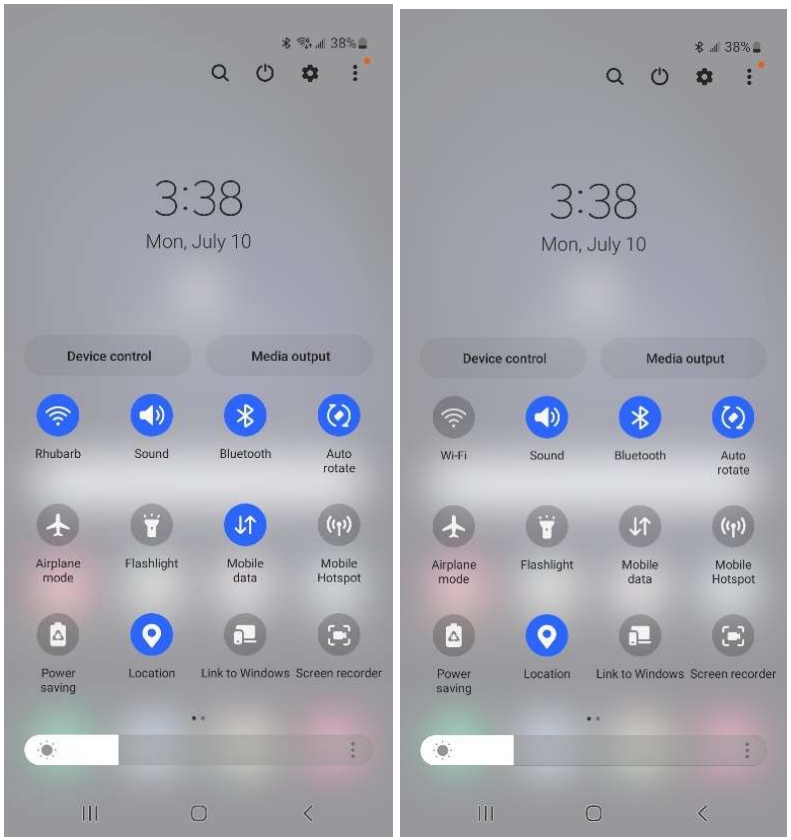
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

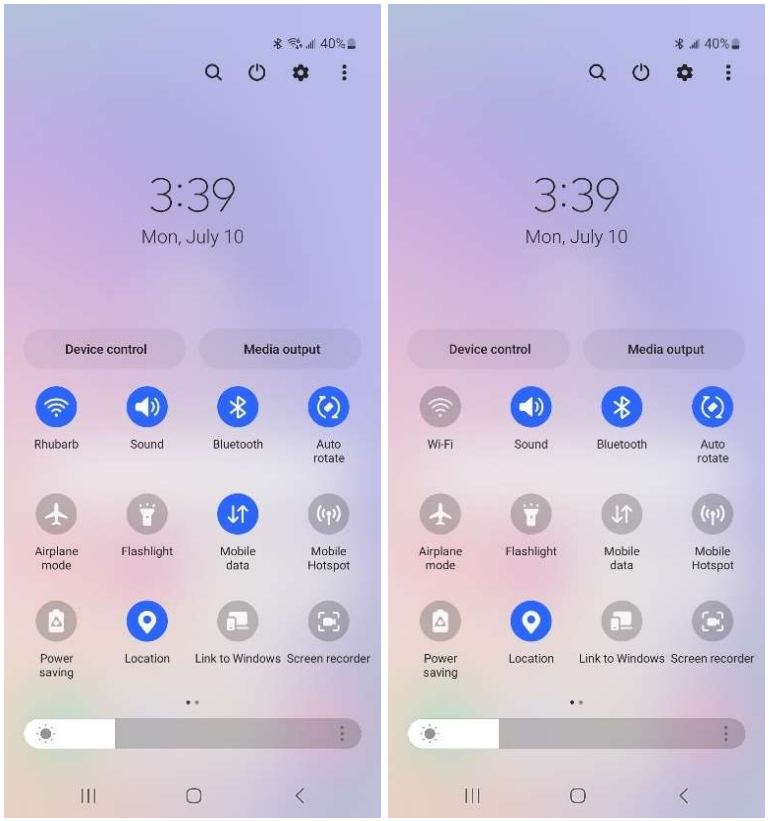
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

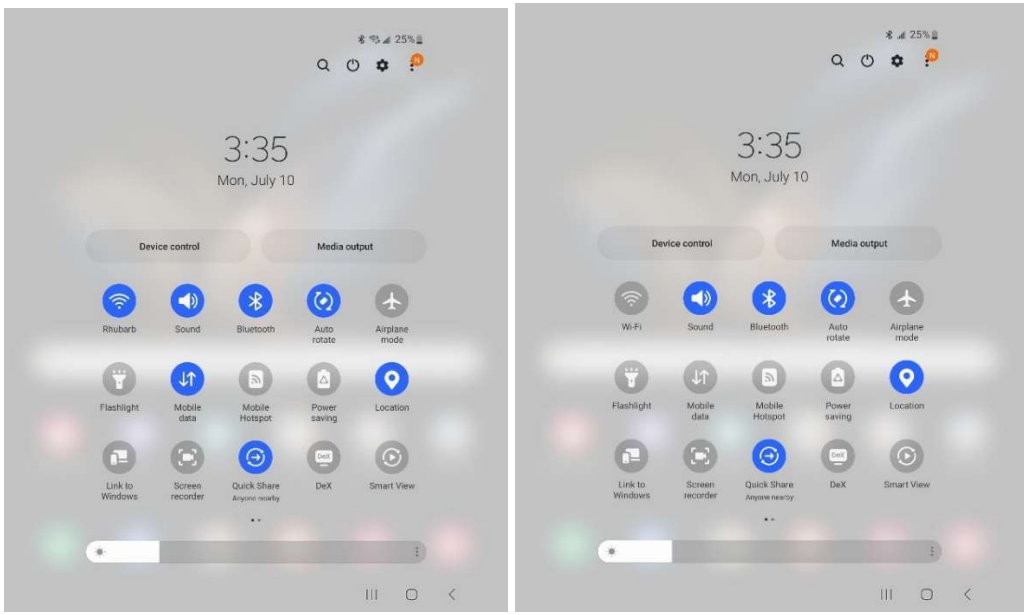


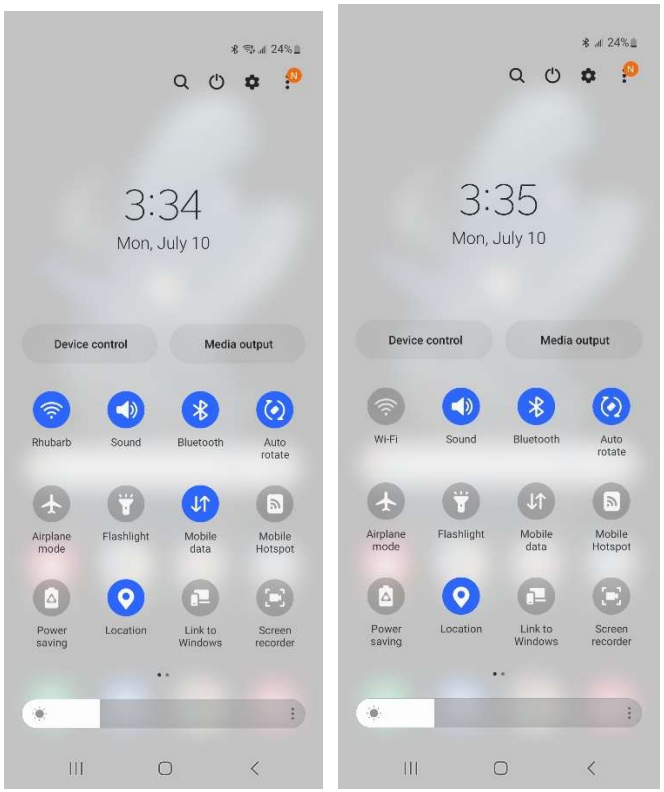
Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

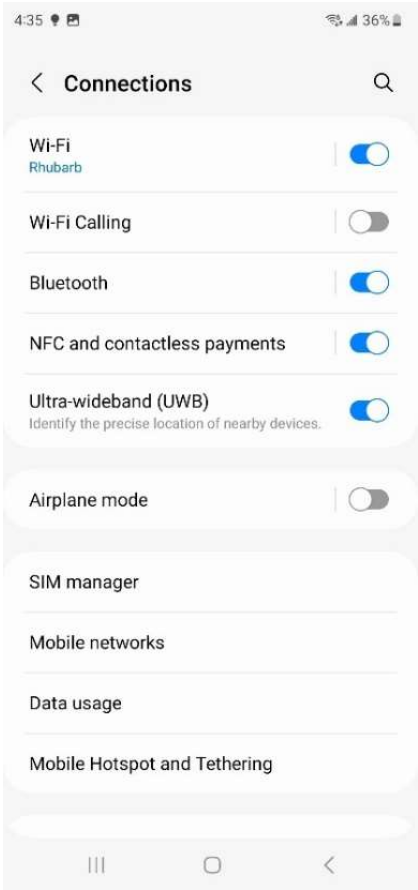
For example, the following screenshots show exemplary Accused Samsung '590 Products using a controller (*e.g.*, application processor or CPU) to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication chips by turning them on/off through the quick control menu:

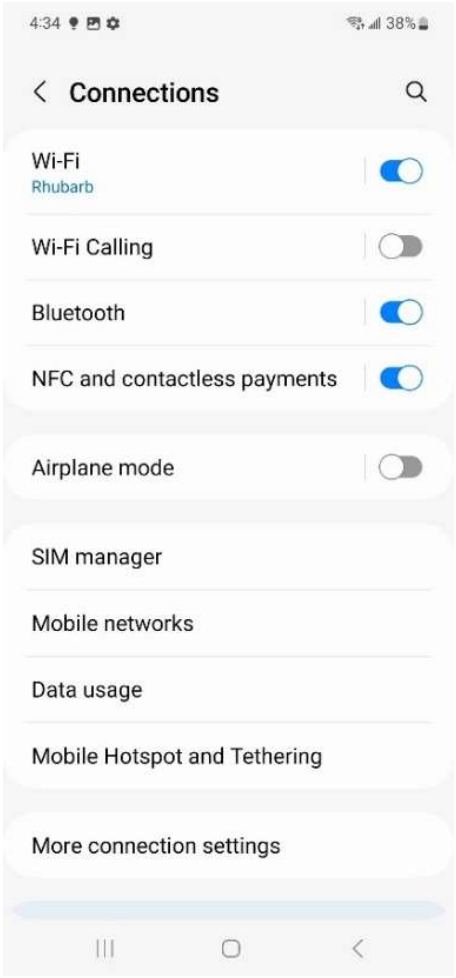
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

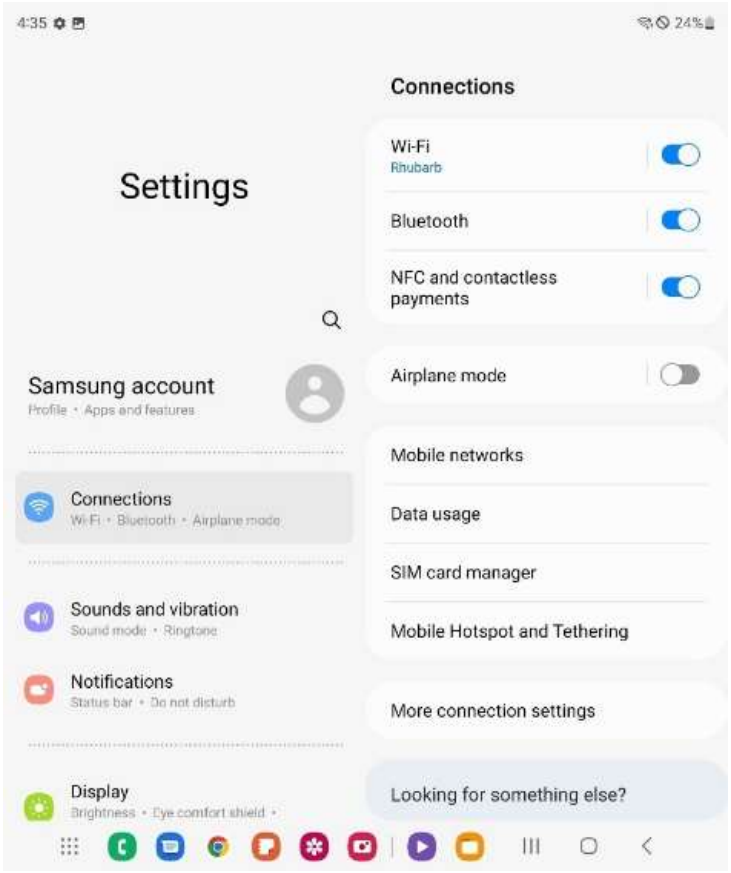
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

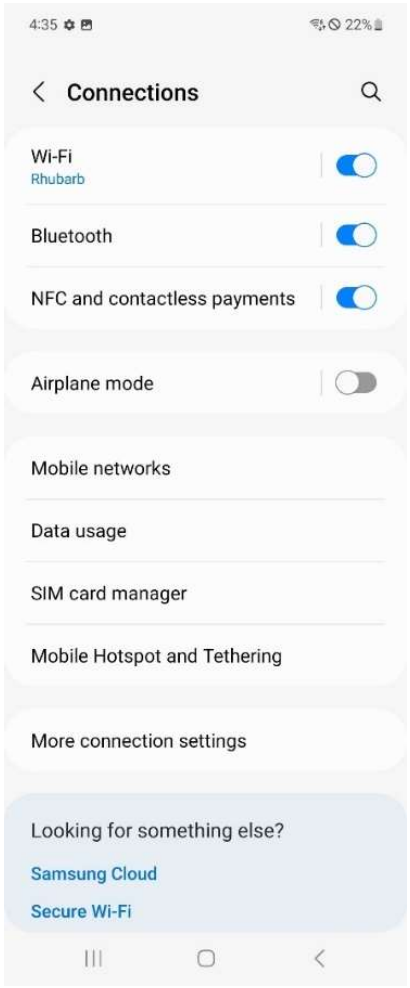
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)  As an additional example of controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	"Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options. User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

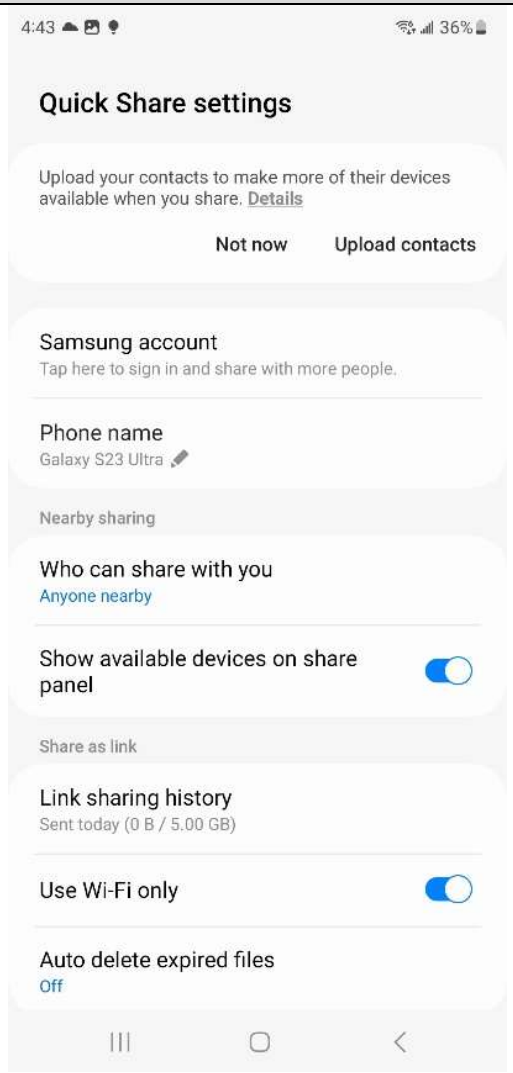
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4) 

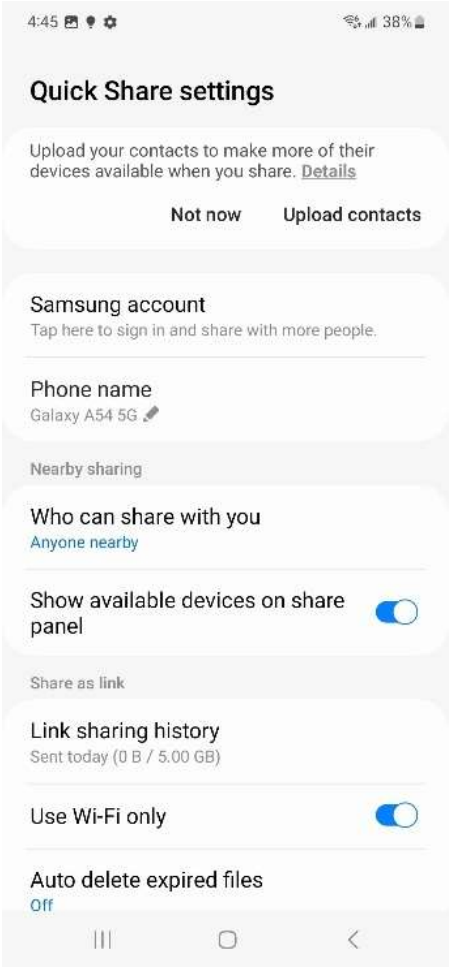
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of the controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products receive instructions from the user to use "Quick Share," "Samsung Pay," "Bluetooth File Share," and/or access the internet which will be accepted by the operating system executing on the one or more CPUs and based on such execution the controller will control the assignment of the connection by sending the instructions to one of the WiFi, NFC, Bluetooth, and cellular circuits, respectively. *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include controller controlling assignment of connection of each of the first, second, and third radio communication circuits. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/samsung-pay/; https://www.samsung.com/us/support/answer/ANS00083184/.
[5.g] wherein the controller controls assignment of connection for each of the first and second radio communication circuits in response to receiving an indication from a user such that when an indication from the user indicates to use the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for receiving the video information or transmitting the information by radio,	In each of the Accused Samsung '590 Products, the controller controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user such that when an indication from the user indicates to use the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for receiving the video information or transmitting the information by radio. **First Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Wi-Fi and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to recieve video information using the Wi-Fi communication circuit, the controller assigns a connection to the Wi-Fi communication circuit for receiving the video by using Wi-Fi, for example, "Quick Share." For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share "Wi-Fi only" and then receiving data through the Quick Share application. Also, "an indication" from a user to control assignment to the cellular communication chip is turning the cellular or Wi-Fi connection on/off from the quick menu.

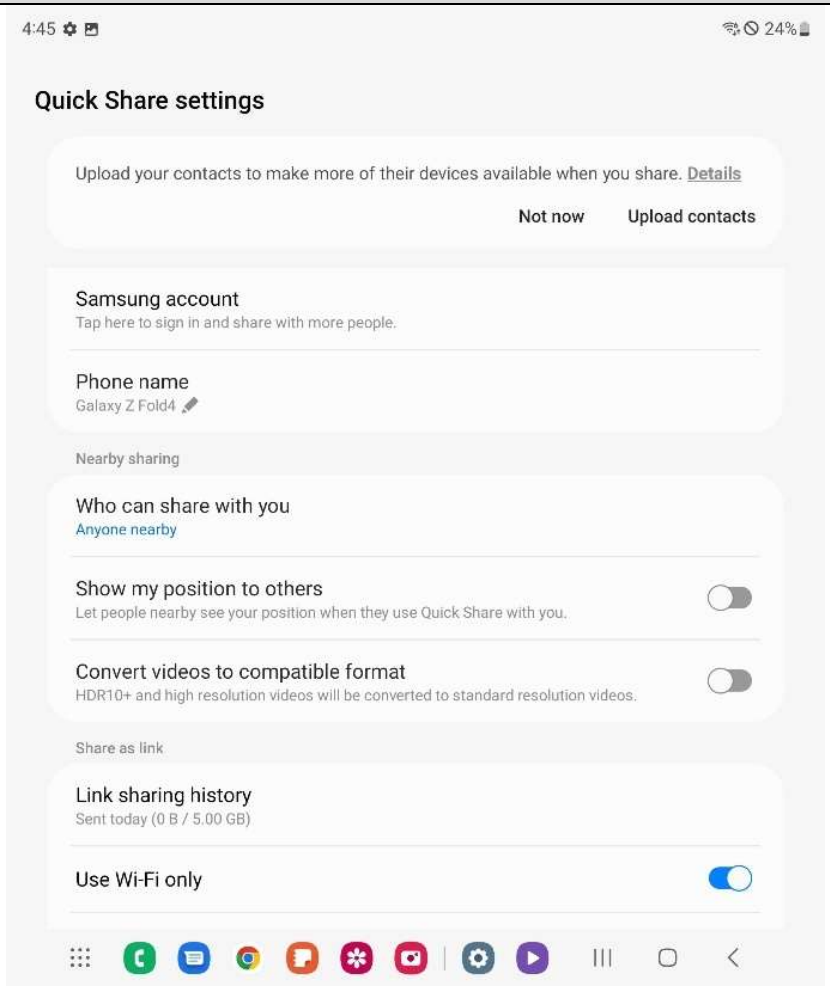
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example, "an indication" from a user to control assignment to the Wi-Fi communication chip is "Accepting" a Quick Share request to receive video from another device. **How to use Quick Share feature on Galaxy device** Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

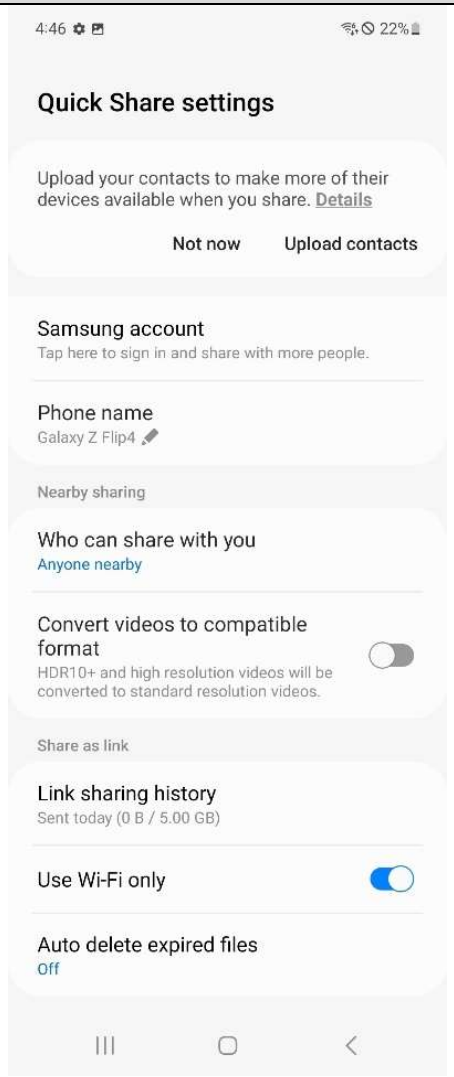
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show exemplary Accused Samsung '590 Products turning selecting Quick Share "Wi-Fi only" and then receiving data through the Quick Share application: **Samsung Galaxy 23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

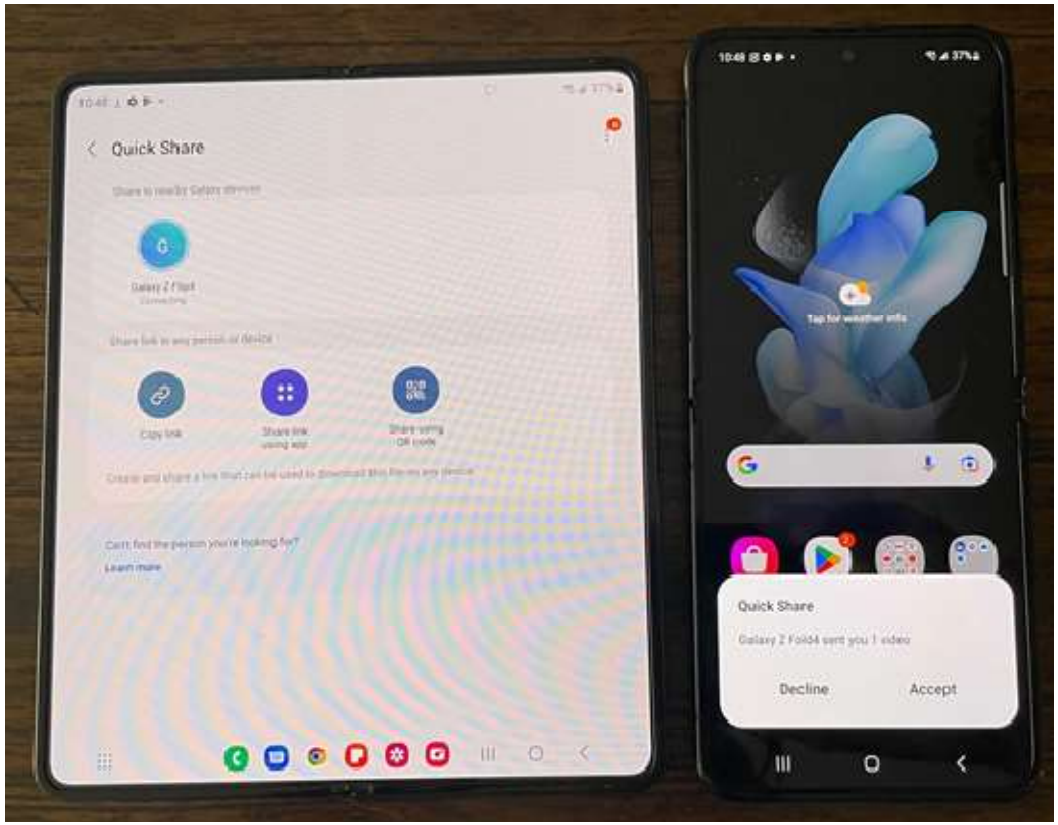
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

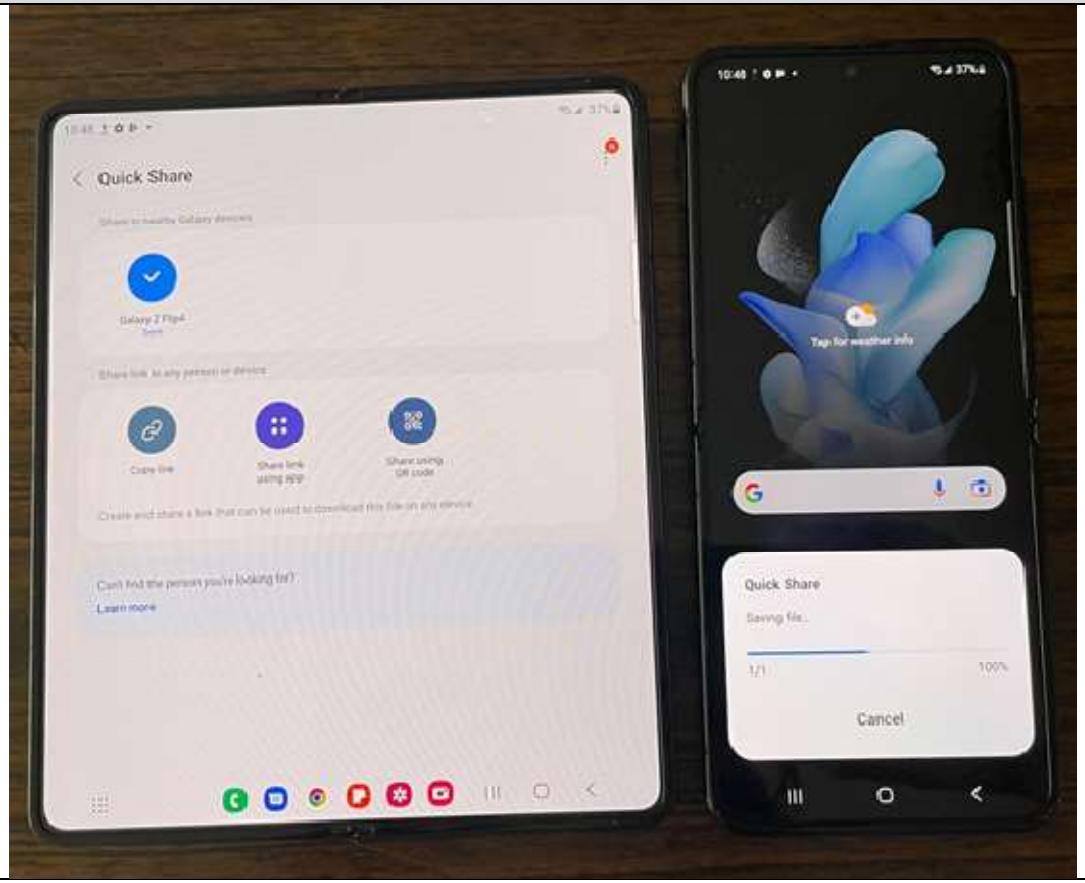
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
	Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)	

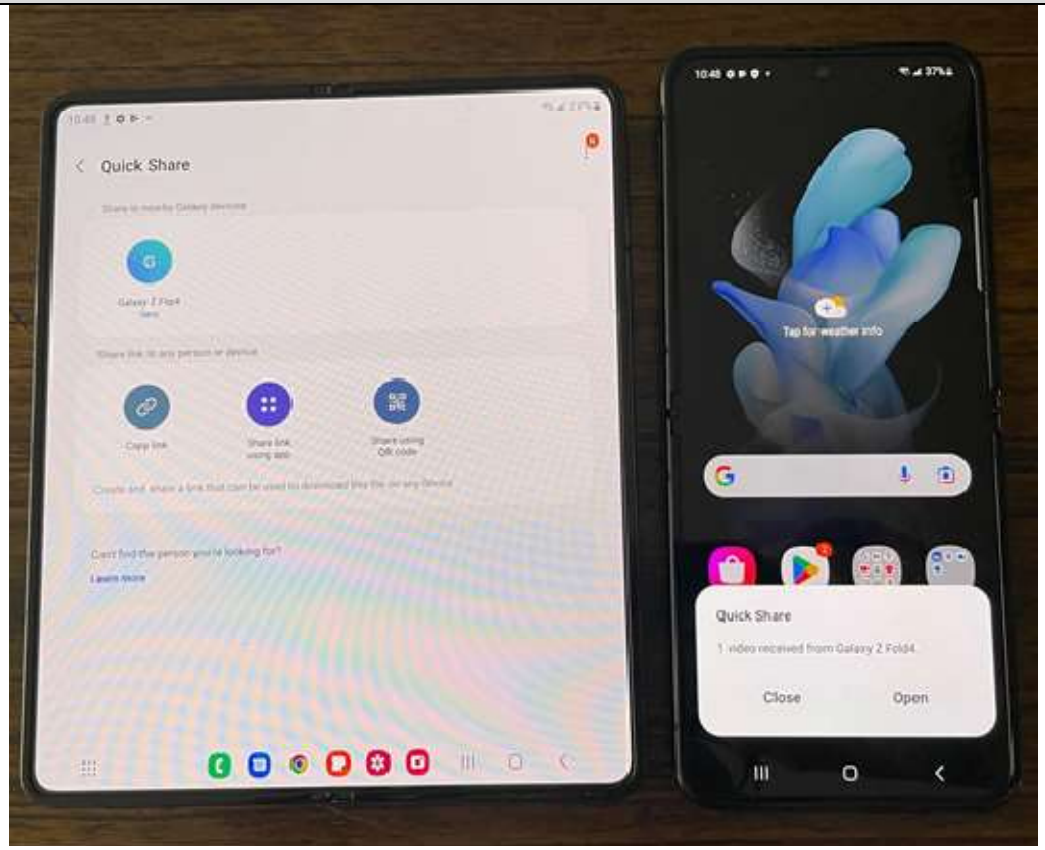

1 item
Galaxy Store
Play Store
Google
Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

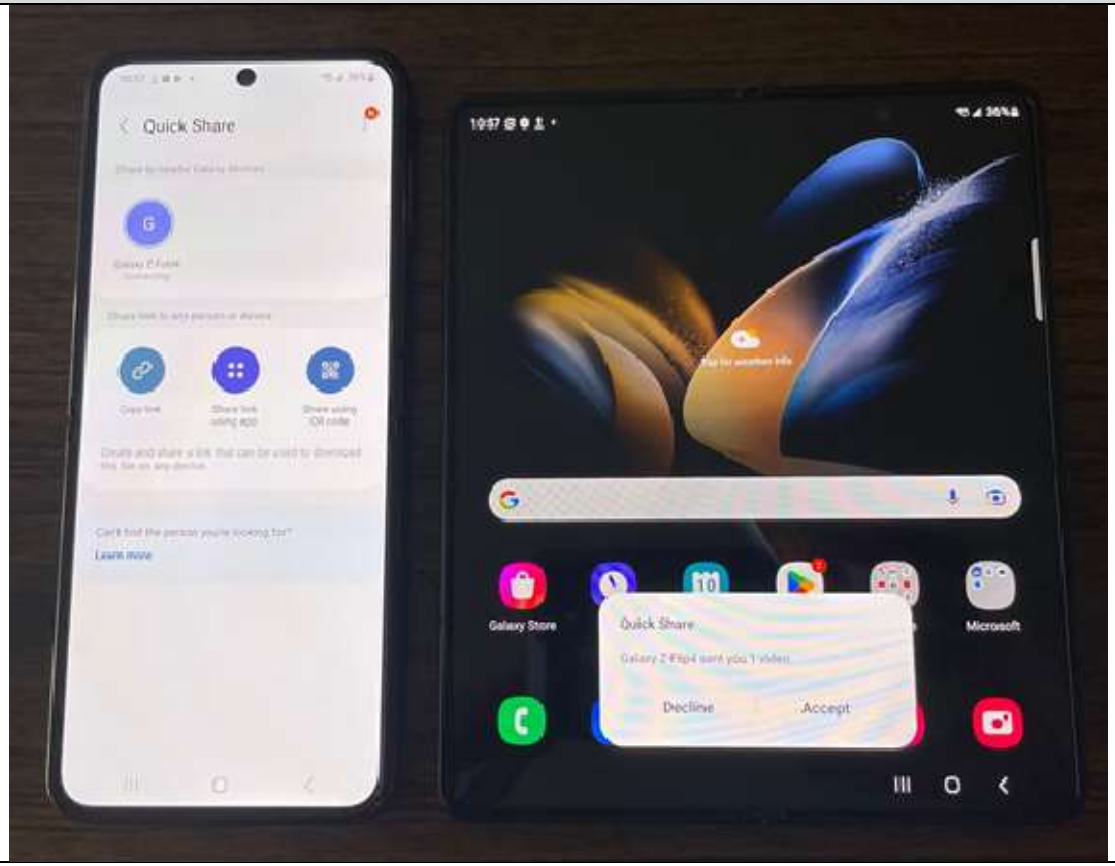
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)


1 item
Galaxy Store
Clock
Calendar
Play Store
Google
Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

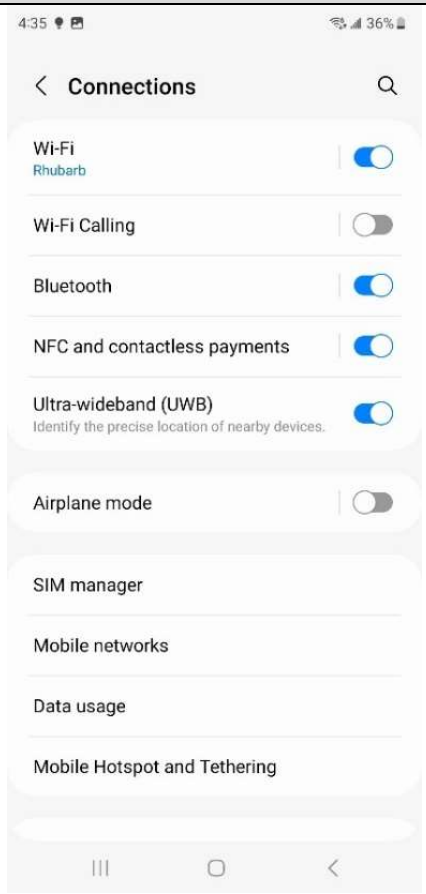
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

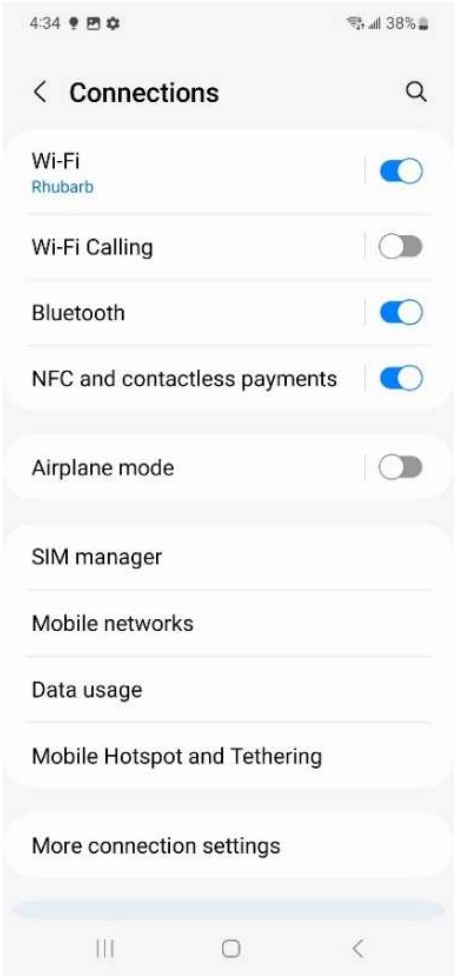
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

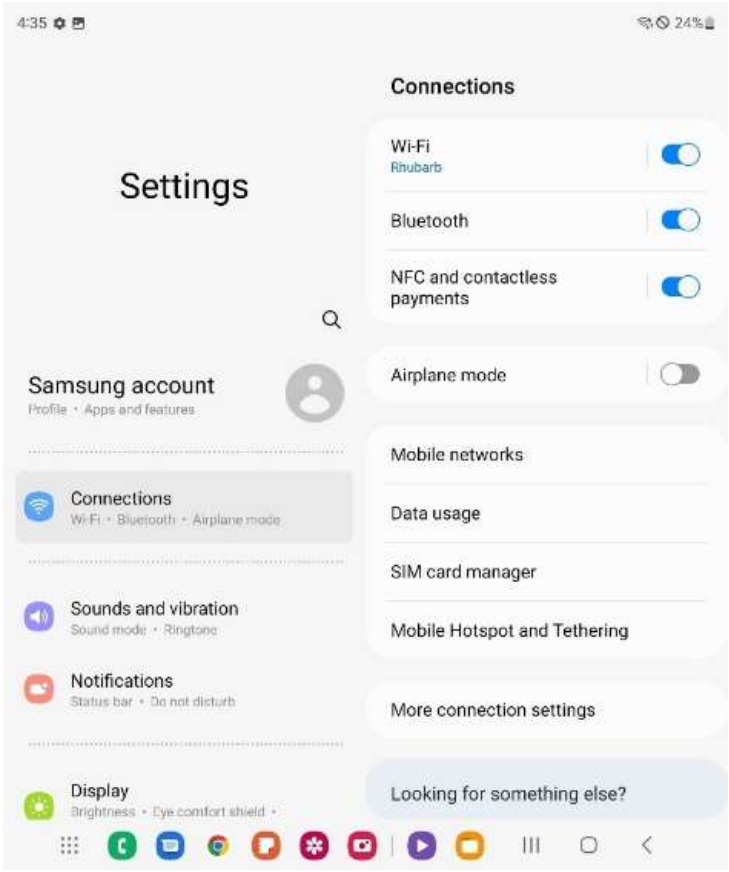


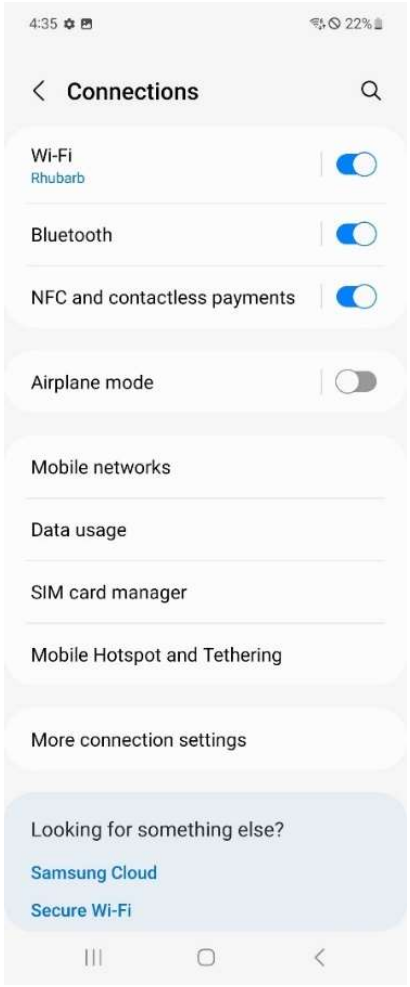
For example, the following screenshots show exemplary Accused Samsung '590 Products turning Wi-Fi on/off and cellular on/off:

User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

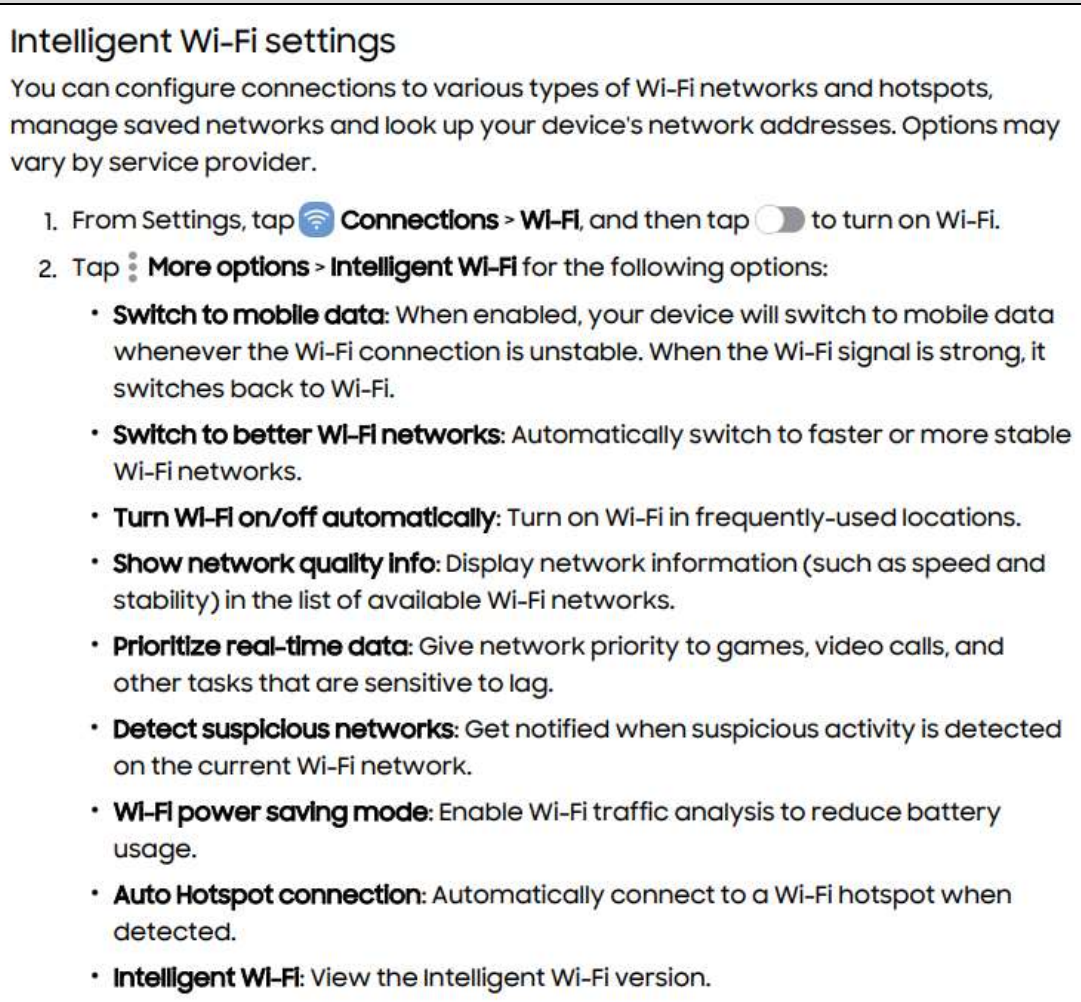
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

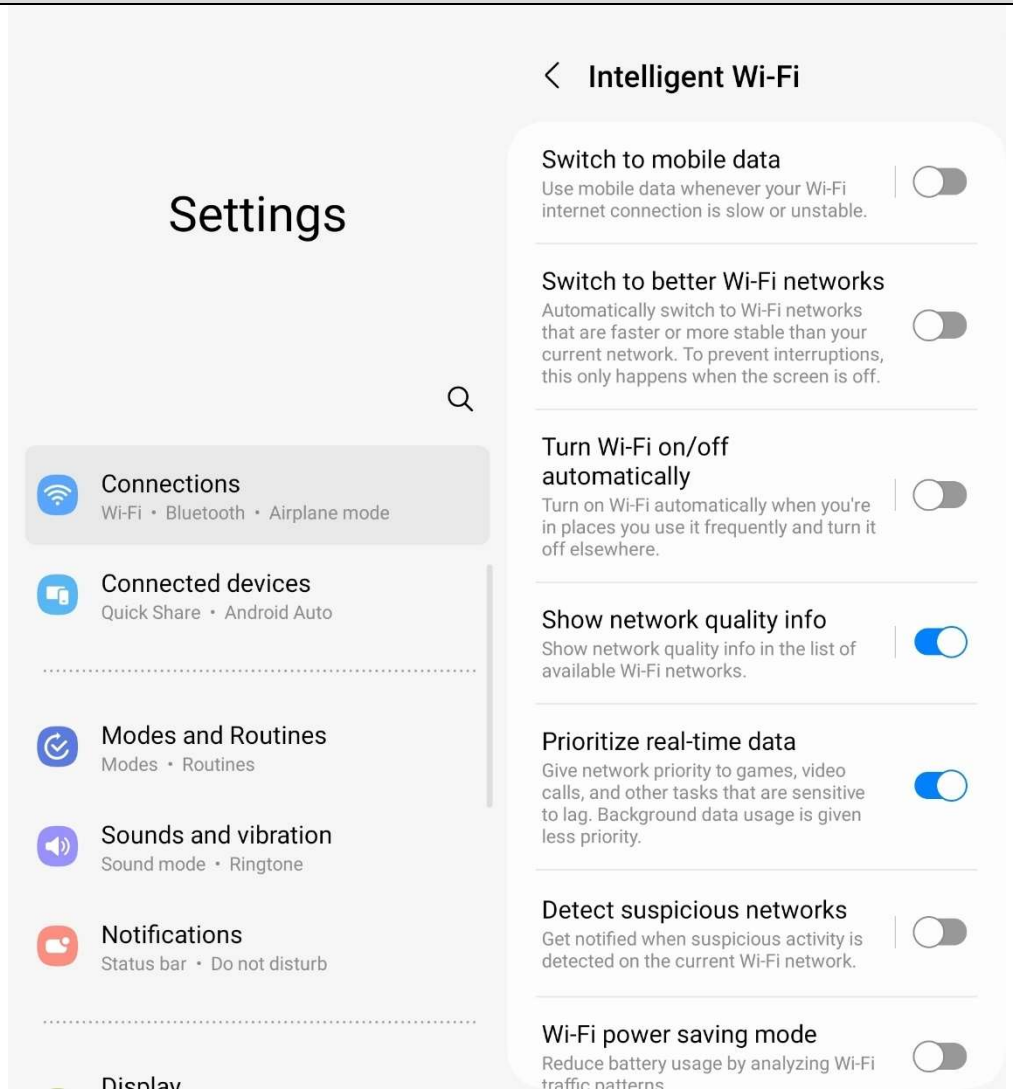
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of "an indication" from a user to control assignment, the user can turn Wi-Fi on and turn cellular connection off to indicate that the user wants to use Wi-Fi for communications. As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Wi-Fi off to indicate that the user wants to use cellular connection for communications. Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Switch to mobile data," so the user is indicating to assign a connection to the cellular communication chip when the Wi-Fi connection is unstable. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 User Guide at pg. 122.

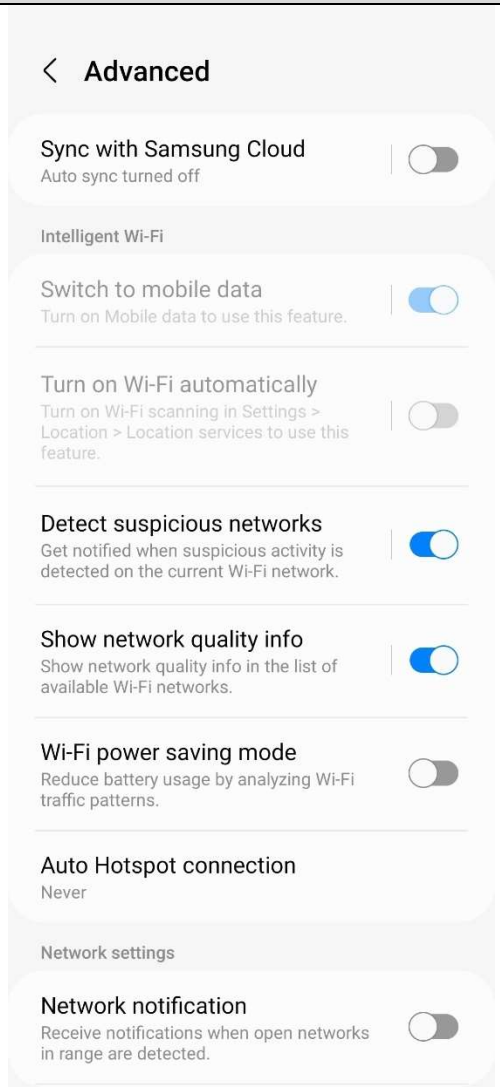
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. • **Prioritize real-time data**: Give network priority to games, video calls, and other tasks that are sensitive to lag. • **Detect suspicious networks**: Get notified when suspicious activity is detected on the current Wi-Fi network. • **Wi-Fi power saving mode**: Enable Wi-Fi traffic analysis to reduce battery usage. • **Auto Hotspot connection**: Automatically connect to a Wi-Fi hotspot when detected. • **Intelligent Wi-Fi**: View the Intelligent Wi-Fi version. Galaxy Z Flip4 User Guide at pg. 122.

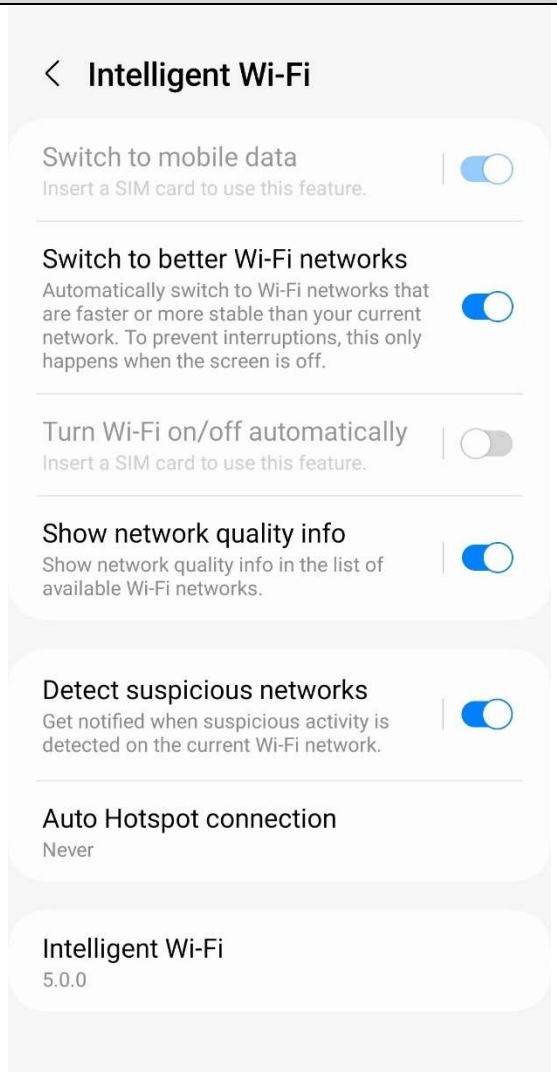
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. Galaxy A54 G User Guide at pg. 101.

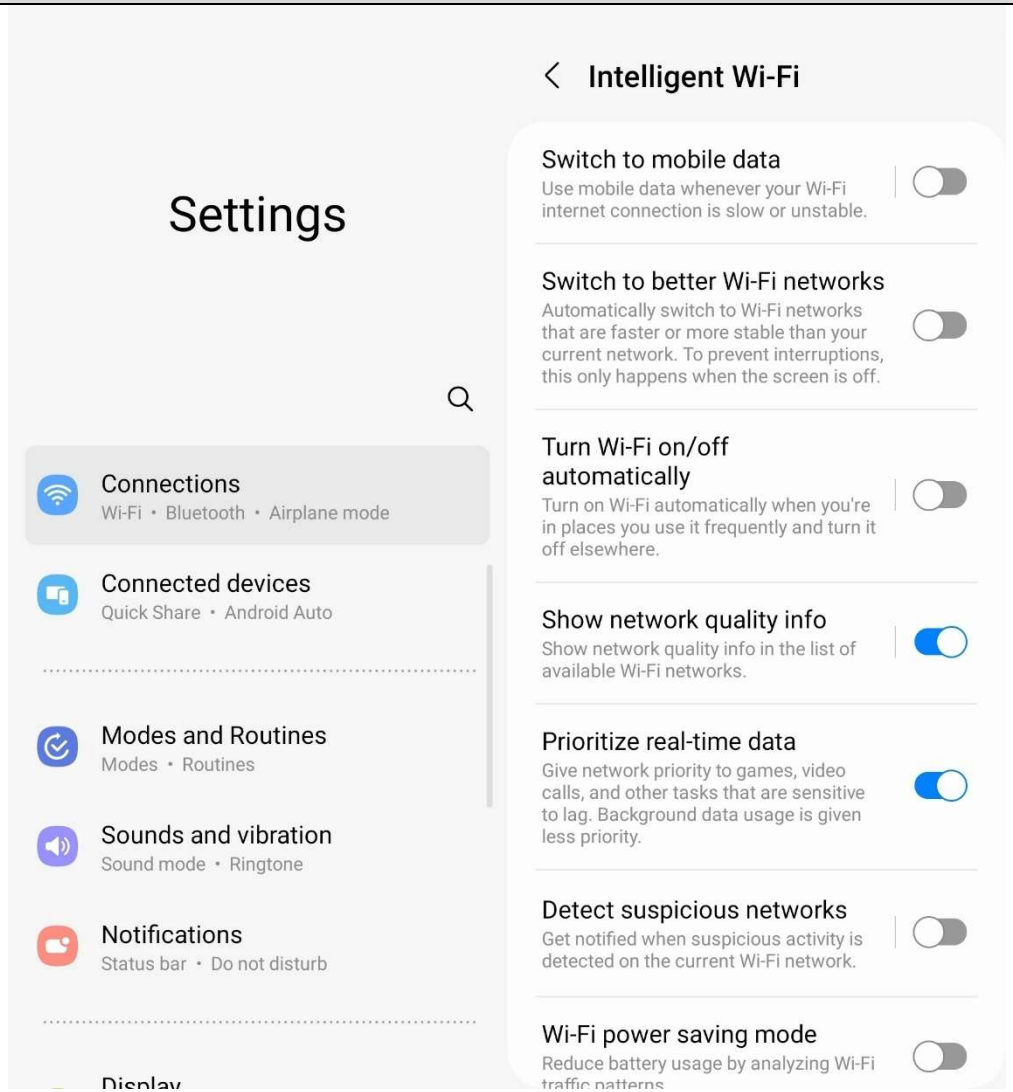
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



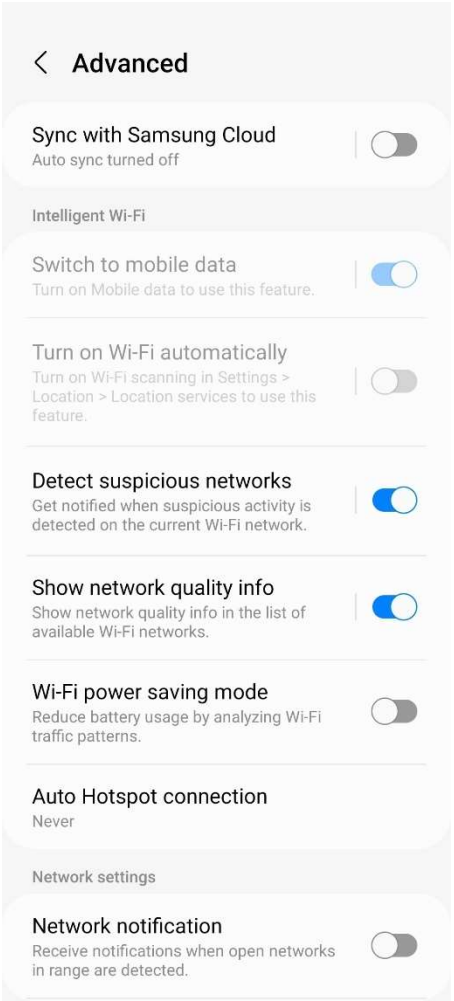
Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

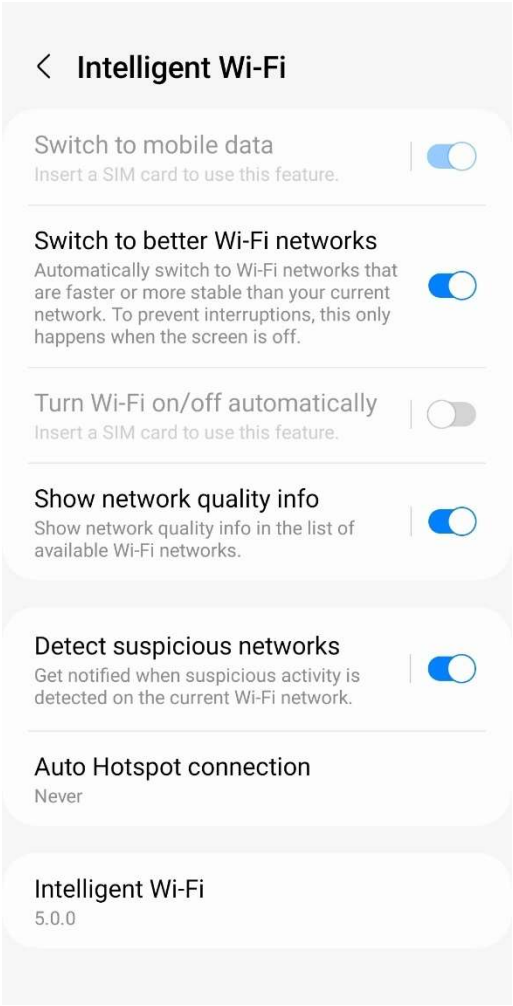
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Turn Wi-Fi on/off automatically," so the user is indicating to switch on Wi-Fi in frequently used areas. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

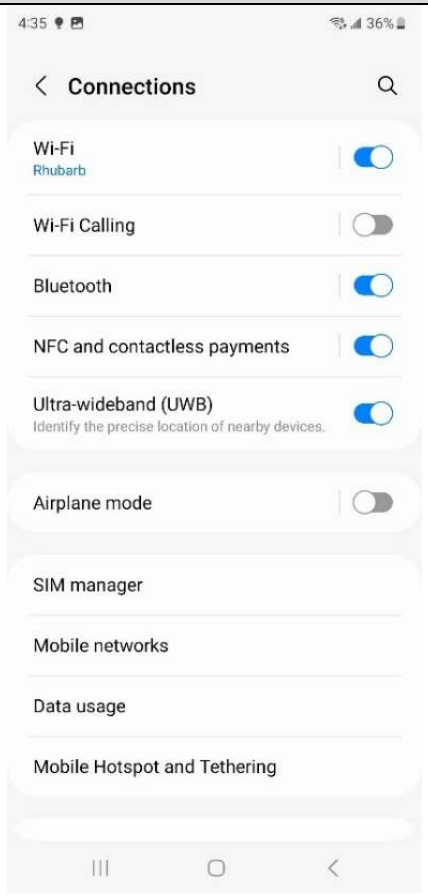


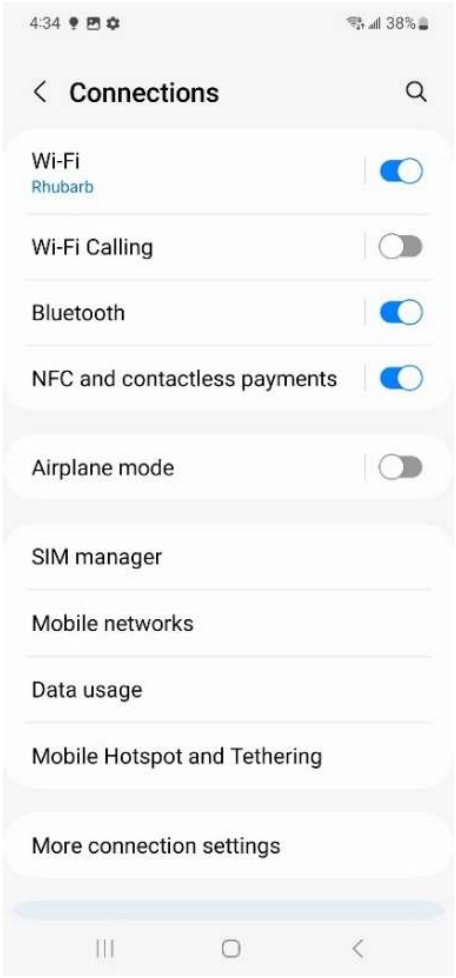
Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

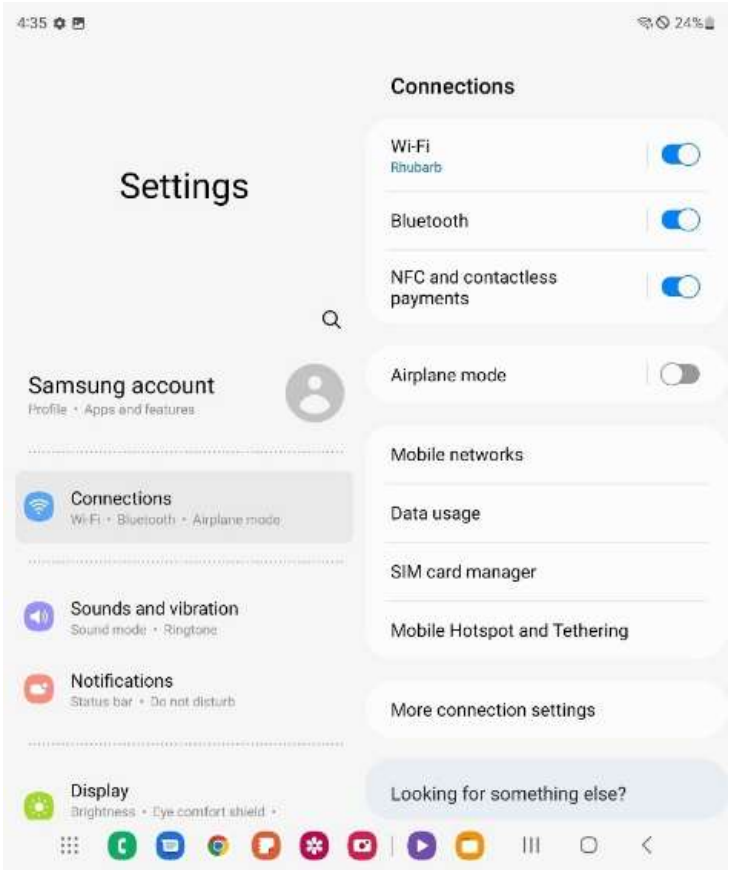
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

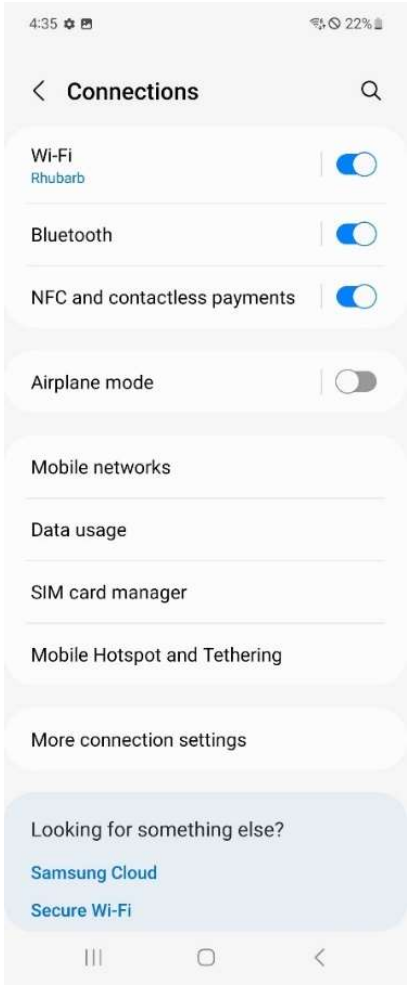
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Second Infringement Theory: For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Bluetooth and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to receive video information using the Bluetooth communication circuit, the controller assigns a connection to the Bluetooth communication circuit for receiving the video by using Bluetooth. For example, "an indication" from a user to control assignment to the Bluetooth communication chip is turning Bluetooth on/off, and "an indication" from a user to control assignment to the cellular communication chip is turning the cellular connection on/off from the quick menu. As an additional example, "an indication" from a user is to "Accept" reception of video via Bluetooth. For example, the following screenshots show exemplary Accused Samsung '590 Products turning Bluetooth on/off and cellular on/off: User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>As an additional example of "an indication" from a user to control assignment, the user can turn Bluetooth on and turn cellular connection off to indicate that the user wants to use Bluetooth for communications.

As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Bluetooth off to indicate that the user wants to use cellular connection for communications.

Further, the user can provide an indication to transmit video information using the Bluetooth communication circuit by selecting "Bluetooth" share, and the controller then assigns a connection to the Bluetooth communication circuit for transmitting the video.

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

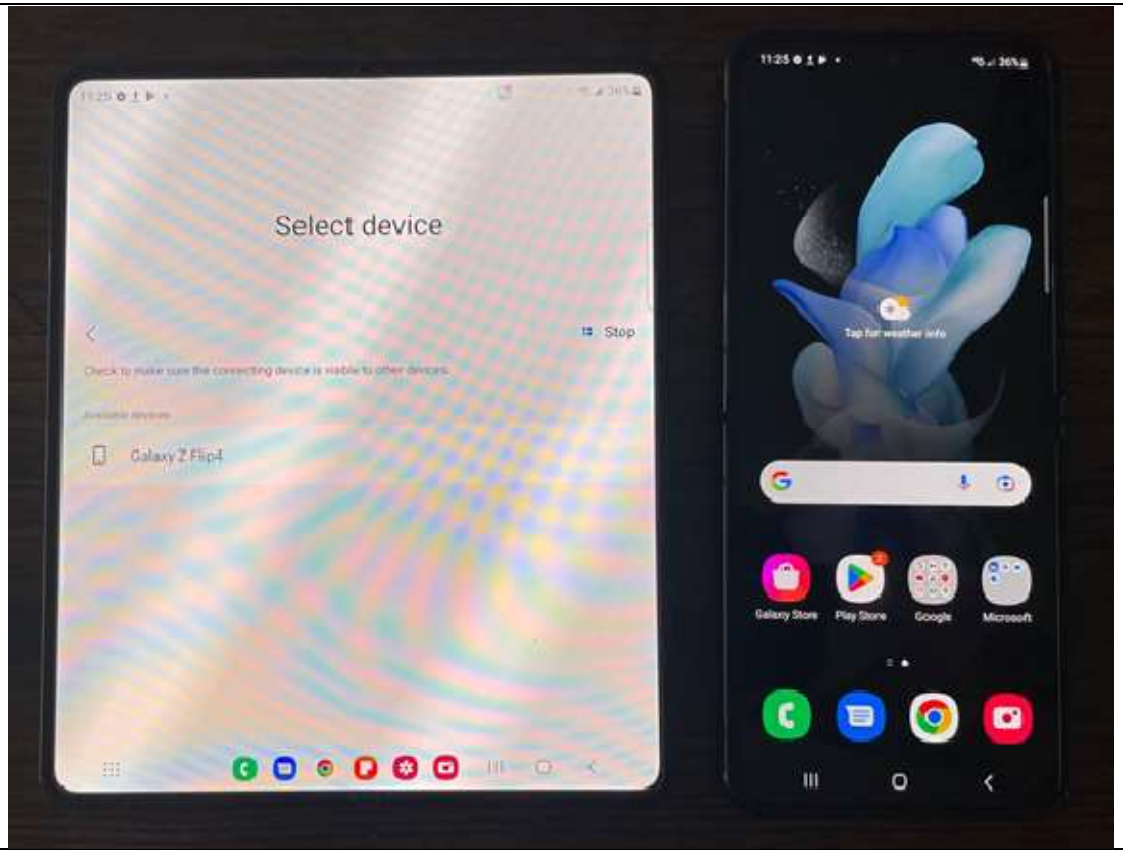
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

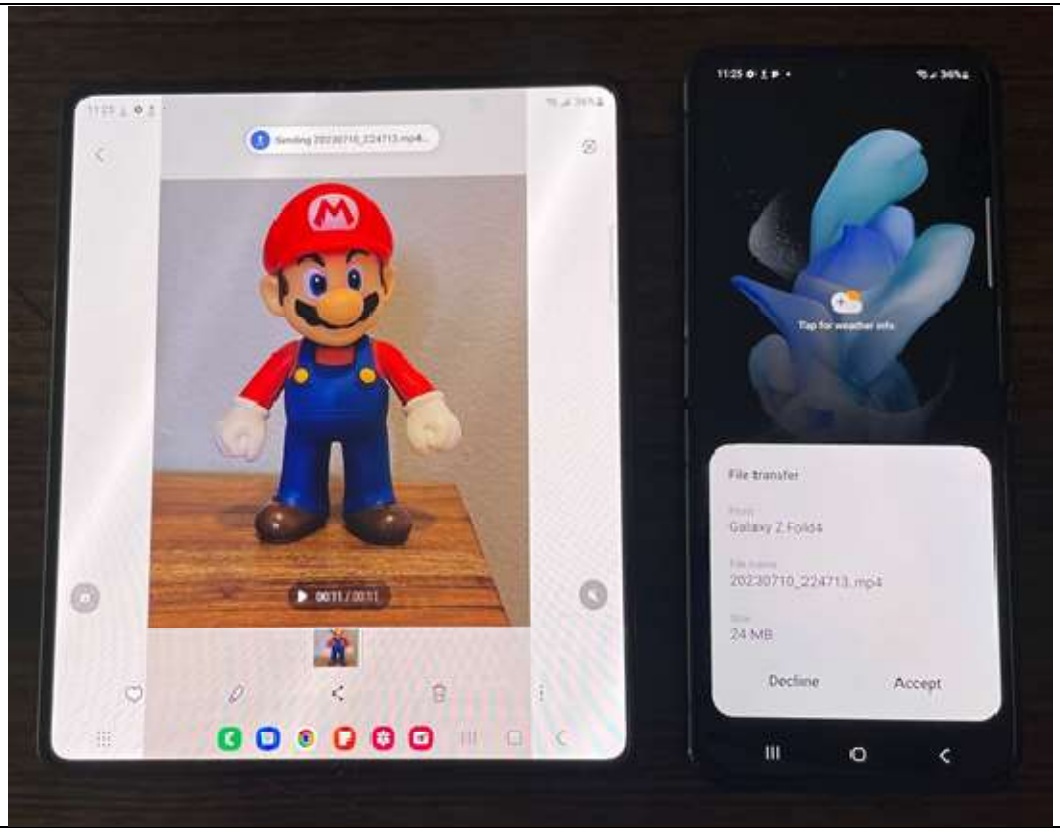
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Galaxy Store Play Store Google Microsoft


Tap for weather info
File transfer
Galaxy Z Fold4
20230710_224713.mp4
24 MB
Decline
Accept

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



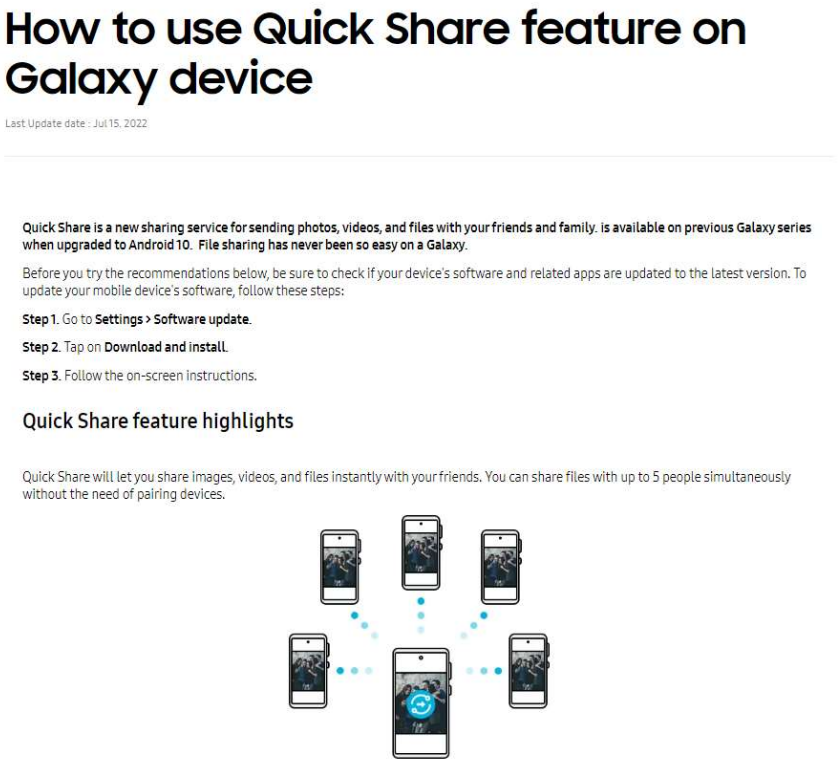
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls assignment of connection in response to a user selecting options via the touch interface (display) in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.
[5.h] wherein the controller controls each of the first and second radio communication circuits so that the first radio communication circuit	In each of the Accused Samsung '590 Products, the controller controls each of the first and second radio communication circuits so that the first radio communication circuit receives video information and the second radio communication circuit connects to the internet or the home network simultaneously.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
receives video information and the second radio communication circuit connects to the internet or the home network simultaneously, and	**First Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control receiving of video information via the Wi-Fi communication chip (e.g., Quick Share) and the cellular communication chip connects to the Internet or home network simultaneously.  How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. Quick Share feature highlights Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	1.7 Simultaneous Transmission Capabilities According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

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60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

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Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

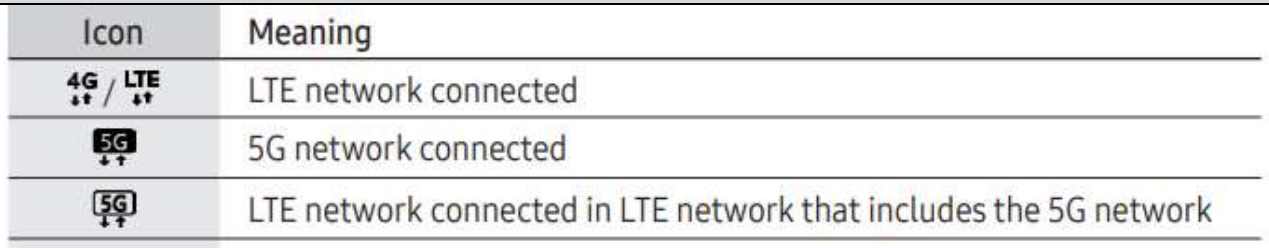
RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

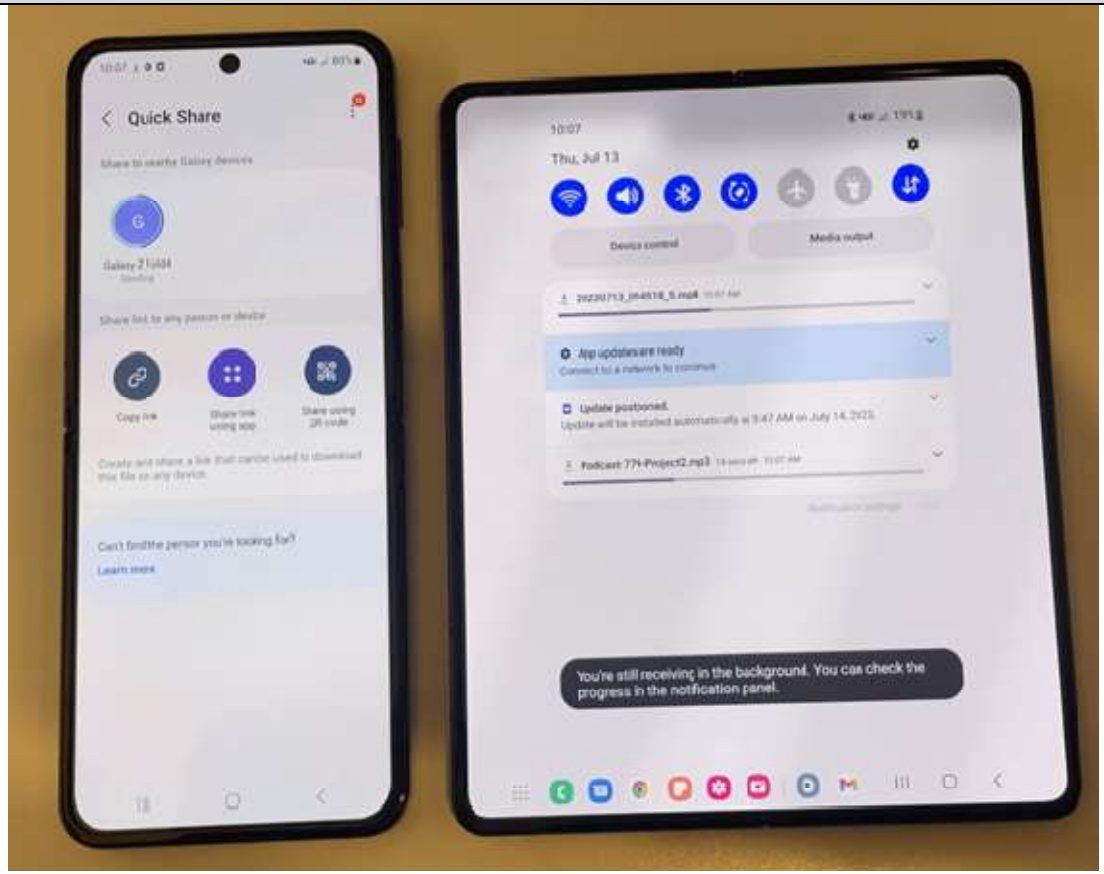
For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra User Guide, pg. 30 In addition, the Wi-Fi communication chip is used to receive video information via "Quick Share" while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content as Wi-Fi is switched off and/or Wi-Fi router is off (similar functionality also applies to receiving e-mail or MMS or streaming video or doing a video call over a cellular network while transmitting a file through Quick Share): Transmitting Device (Samsung Galaxy S23 Ultra) Receiving Device (Samsung A54 5G):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy A54 5G) Receiving Device (Samsung Galaxy S23 Ultra):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy ZFold 4) Receiving Device (ZFlip 4):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy ZFlip 4) Receiving Device (ZFold 4):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. **Second Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control receiving of video

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	information via the Bluetooth communication chip and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:** **1.7 Simultaneous Transmission Capabilities** According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

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Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

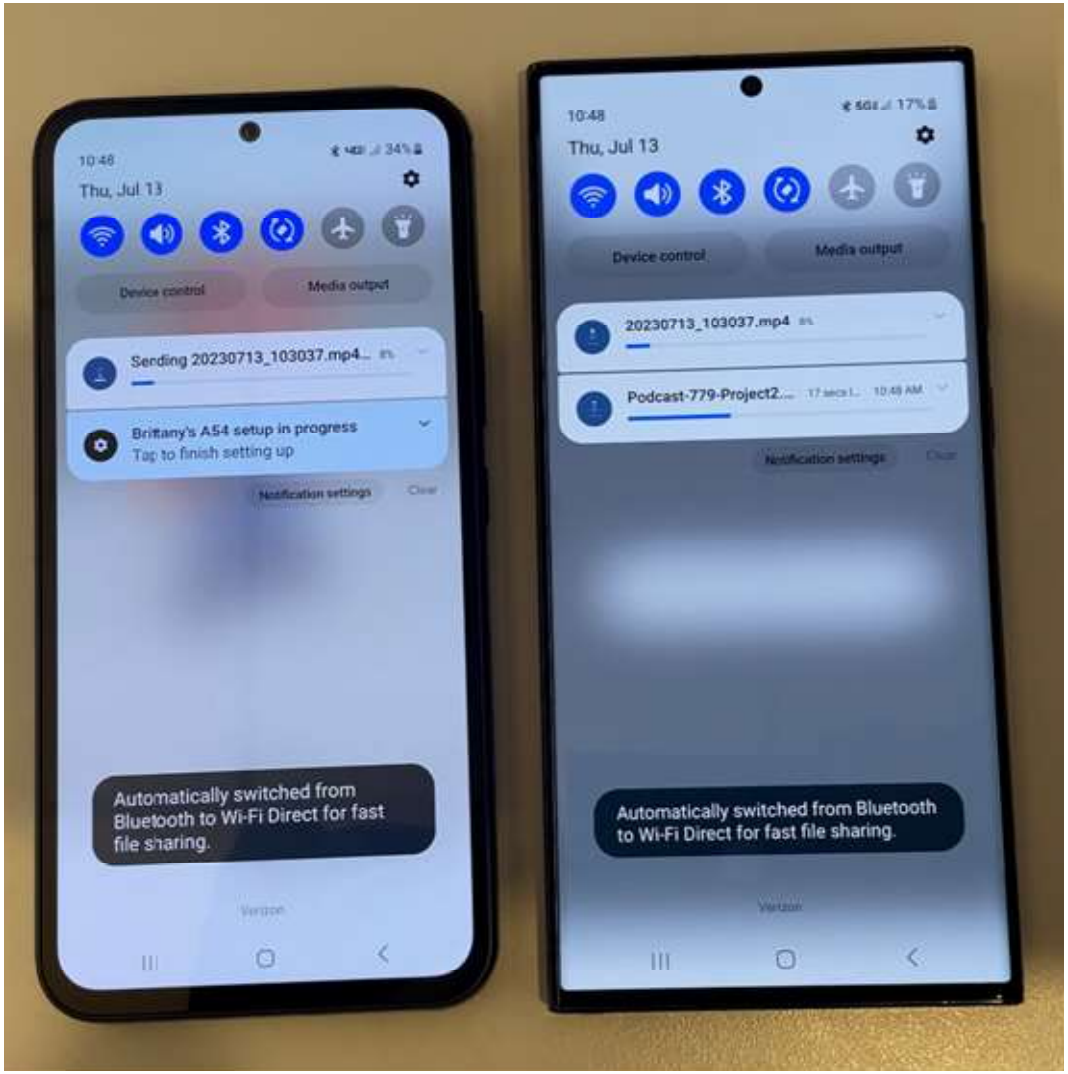
Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network
	Wi-Fi connected
	Bluetooth feature turned on

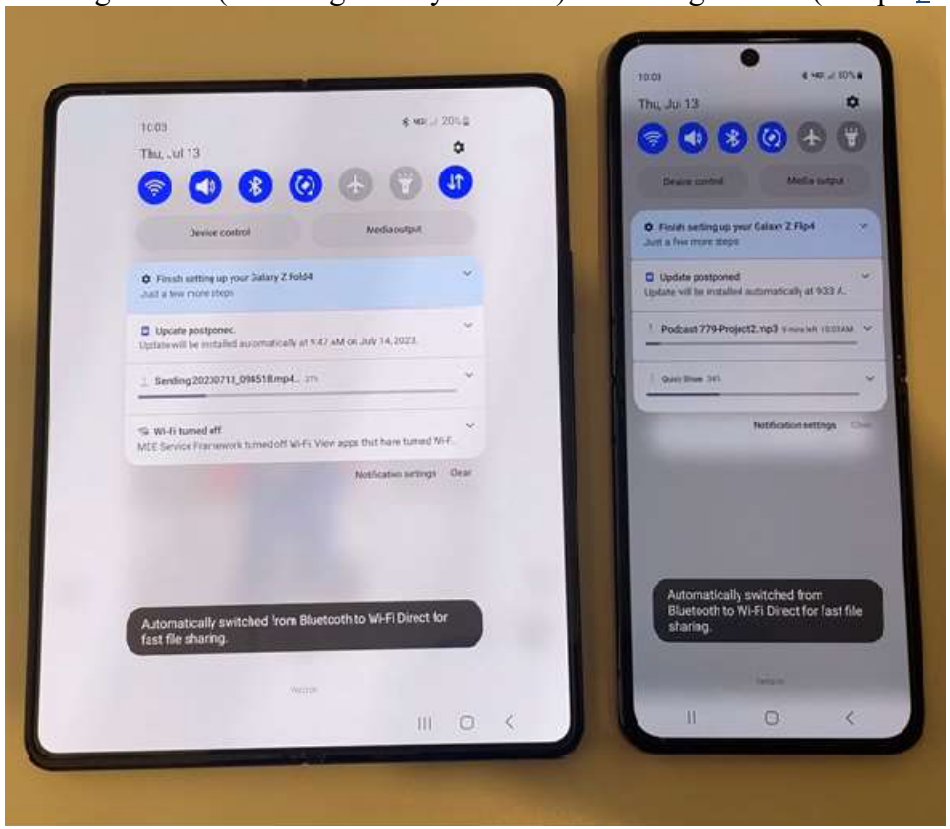
Galaxy S23 Ultra User Guide, pg. 30.

In addition, the Bluetooth communication chip is used to receive video information via Bluetooth file share while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content as Wi-Fi is switched off and/or Wi-Fi router is off (similar functionality also applies to receiving e-mail or MMS or streaming video or doing a video call over a cellular network while transmitting a Bluetooth file):

Transmitting Device (Samsung Galaxy S23 Ultra) Receiving Device (Samsung A54 5G):

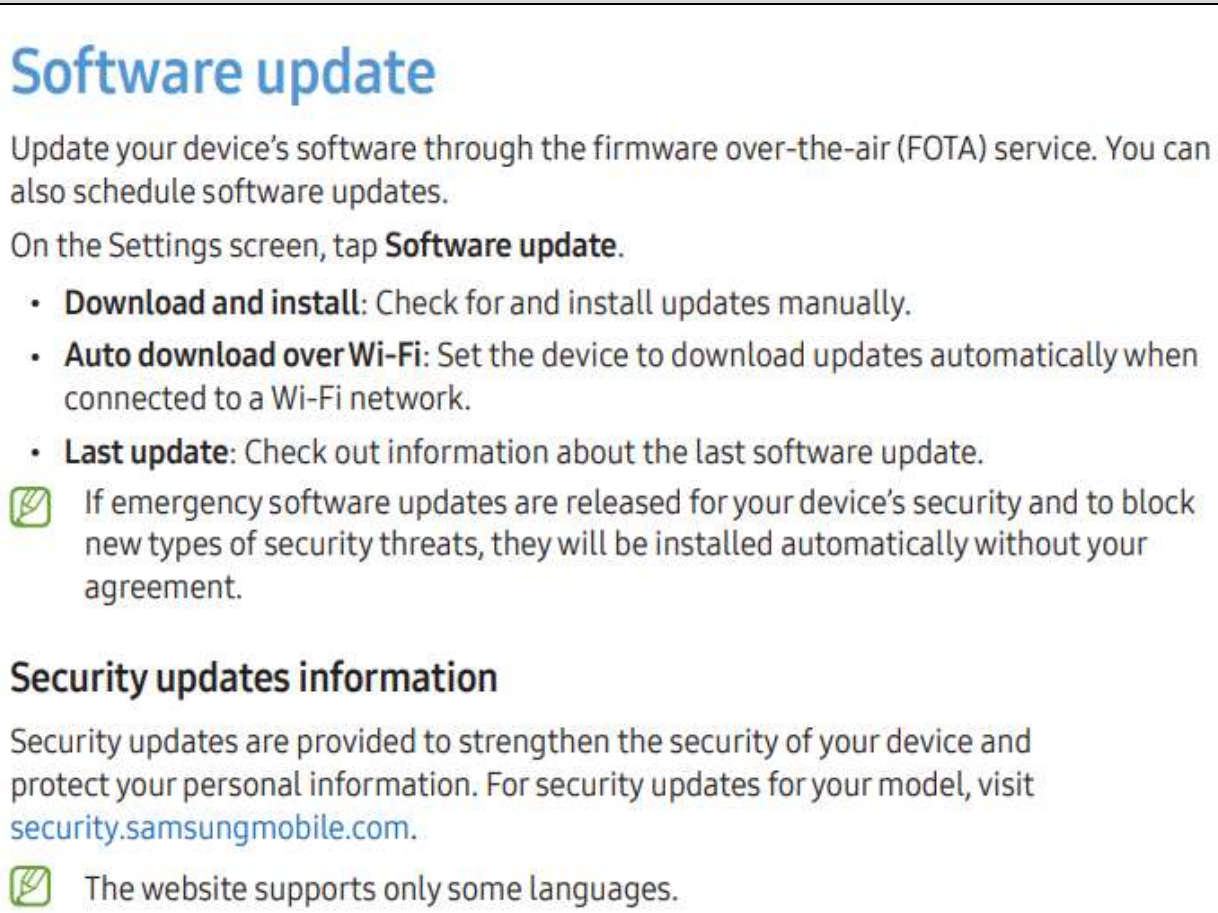
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy A54 5G) Receiving Device (Samsung Galaxy S23 Ultra):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Transmitting Device (Samsung Galaxy ZFold 4) Receiving Device (ZFlip 4):  As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy ZFlip 4) Receiving Device (ZFold 4):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection. *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls simultaneous communication by WiFi or Bluetooth and cellular circuits in a similar manner when implementing Samsung QuickShare/Bluetooth File Share and connecting to the Internet. *See*

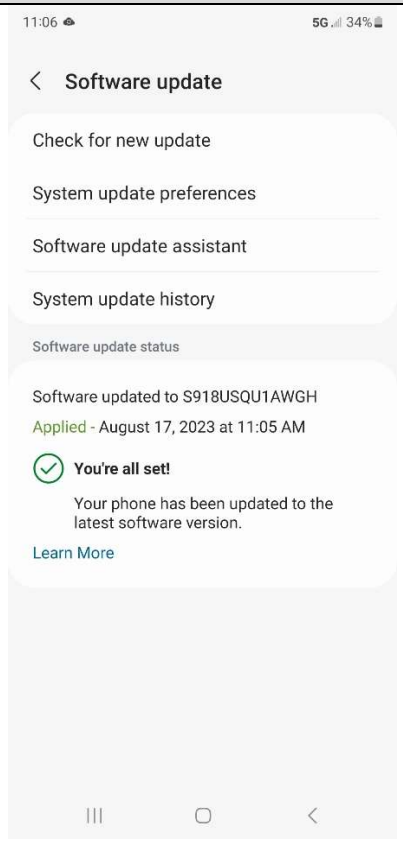
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/. **Doctrine of Equivalents** To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling each of the first and second radio communication circuit so that the first radio communication circuit receives video information and the second radio communication circuit connects to the internet or the home network simultaneously. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, the Accused Samsung '590 Products include an application processor/CPU which executes the operating system and source code for various applications to control Bluetooth, Wi-Fi, and cellular functionalities occurring simultaneous. The performance of this function achieves substantially the same result, for example, simultaneous transmission of video information with connection to the internet or home network.
[5.i] wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the display apparatus is available, and the display apparatus executes an update process such that an updated operating system of	In each of the Accused Samsung '590 Products, the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the display apparatus is available, and the display apparatus executes an update process such that an updated operating system of the display apparatus is stored in the display apparatus after execution of the update process.. For example, the operating system can be updated by connecting to the Internet via at least cellular communication circuits. **Galaxy S23 Ultra:**

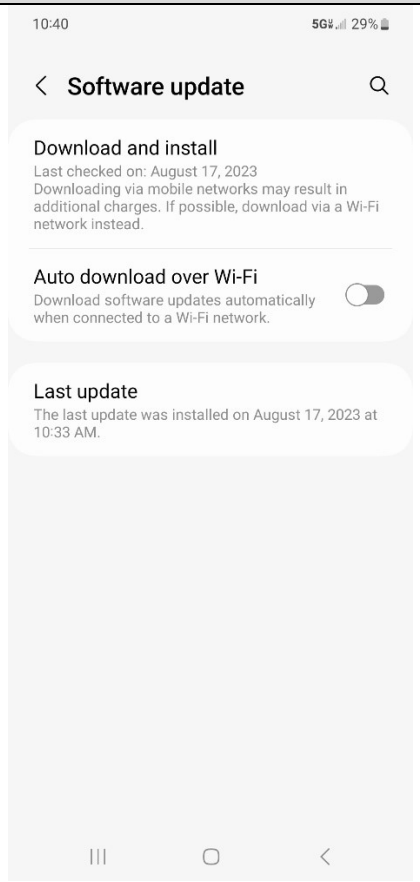
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
the display apparatus is stored in the display apparatus after execution of the update process.	 Galaxy S23 Series User Guide at pg. 163. **Galaxy Z Flip4:**

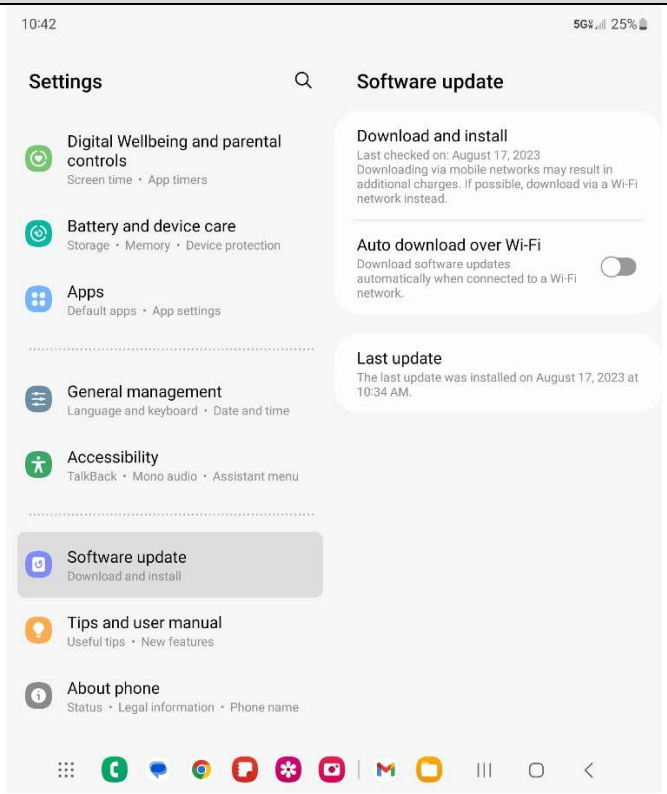
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy Z Fold4:**

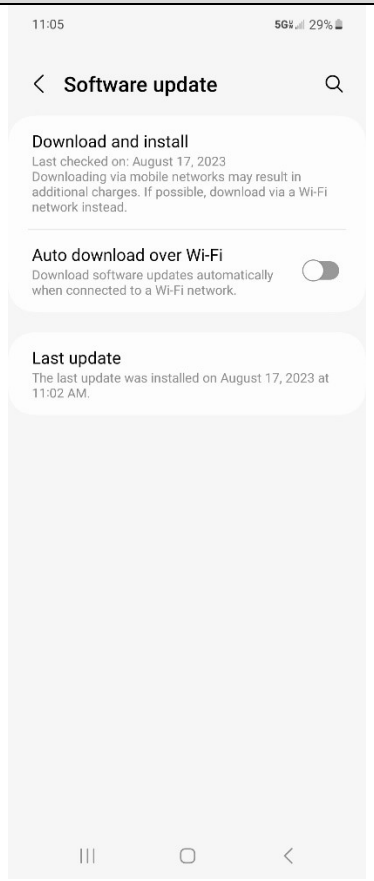
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy A54 5G:**

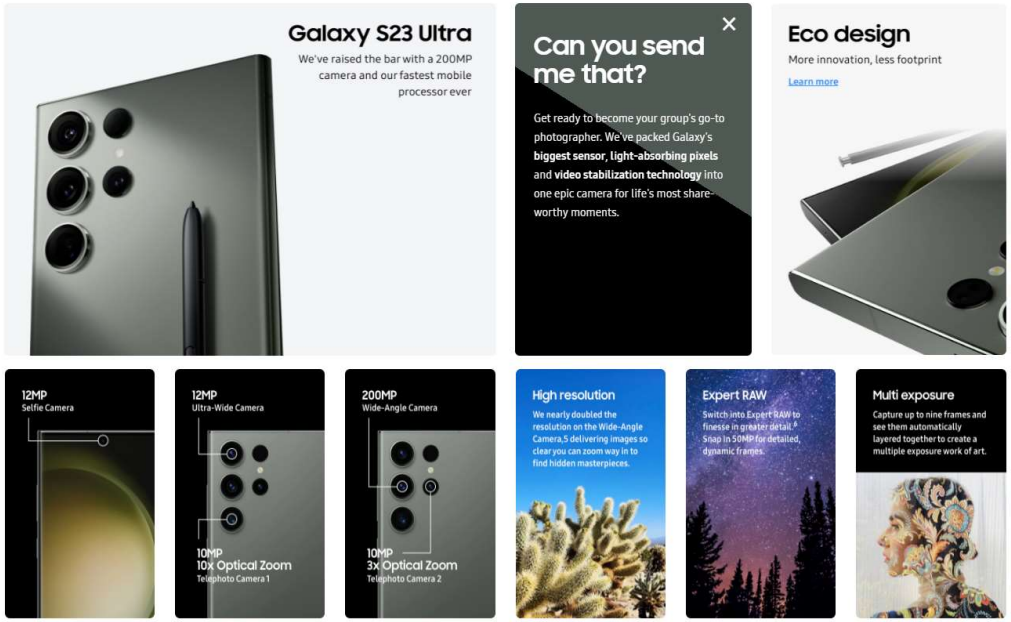
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Auto download over Wi-Fi**: Automatically download software updates when the device is connected to a Wi-Fi network. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy A54 User Guide at pg. 146. For example, the following screenshots show exemplary Accused Samsung '590 Products using the second radio communication circuits ("Download and install" option) to receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available: Galaxy S23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy ZFold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy Z Flip 4:

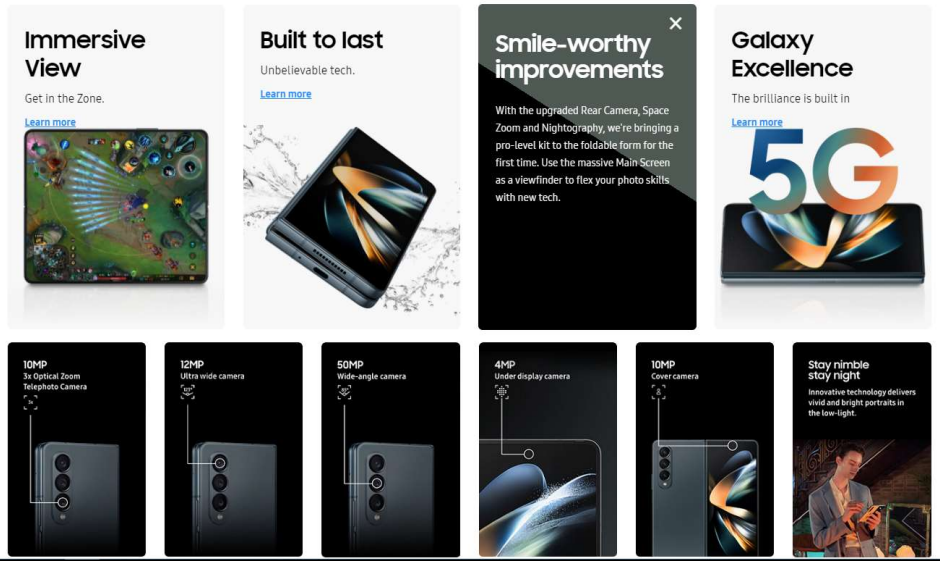
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for receiving a signal from the Internet and updating the operating system in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00077582/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[9.preamble] A method for video processing, comprising:	Each of the Accused Samsung '590 Products perform a method for video processing. For example, the Accused Samsung '590 Products include front and back cameras for recording video, a display for displaying video, and one or more processors (*e.g.*, a CPU, ISP, and/or DSP) with image and video processing capability: 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Quad	200 MP, f/1.7, 24mm (wide), 1/1.3", 0.6µm, multi-directional PDAF, Laser AF, OIS
		10 MP, f/4.9, 230mm (periscope telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 10x optical zoom
		10 MP, f/2.4, 70mm (telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55", 1.4µm, Dual Pixel PDAF, Super Steady video
	Features	LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/240fps, 1080p@960fps, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), Dual Pixel PDAF
	Features	Dual video call, Auto-HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Triple	50 MP, f/1.8, 23mm (wide), 1.0µm, Dual Pixel PDAF, OIS
		10 MP, f/2.4, 66mm (telephoto), 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 123˚, 12mm (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	8K@24fps, 4K@60fps, 1080p@60/240fps (gyro-EIS), 720p@960fps (gyro-EIS), HDR10+
SELFIE CAMERA	Single	4 MP, f/1.8, 26mm (wide), 2.0µm, under display
		Cover camera:
		10 MP, f/2.2, 24mm (wide), 1/3", 1.22µm
	Features	HDR
	Video	4K@30/60fps, 1080p@30/60fps, gyro-EIS

Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

MAIN CAMERA	Dual	12 MP, f/1.8, 24mm (wide), 1/1.76", 1.8µm, Dual Pixel PDAF, OIS
		12 MP, f/2.2, 123˚ (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	4K@30/60fps, 1080p@60/240fps, 720p@960fps, HDR10+
SELFIE CAMERA	Single	10 MP, f/2.4, 26mm (wide), 1.22µm
	Features	HDR
	Video	4K@30fps

Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

MAIN CAMERA	Triple	50 MP, f/1.8, (wide), 1/1.56", 1.0µm, PDAF, OIS
		12 MP, f/2.2, 123° (ultrawide), 1.12µm
		5 MP, f/2.4, (macro)
	Features	LED flash, panorama, HDR
	Video	4K@30fps, 1080p@30/60fps, 720p@480fps
SELFIE CAMERA	Single	32 MP, f/2.2, 26mm (wide), 1/2.8", 0.8µm
	Video	4K@30fps, 1080p@30/60fps

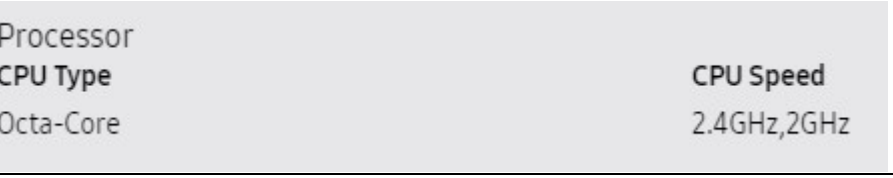
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



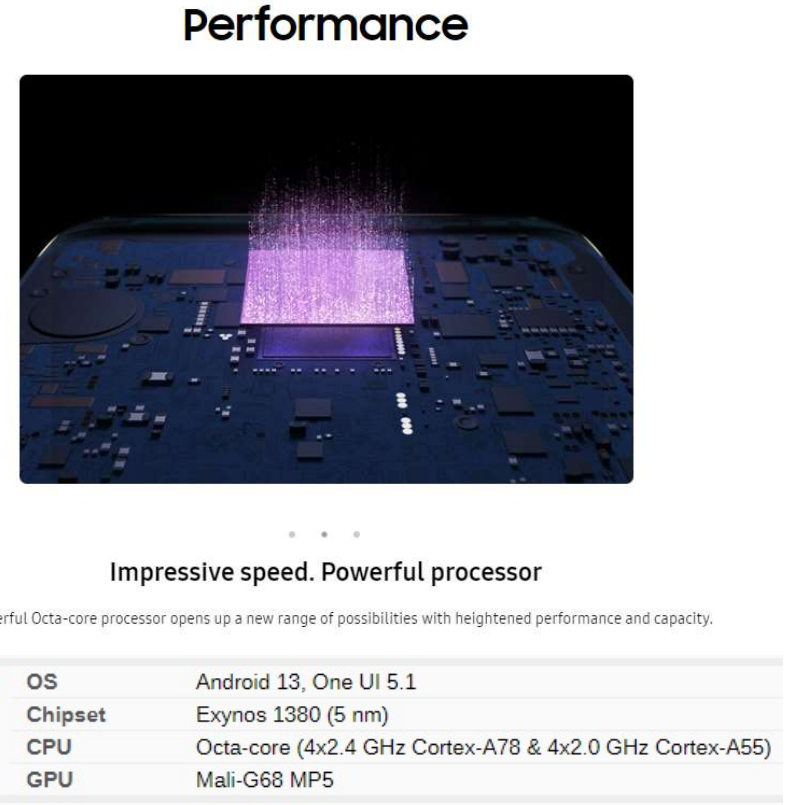
Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

In addition, the AIDA64 Reports show that each of the Accused Samsung '590 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (*e.g.*, CPU, ISP, or DSP) processes video.

Product	AIDA 64 Report- Camera

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy S23 Ultra	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 6.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 3.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 2.20 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy Z Fold4	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.40 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
		Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.30 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.74 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy Z Flip4	<< Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 5.00 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.17 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.70 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy A54 5G	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.54 mm Focus Modes: infinity, auto, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 8.0 MP (3264 × 2448) Focal Length: 3.72 mm

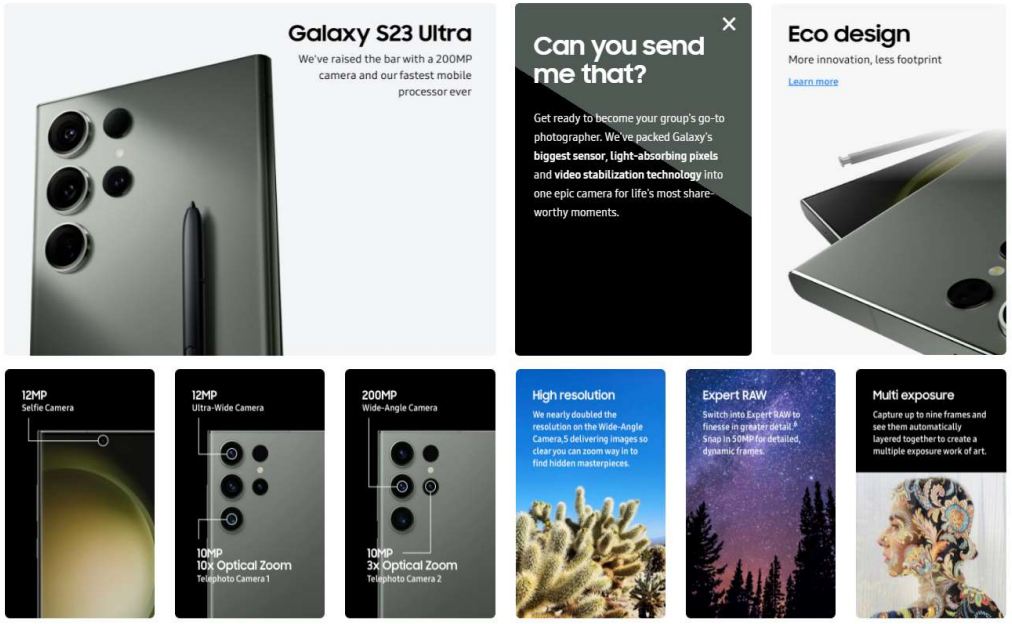
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Focus Modes: fixed, infinity Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.74 mm Focus Modes: fixed, infinity Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Front-Facing Camera >> Resolution: 5.7 MP (2880 × 1980) Focal Length: 3.72 mm Focus Modes: fixed, infinity Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported

The AIDA64 Reports and tech specs show that the Accused Samsung '590 Products contain one or more processors.

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

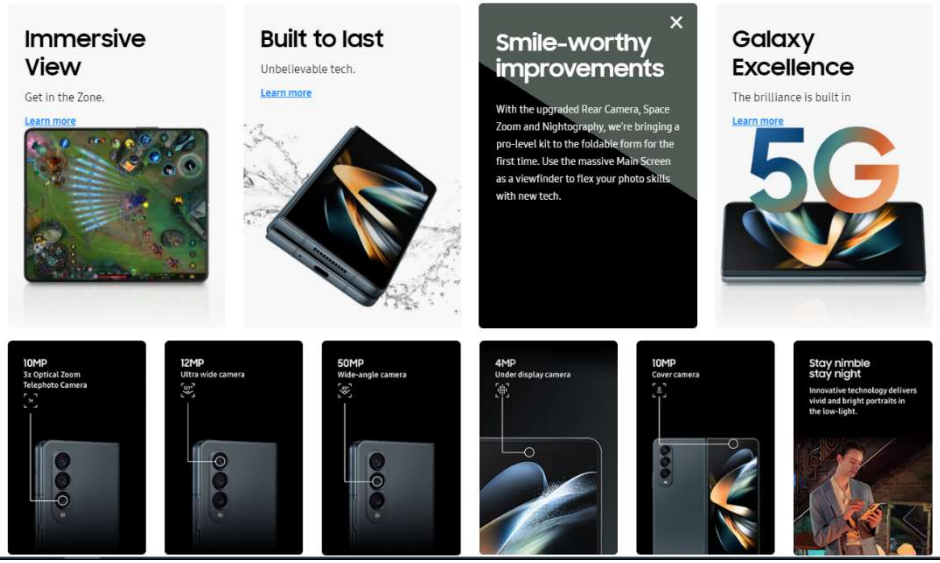
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include front and back cameras for recording video, a display for displaying video, and one or more processors (*e.g.*, a CPU, ISP, and/or DSP) with image and video processing capability. *See* https://www.samsung.com/us/support/answer/ANS00089063/.
[9.a] receiving video information and still picture information via an optical system by an imaging circuit of a video processing apparatus;	Each of the Accused Samsung '590 Products performs a method of receiving video information and still picture information via an optical system by an imaging circuit of a video processing apparatus. For example, each of the Accused Samsung '590 Products include a chipset that works in conjunction with a camera for receiving video information and still picture information from an optical system (*e.g.*, a camera that generates video and still pictures). 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Quad	200 MP, f/1.7, 24mm (wide), 1/1.3", 0.6µm, multi-directional PDAF, Laser AF, OIS
		10 MP, f/4.9, 230mm (periscope telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 10x optical zoom
		10 MP, f/2.4, 70mm (telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55", 1.4µm, Dual Pixel PDAF, Super Steady video
	Features	LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/240fps, 1080p@960fps, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), Dual Pixel PDAF
	Features	Dual video call, Auto-HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Triple	50 MP, f/1.8, 23mm (wide), 1.0µm, Dual Pixel PDAF, OIS
		10 MP, f/2.4, 66mm (telephoto), 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 123˚, 12mm (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	8K@24fps, 4K@60fps, 1080p@60/240fps (gyro-EIS), 720p@960fps (gyro-EIS), HDR10+
SELFIE CAMERA	Single	4 MP, f/1.8, 26mm (wide), 2.0µm, under display
		Cover camera:
		10 MP, f/2.2, 24mm (wide), 1/3", 1.22µm
	Features	HDR
	Video	4K@30/60fps, 1080p@30/60fps, gyro-EIS

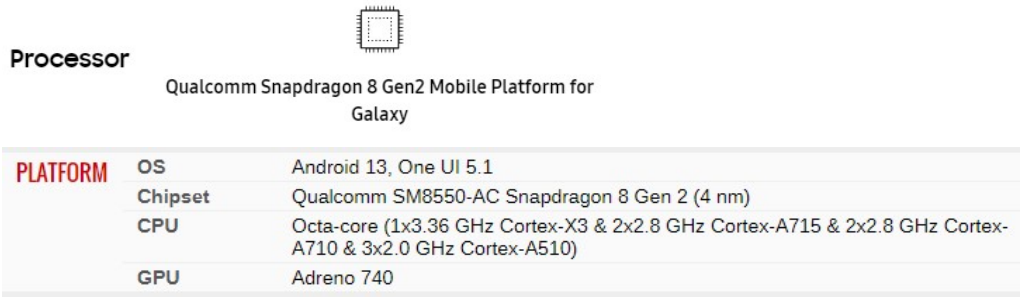
Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

MAIN CAMERA	Dual	12 MP, f/1.8, 24mm (wide), 1/1.76", 1.8µm, Dual Pixel PDAF, OIS
		12 MP, f/2.2, 123˚ (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	4K@30/60fps, 1080p@60/240fps, 720p@960fps, HDR10+
SELFIE CAMERA	Single	10 MP, f/2.4, 26mm (wide), 1.22µm
	Features	HDR
	Video	4K@30fps

Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Capture your Awesome moments with a multi-lens camera  MAIN CAMERA — Triple: 50 MP, f/1.8, (wide), 1/1.56", 1.0µm, PDAF, OIS; 12 MP, f/2.2, 123˚ (ultrawide), 1.12µm; 5 MP, f/2.4, (macro) MAIN CAMERA — Features: LED flash, panorama, HDR MAIN CAMERA — Video: 4K@30fps, 1080p@30/60fps, 720p@480fps SELFIE CAMERA — Single: 32 MP, f/2.2, 26mm (wide), 1/2.8", 0.8µm SELFIE CAMERA — Video: 4K@30fps, 1080p@30/60fps Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

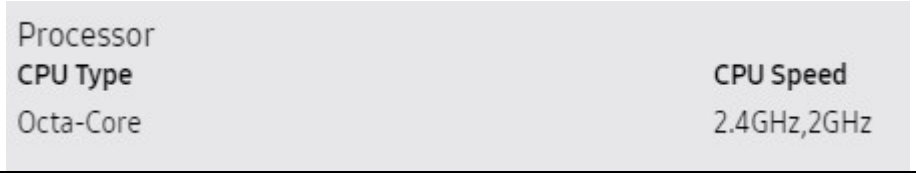
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



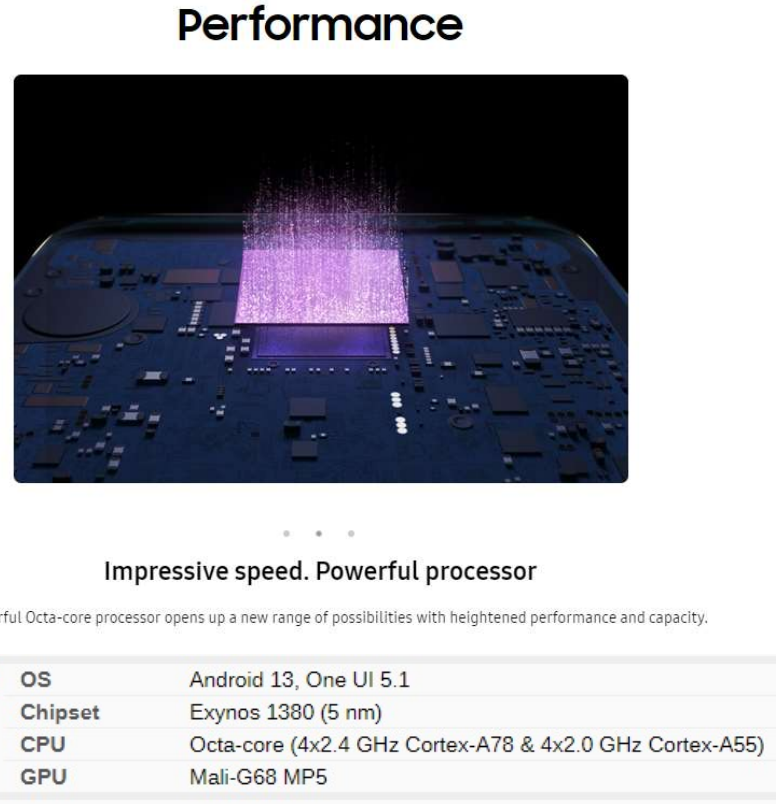
Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

In addition, the AIDA64 Reports show that each of the Accused Samsung '590 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (*e.g.*, CPU, ISP, or DSP) processes video.

Product	AIDA 64 Report- Camera

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy S23 Ultra	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 6.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 3.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 2.20 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy Z Fold4	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.40 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
		Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.30 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.74 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy Z Flip4	<< Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 5.00 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.17 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.70 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy A54 5G	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.54 mm Focus Modes: infinity, auto, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 8.0 MP (3264 × 2448) Focal Length: 3.72 mm

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

<< Rear-Facing Camera >>
Resolution: 12 MP (4000 × 3000)
Focal Length: 1.74 mm
Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

<< Front-Facing Camera >>
Resolution: 5.7 MP (2880 × 1980)
Focal Length: 3.72 mm
Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

The AIDA64 Reports and tech specs show that the Accused Samsung '590 Products contain one or more processors.

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

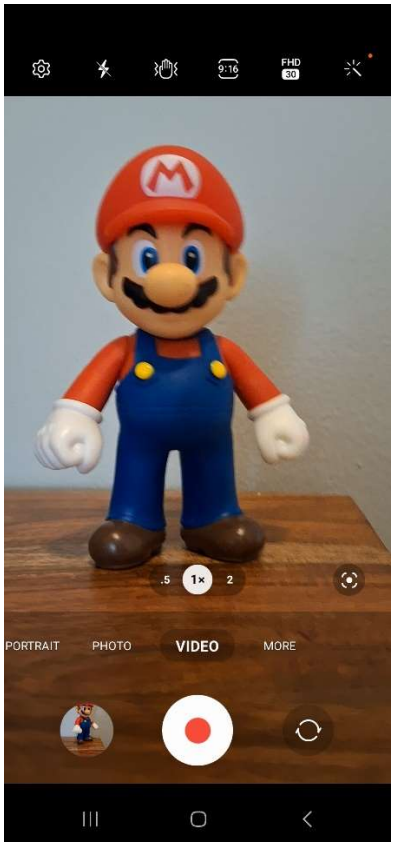
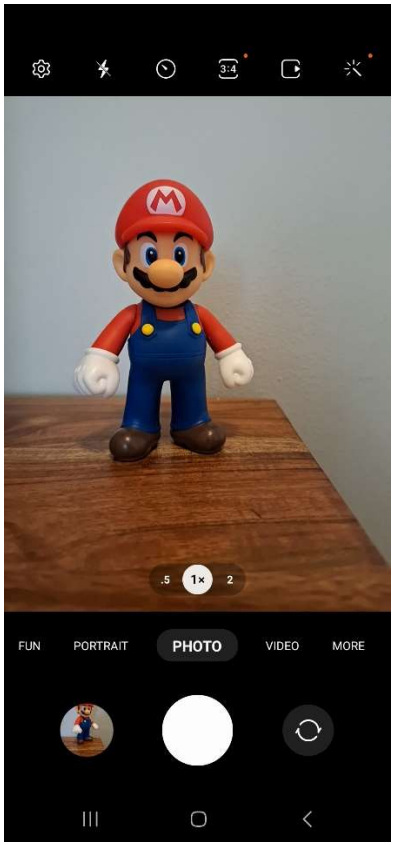
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

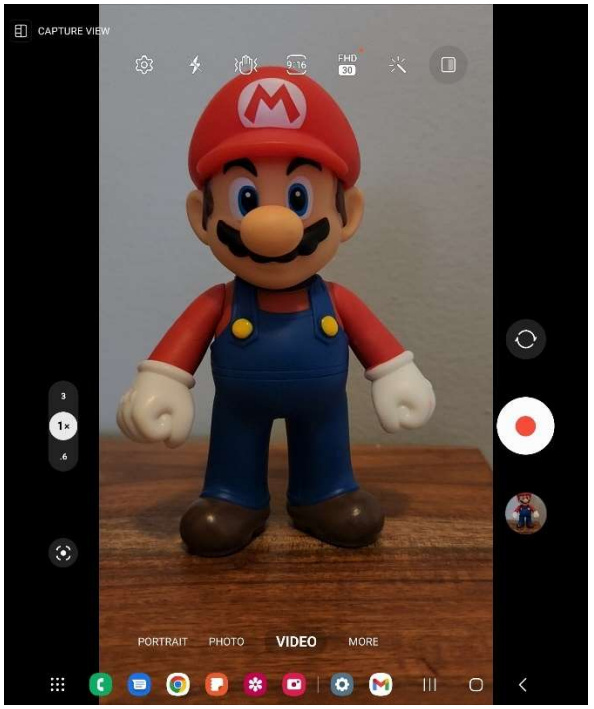
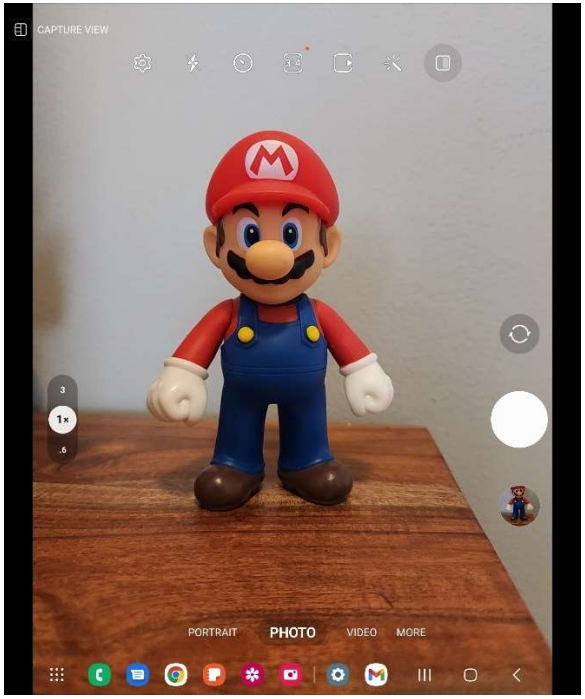
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show exemplary Accused Samsung '590 Products recording video and taking video and still pictures:

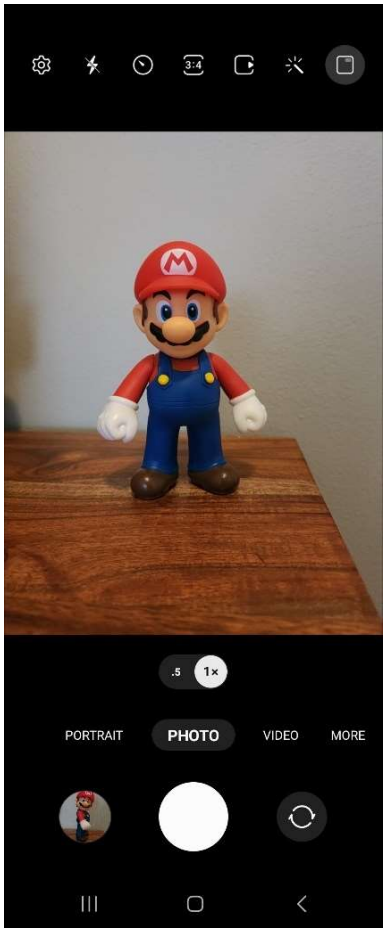
Camera Recording Video (Samsung Galaxy S23 Ultra)	Camera Taking Still Picture (Samsung Galaxy S23 Ultra)





U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy A54 G)	Camera Taking Still Picture (Samsung Galaxy A54G)
		

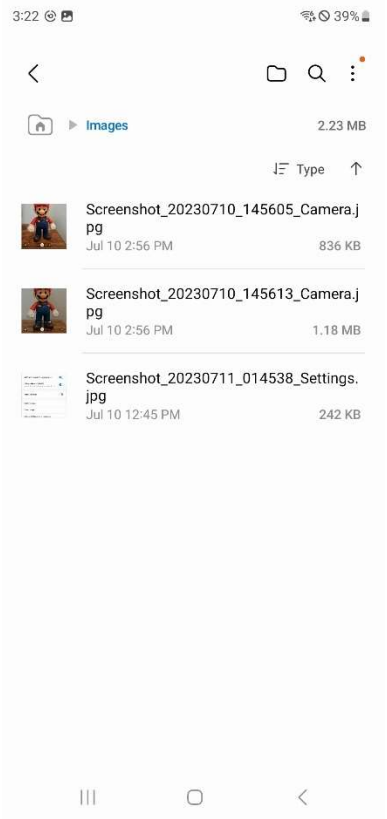
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy Z Fold4)	Camera Taking Still Picture (Samsung Galaxy Z Fold4)
		

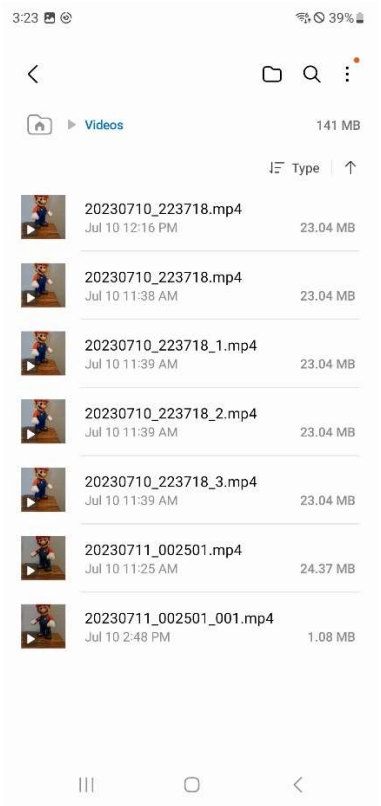
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy Z Flip4)	Camera Taking Still Picture (Samsung Galaxy Z Flip4)
		
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include front and back cameras for recording video and still pictures. *See*	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS00089063/; *see also* https://www.samsung.com/us/support/answer/ANS00079026/.
[9.b] compressing the still picture information using a first type of compression method and the video information using a second type of compression method;	Each of the Accused Samsung '590 Products performs a method of compressing the still picture information using a first type of compression method and the video information using a second type of compression method. For example, each of the Accused Samsung '590 Products includes a compression circuit compressing the still picture information via at least the JPEG standard compression scheme and the video information via at least the MPEG-4 compression scheme. For example, the following screenshots show exemplary Accused Samsung '590 Products using a compression circuit compressing the still picture information via at least the JPEG standard compression scheme and the video information via at least the MPEG-4 compression scheme:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

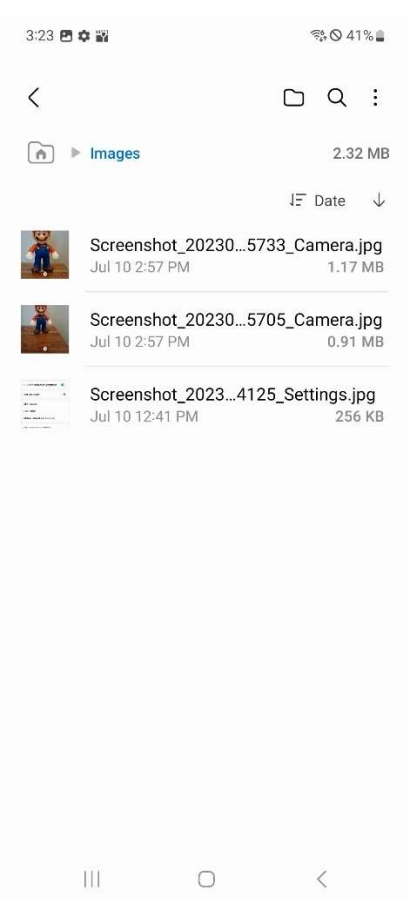
Still picture information using a ".jpg" file extension (Samsung Galaxy S23 Ultra)	Video information using a ".mp4" file extension (Samsung Galaxy S23 Ultra)

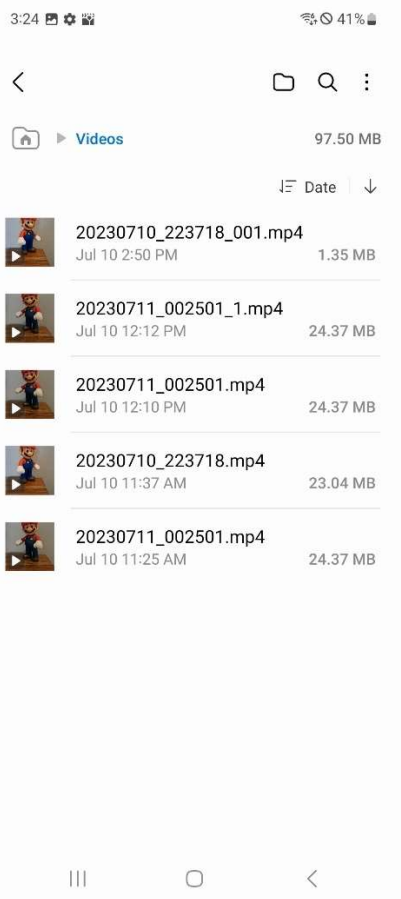


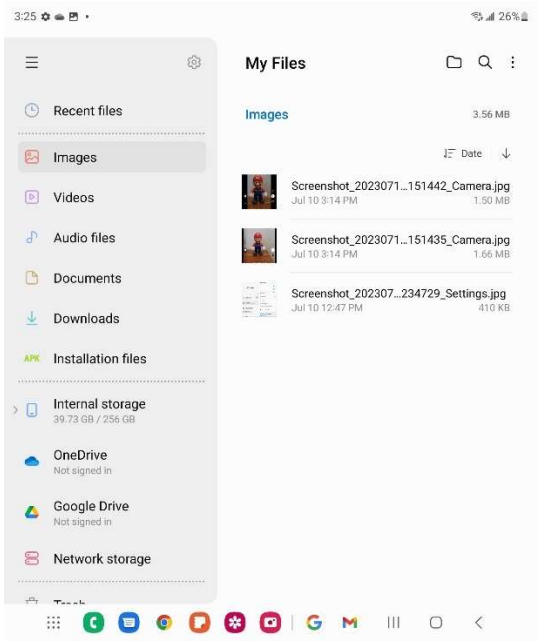
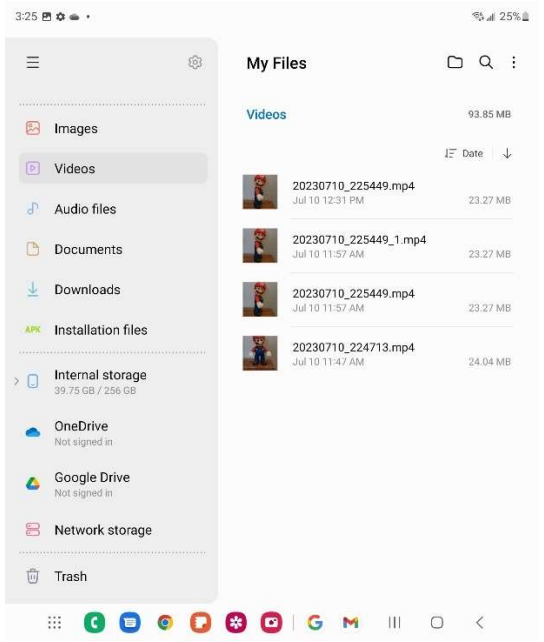


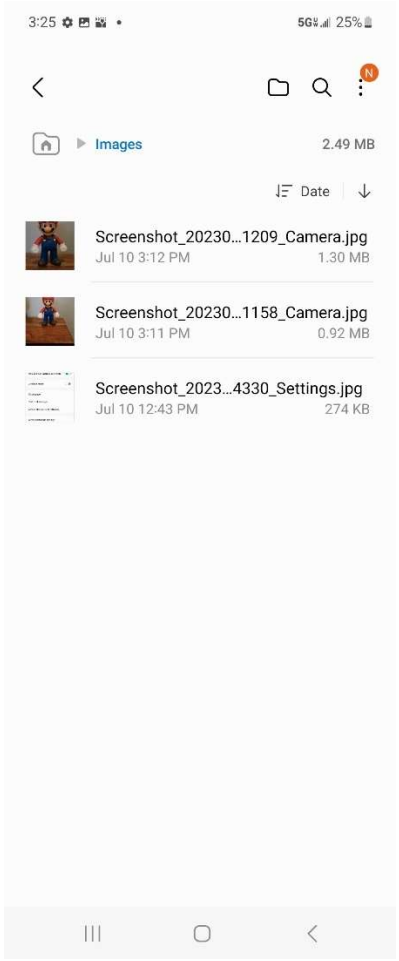
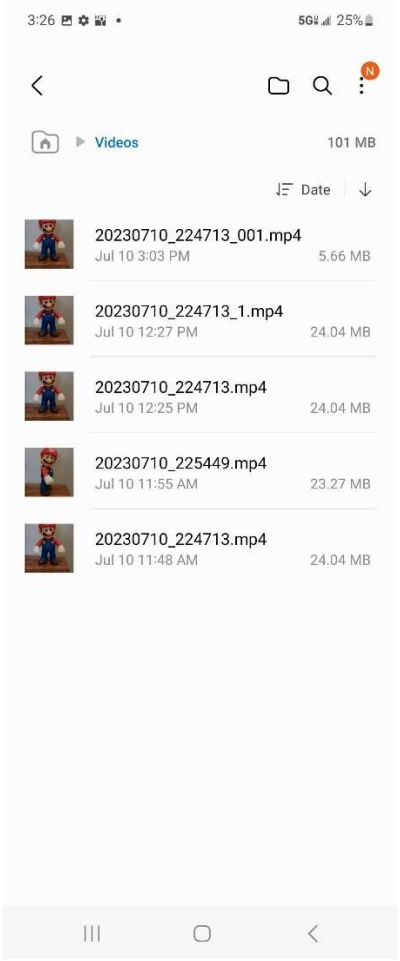
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

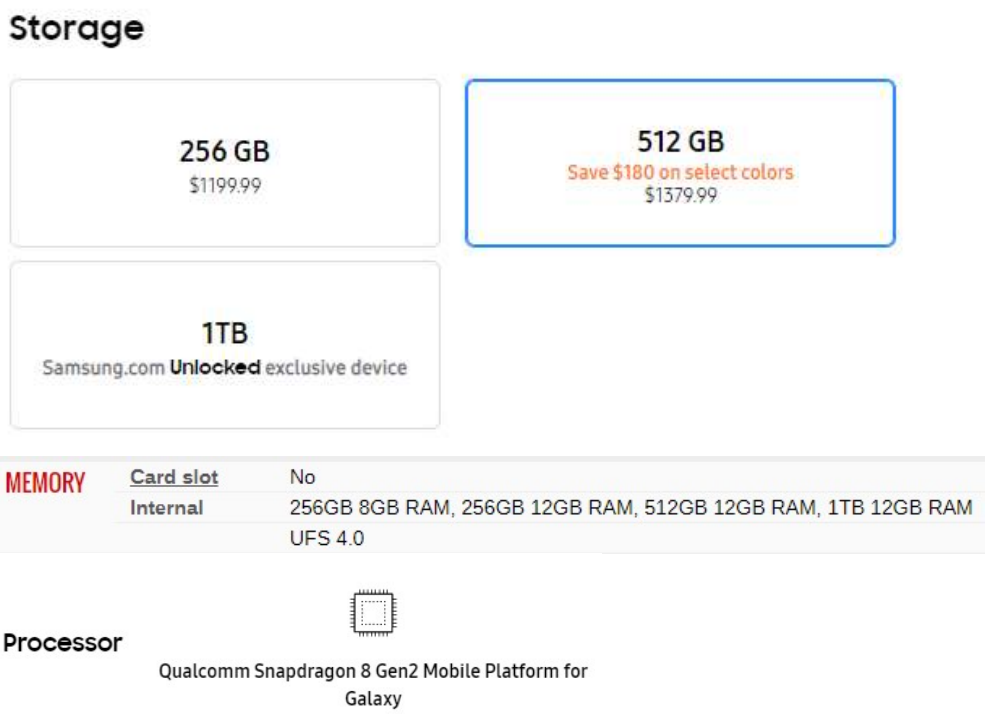
Still picture information using a ".jpg" file extension (Samsung Galaxy A54 5G)	Video information using a ".mp4" file extension (Samsung Galaxy A54 5G)





U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Still picture information using a ".jpg" file extension (Samsung Galaxy ZFlip 4)	Video information using a ".mp4" file extension (Samsung Galaxy ZFlip 4)
		

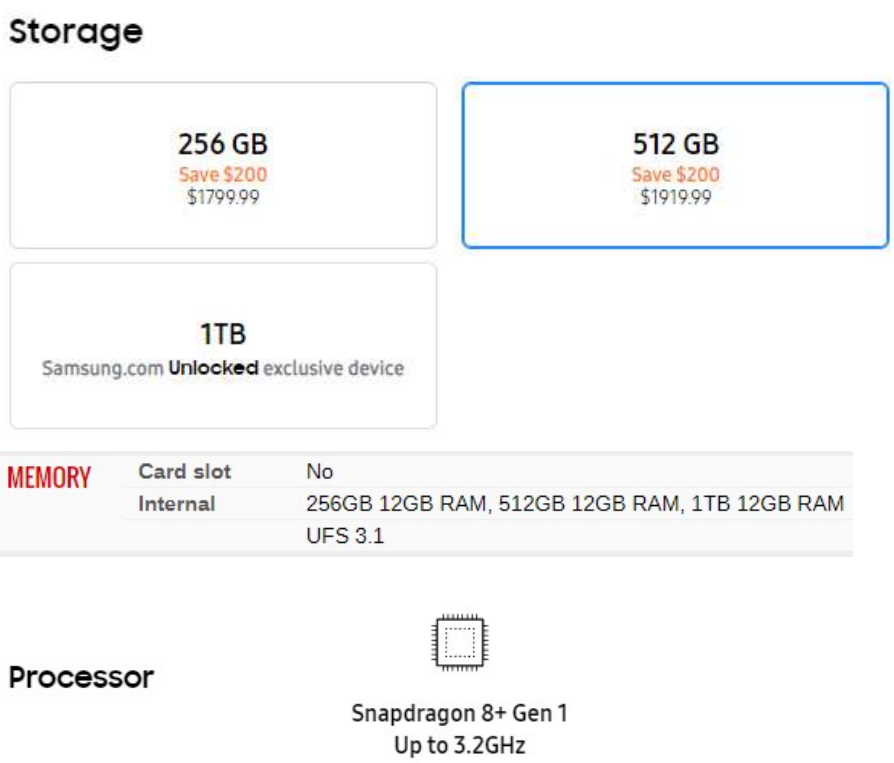
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Still picture information using a ".jpg" file extension (Samsung Galaxy ZFold 4)	Video information using a ".mp4" file extension (Samsung Galaxy ZFold 4)
		

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include similar compressions circuit.
[9.c] accumulating video information received by the imaging circuit after the video information is compressed by the compression circuit;	Each of the Accused Samsung '590 Products performs a method of accumulating video information received by the imaging circuit after the video information is compressed by the compression circuit. For example, each of the Accused Samsung '590 Products includes a processor together with local storage that comprise an accumulation circuit capable of accumulating video information received by the imaging circuit after the video information is compressed by the compression circuit. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

PLATFORM	OS	Android 13, One UI 5.1
	Chipset	Qualcomm SM8550-AC Snapdragon 8 Gen 2 (4 nm)
	CPU	Octa-core (1x3.36 GHz Cortex-X3 & 2x2.8 GHz Cortex-A715 & 2x2.8 GHz Cortex-A710 & 3x2.0 GHz Cortex-A510)
	GPU	Adreno 740

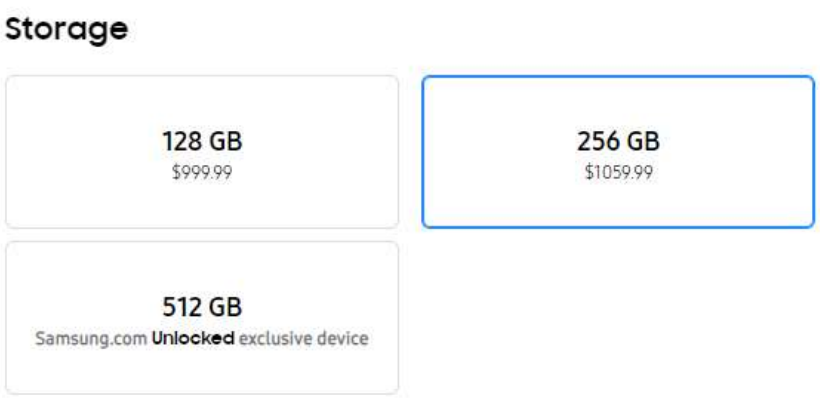
Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

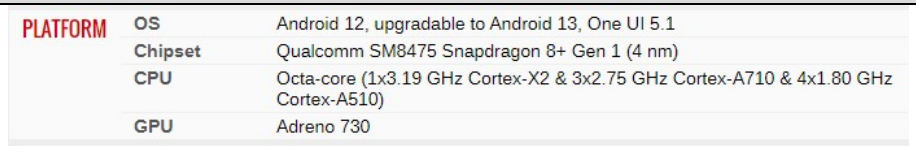
PLATFORM		
	OS	Android 12L, upgradable to Android 13, One UI 5.1
	Chipset	Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm)
	CPU	Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510)
	GPU	Adreno 730

Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

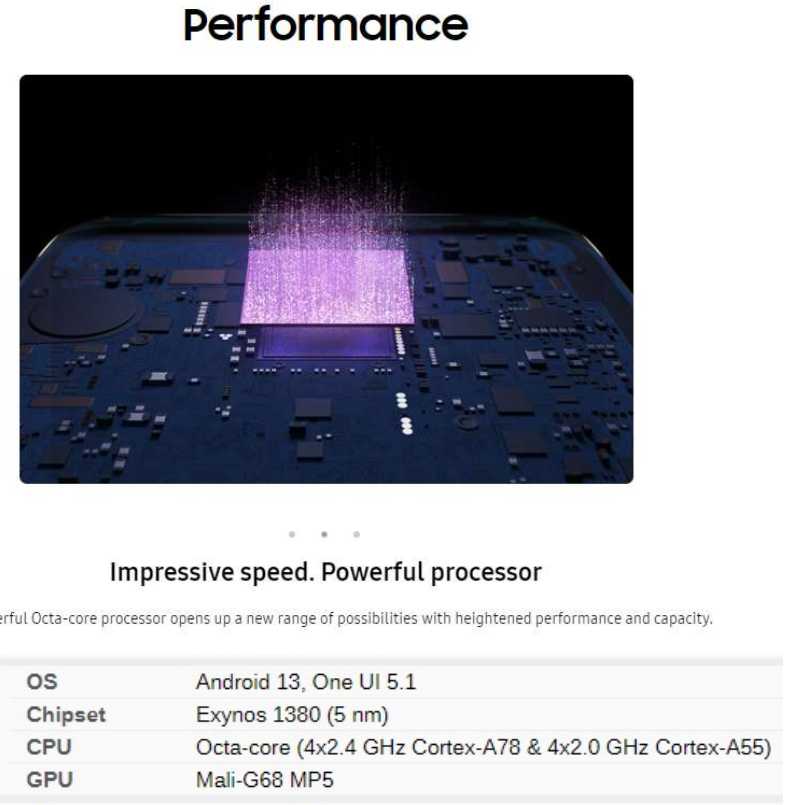


MEMORY		
	Card slot	No
	Internal	128GB 8GB RAM, 256GB 8GB RAM, 512GB 8GB RAM
		UFS 3.1



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

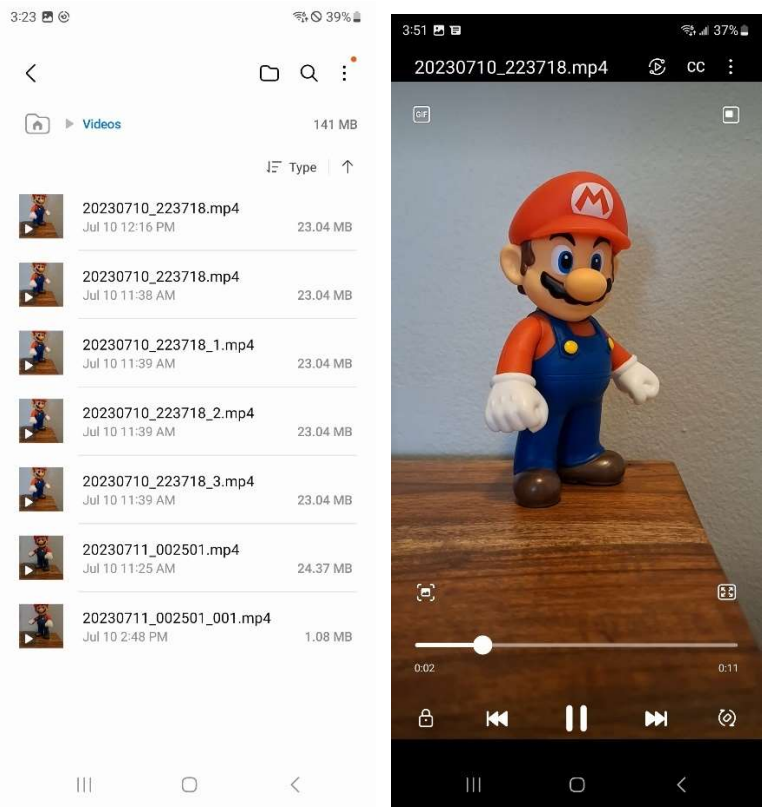


Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

For example, the following screenshots show exemplary Accused Samsung '590 Products using an accumulation circuit capable of accumulating video information received by the imaging circuit after the video information is compressed by the compression circuit:

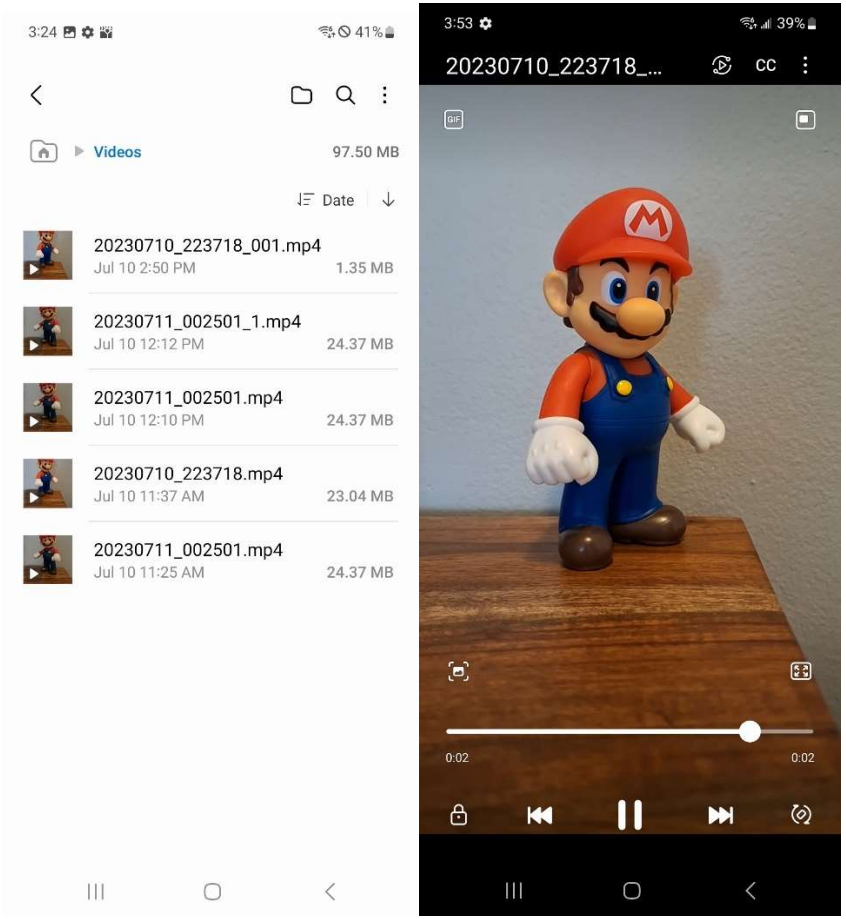
Video storage (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



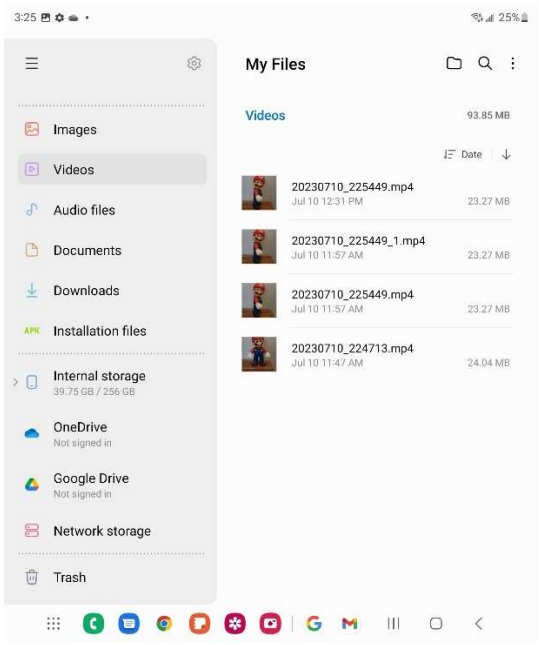
Video storage (Samsung GalaxyA54 5G)

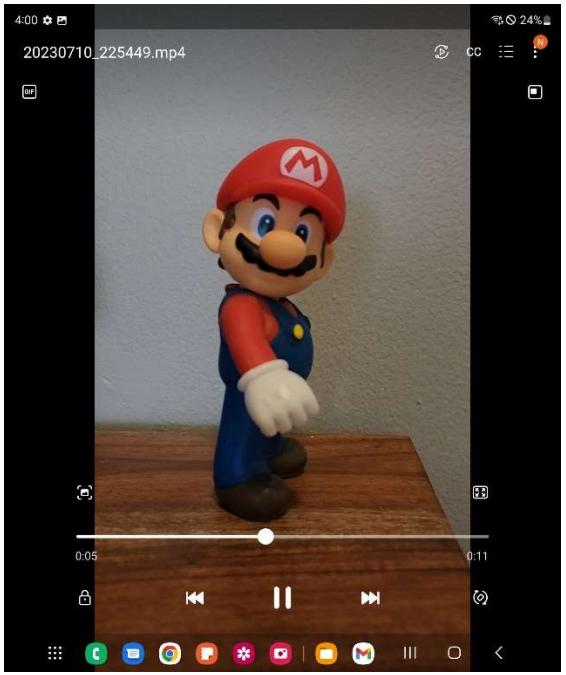
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



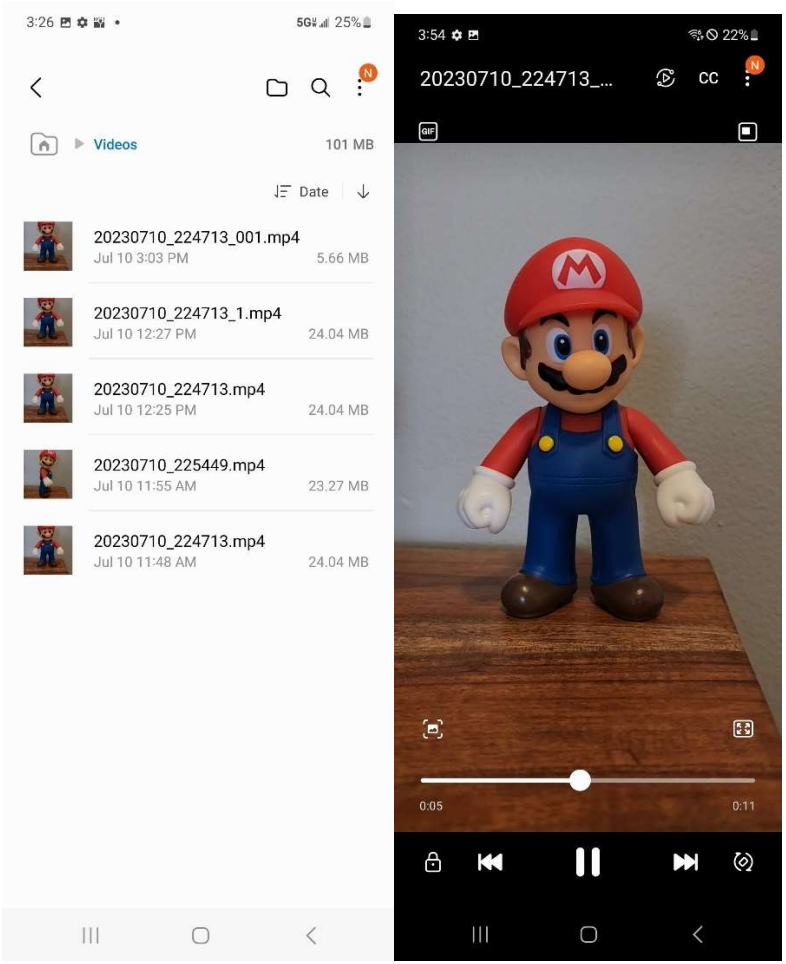
Video storage (Samsung GalaxyZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement





Video storage (Samsung GalaxyZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products perform similar accumulation (e.g., memory). *See* https://www.samsung.com/us/support/answer/ANS00079026/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[9.d] implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band; [9.e] transmitting, using the first transmission frequency band, the video information to an external device by radio, via a first radio communication circuit;	Each of the Accused Samsung '590 Products performs a method of implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, and transmitting, using the first transmission frequency band, the video information to an external device by radio, via a first radio communication circuit. **First Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the Wi-Fi communication chip capable of transmitting video information via Wi-Fi communications (e.g., Quick Share) using the first transmission frequency band.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

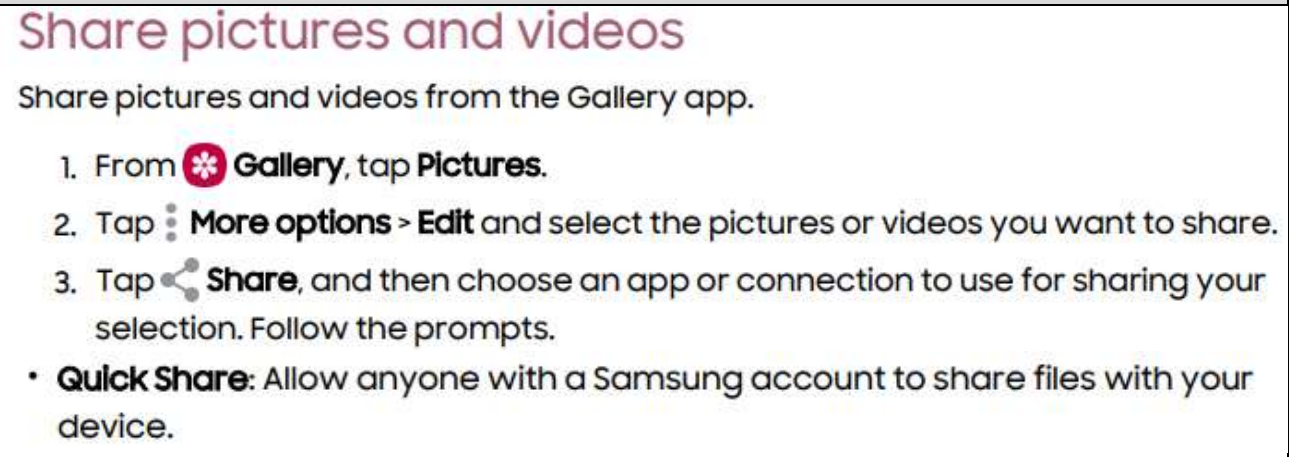
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	# Sharing content Share content by using various sharing options. The following actions are an example of sharing images. 1 Open the **Gallery** app and select an image. 2 Tap and select a sharing method you want. You may incur additional charges when sharing files through the mobile network. ## Quick Share ### Sharing content with nearby devices Share content with nearby devices through Wi-Fi Direct or Bluetooth, or with some SmartThings supported devices. 1 Open the **Gallery** app and select an image. 2 On the other device, open the notification panel, swipe downwards, and then tap (**Quick Share**) to turn it on. If you cannot find (**Quick Share**) on the quick panel, tap and drag the button over to add it.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3 Tap → **Quick Share** and select a device to receive the image. 4 Accept the file transfer request on the other device. This feature does not support sharing videos with TVs or SmartThings supported devices. To watch videos on TV, use the Smart View feature. **Setting who can find your phone** Set who is allowed to find and send content to your phone. 1 Open the notification panel, swipe downwards, and then tap (**Quick Share**). 2 Select an option. • **No one**: Do not allow others to find your phone. • **Contacts only**: Only allow Samsung users in your contacts to share with your phone. • **Anyone nearby**: Allow any nearby devices to share with your phone. **Sharing through Web link** Upload large files to the Samsung storage server and share them with others through Web link. 1 Open the **Gallery** app and select an image. 2 Tap → **Quick Share** and select an option you want under **Share to any device**. • **Copy link**: Share the link copied to the clipboard. • **Share link using app**: Share the link by selecting an app. • **Share using QR code**: Share the link with the created QR code. Galaxy S23 Series User Guide at pg. 111-112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

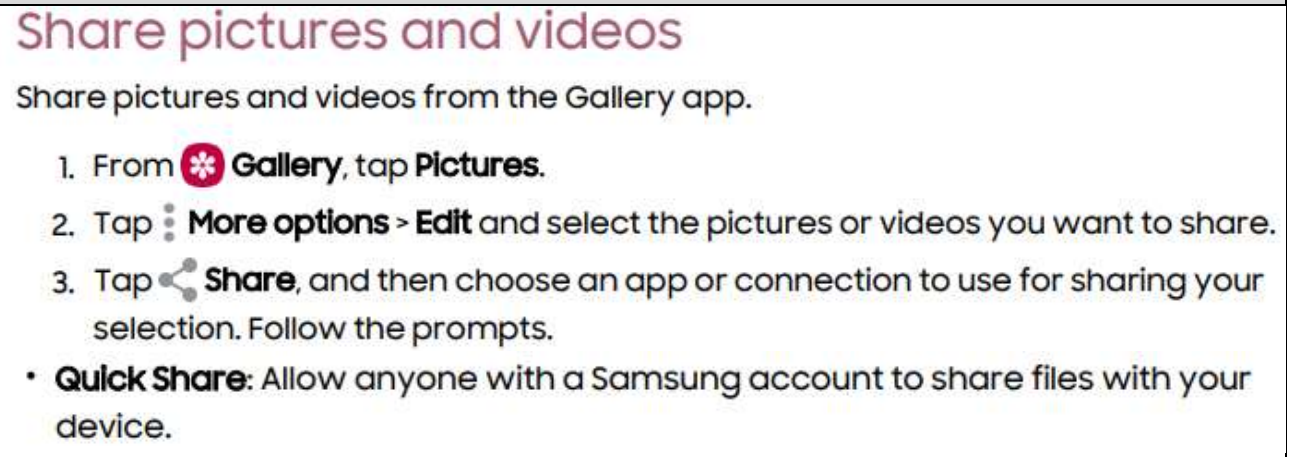
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
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UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
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LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
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NR Band n12	Voice/Data	701.5 - 713.5 MHz
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NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
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NR Band n38	Voice/Data	2575 - 2615 MHz
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NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
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U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
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NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

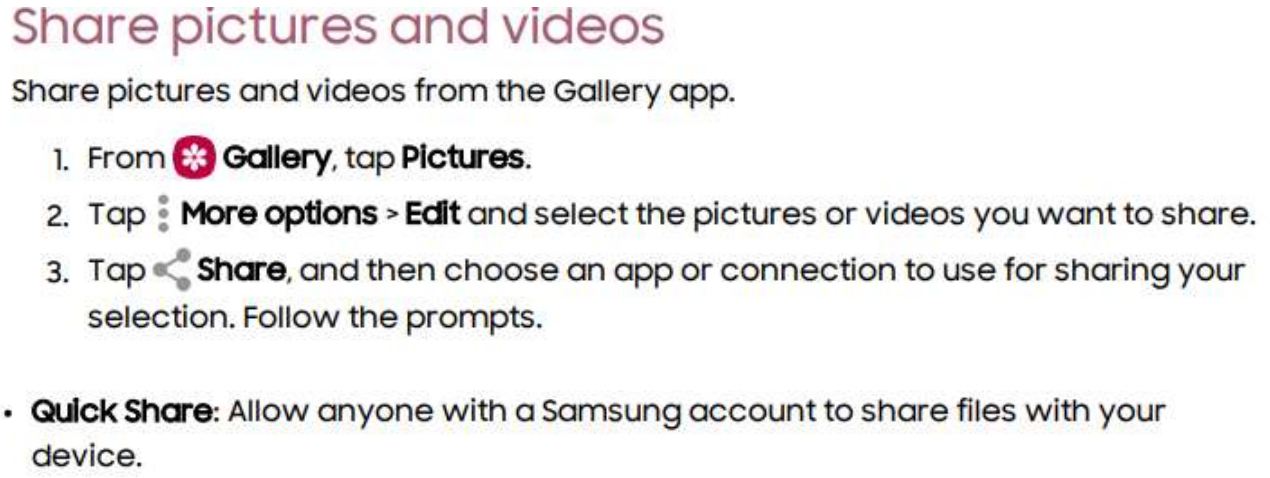
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
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UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
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LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
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LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
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U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
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NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
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UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes (market/region dependent) Radio: No USB: USB Type-C 2.0, OTG Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 49, 112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

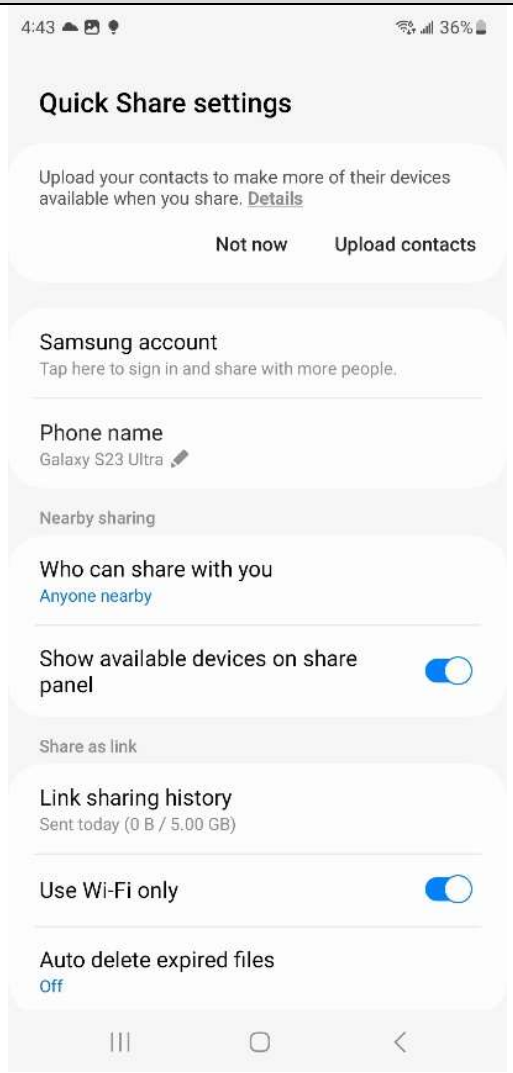
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

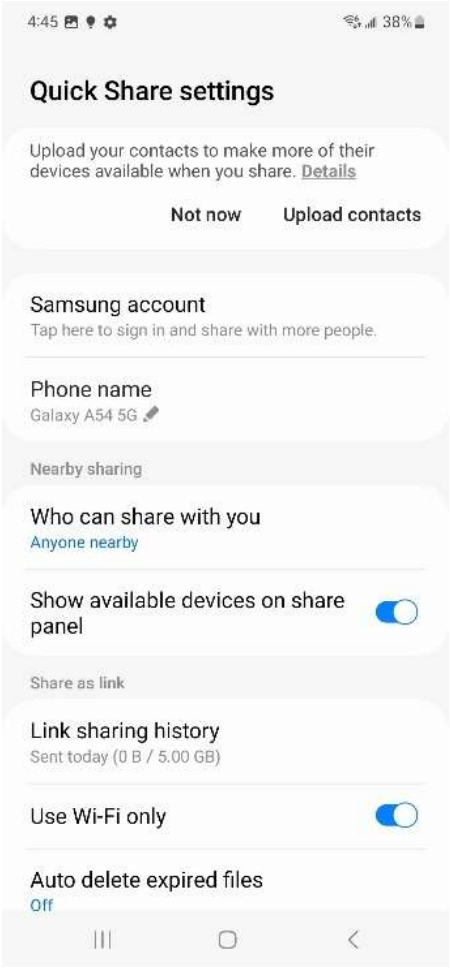
	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

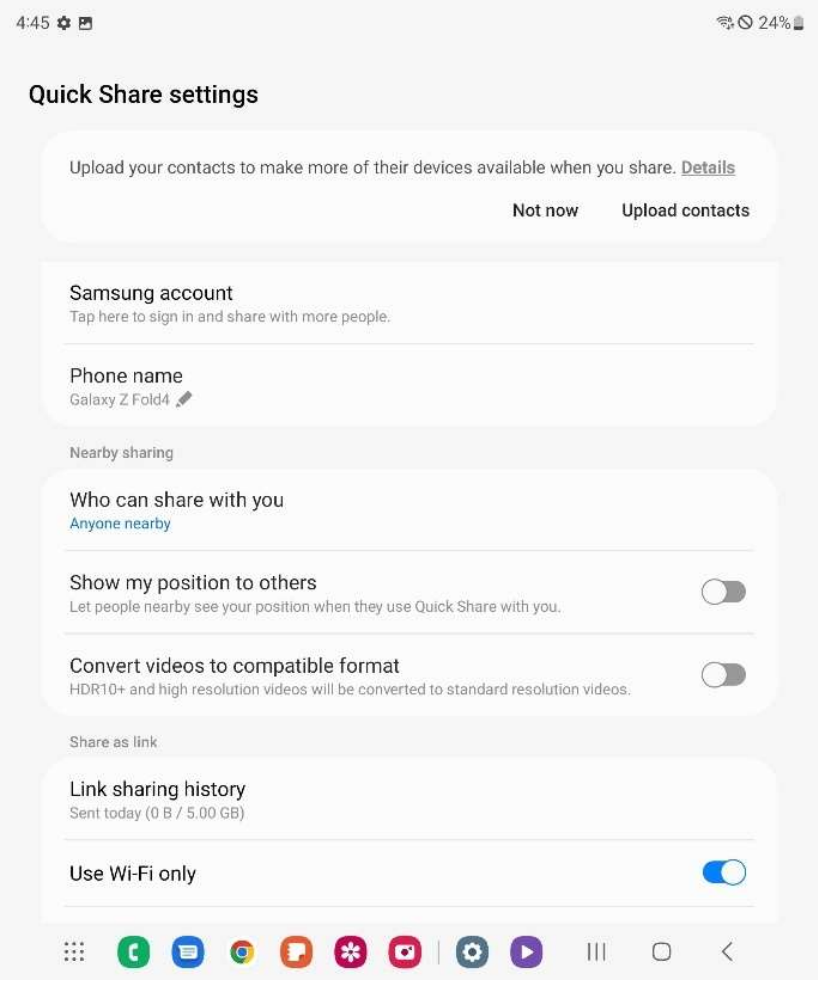
See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

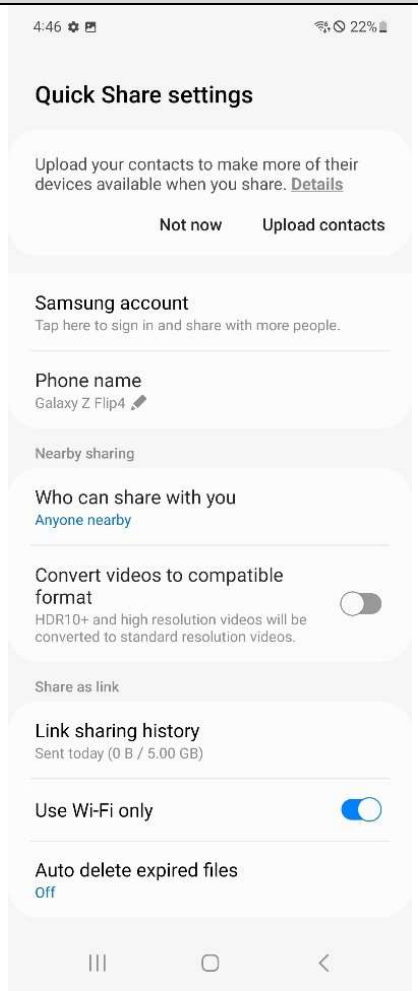
For example, the following screenshots show exemplary Accused Samsung '590 Products using a Wi-Fi communication chip to transmit video information by using Quick Share app:

Samsung Galaxy 23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

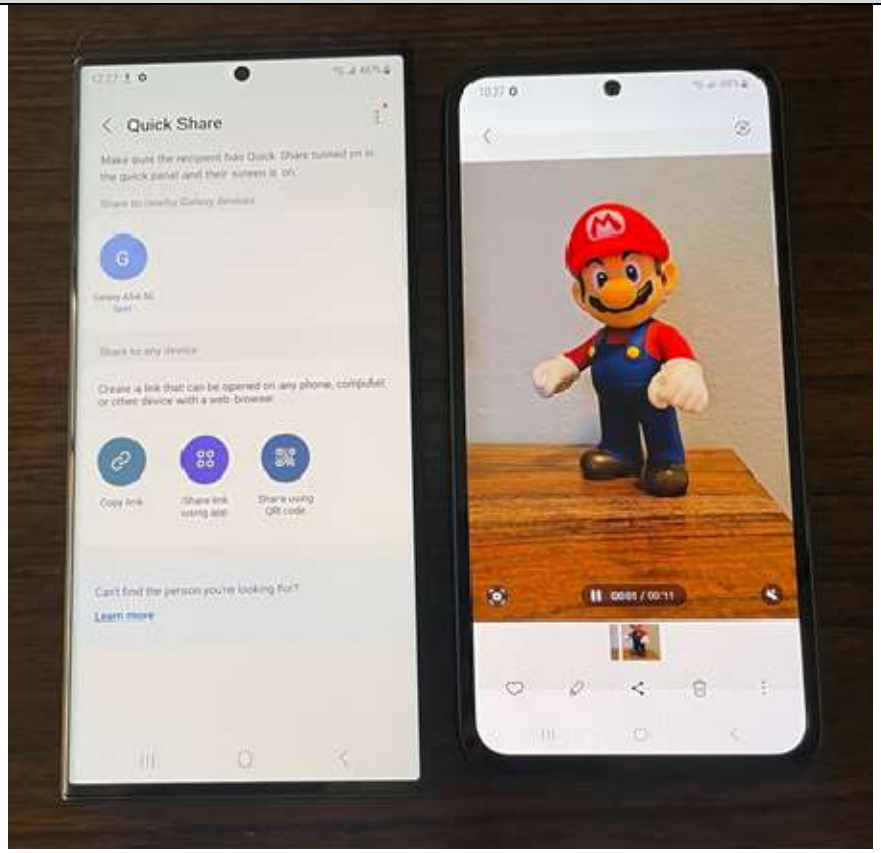
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

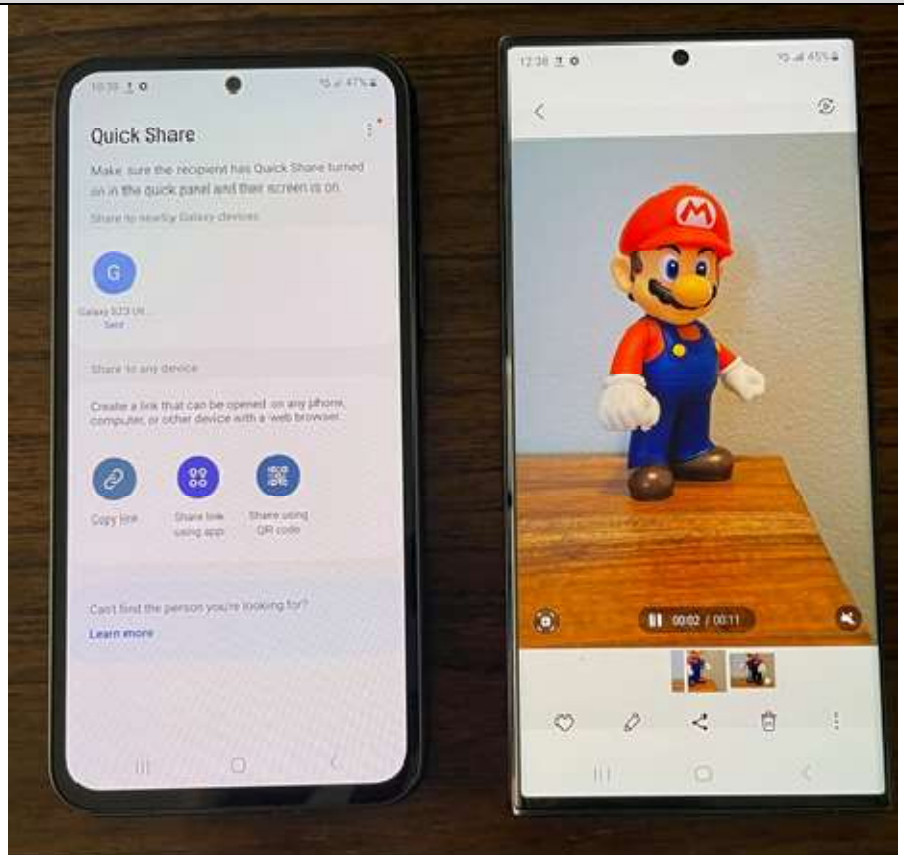
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

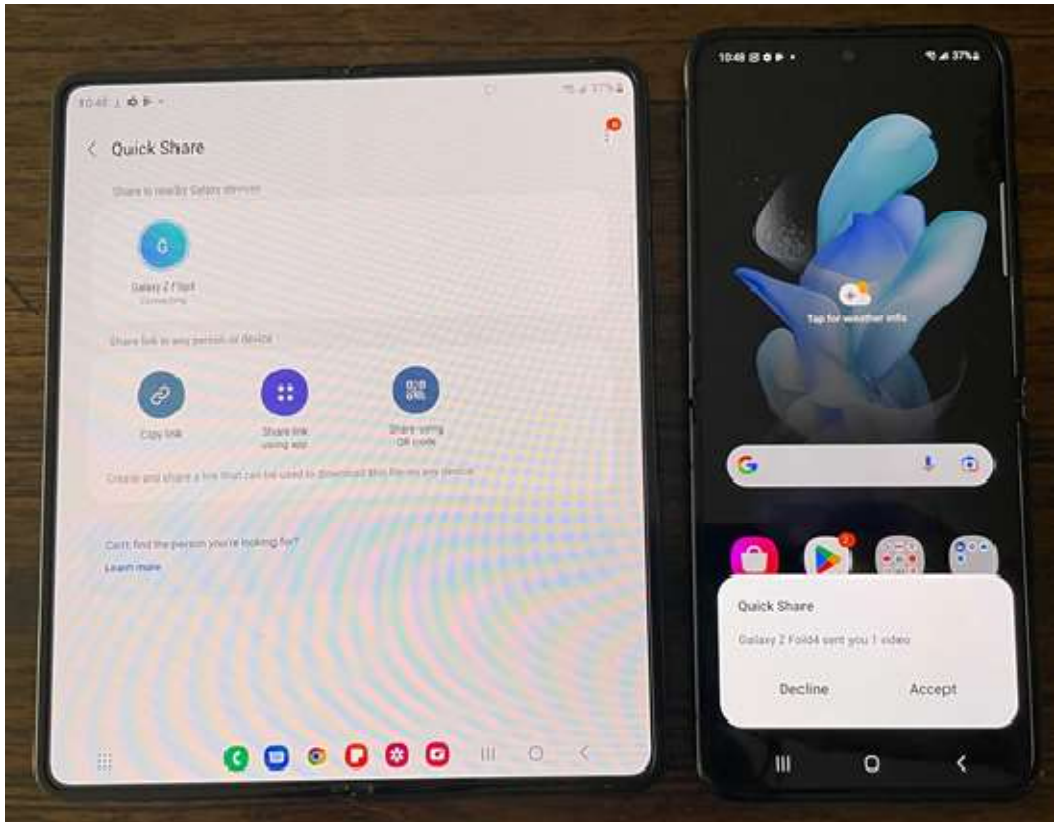
	

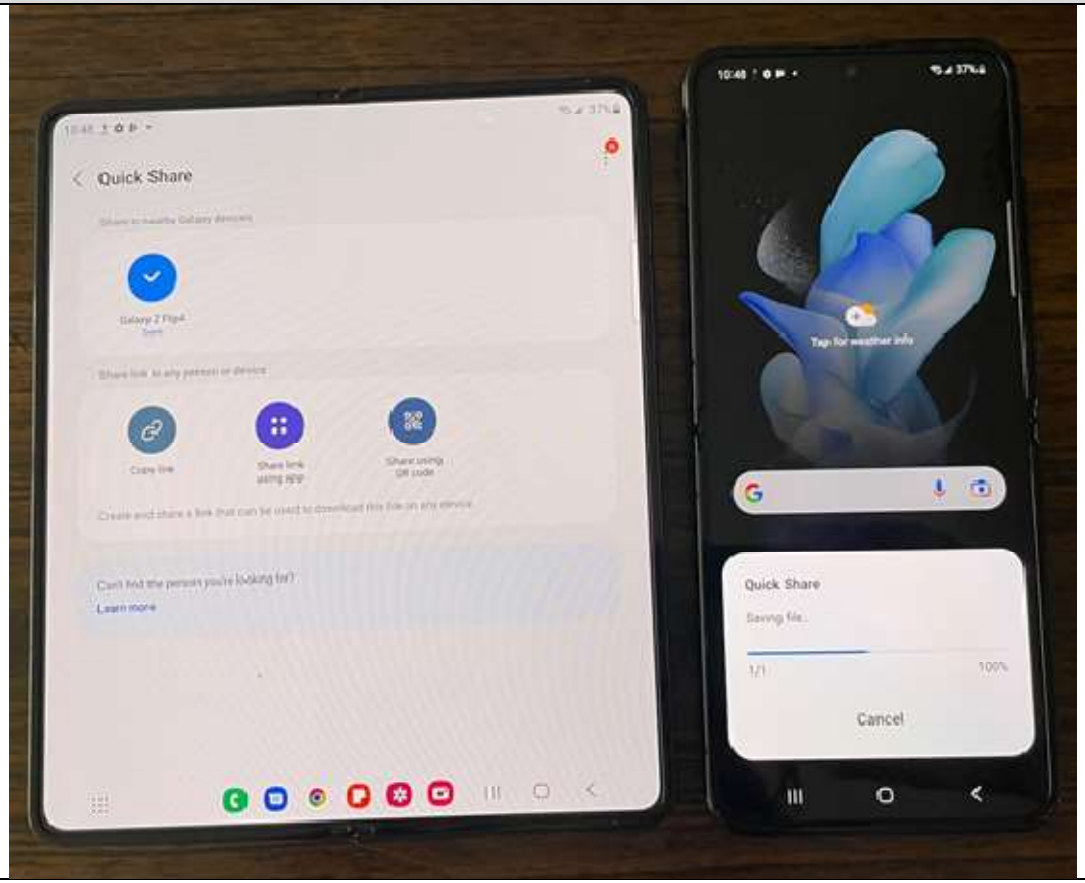

1 item
Galaxy Store
Play Store
Google
Microsoft

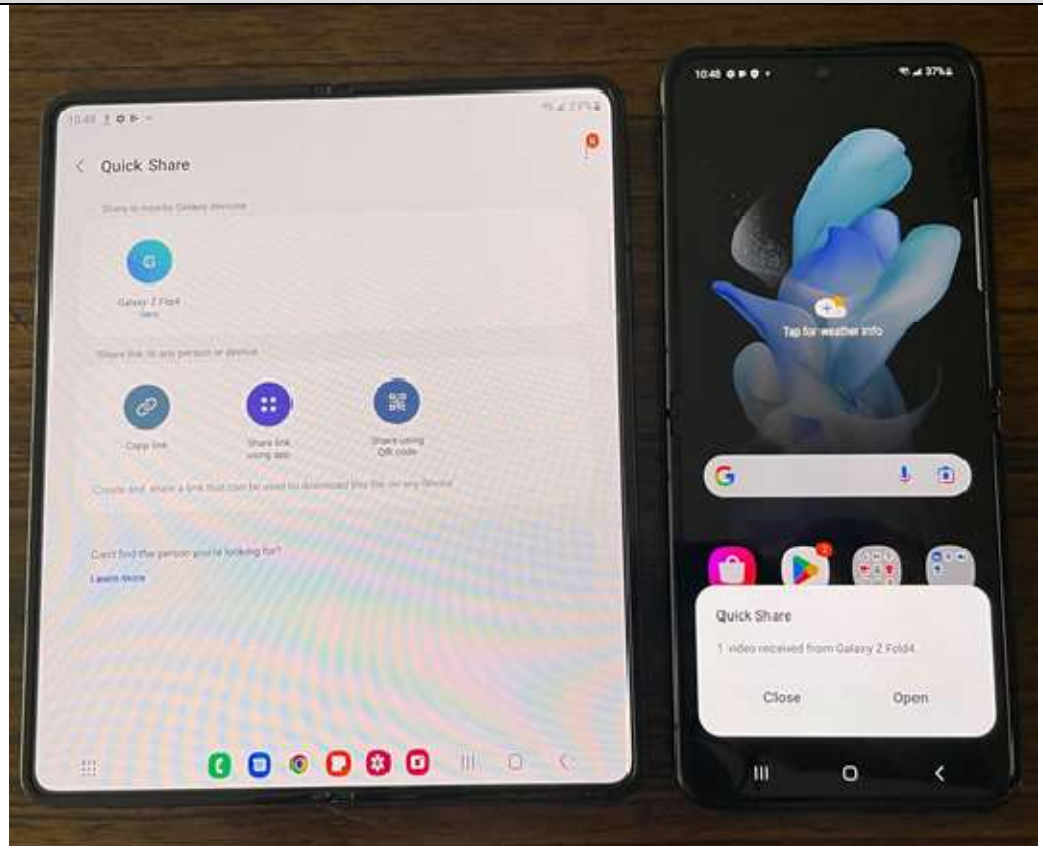
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

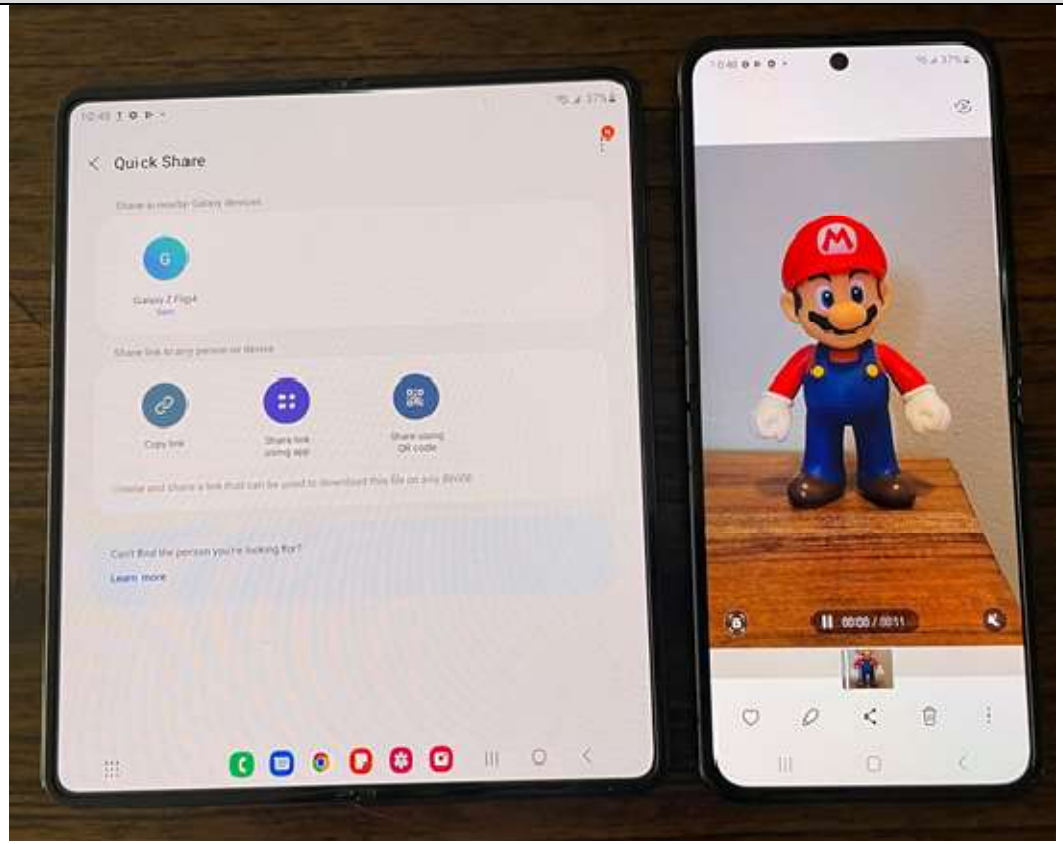
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



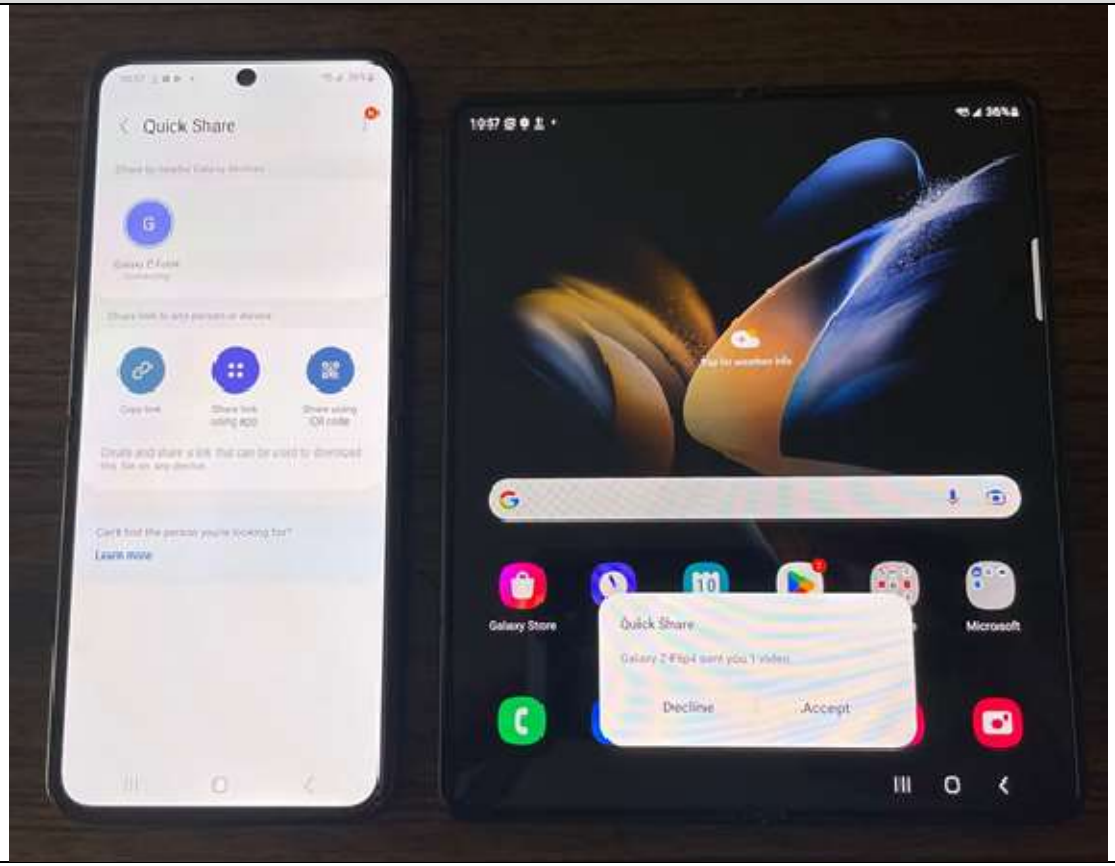
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

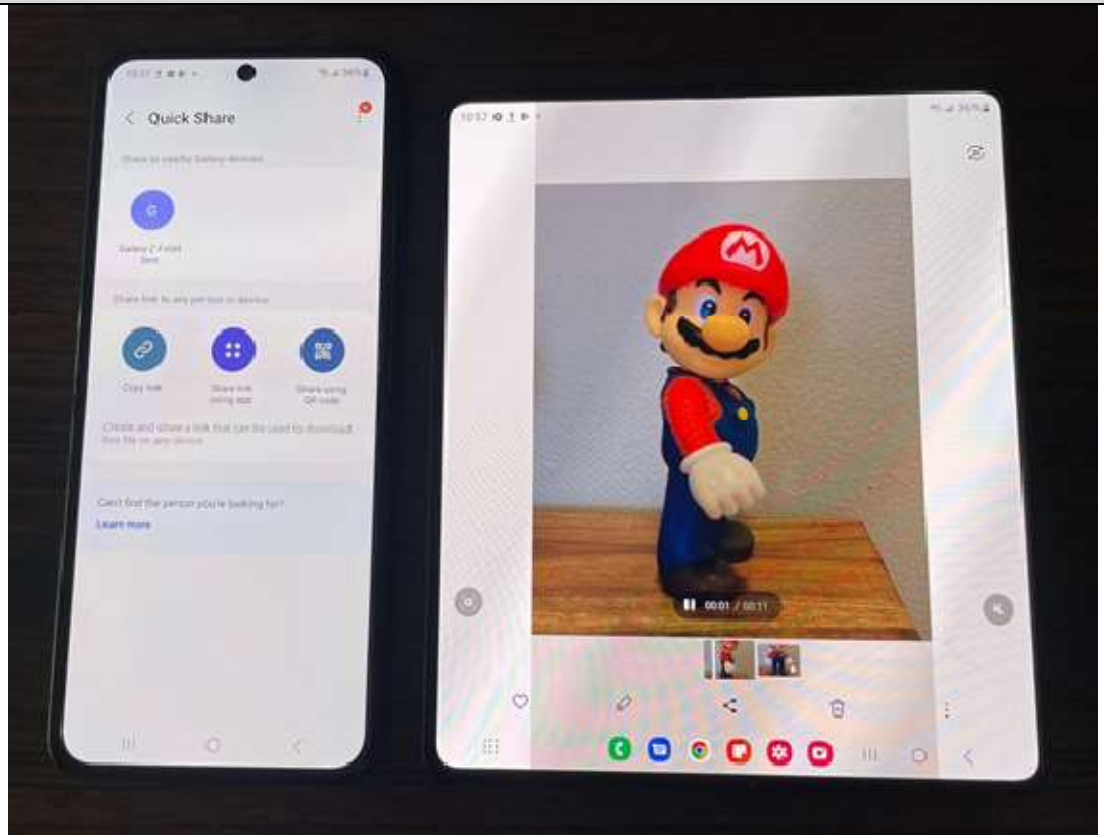
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Quick Share Galaxy Store Microsoft Quick Share Close Open

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Wi-Fi communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/. **Second Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip implementing a first transmission scheme having a first modulation scheme and a first

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	transmission frequency band, the Bluetooth communication chip capable of transmitting video information via Bluetooth communications using the first transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php. Bluetooth Use Bluetooth to exchange data or media files with other Bluetooth-enabled devices. Precautions for using Bluetooth • Samsung is not responsible for the loss, interception, or misuse of data sent or received through Bluetooth. • Always ensure that you share and receive data with devices that are trusted and properly secured. If there are obstacles between the devices, the operating distance may be reduced. • Some devices, especially those that are not tested or approved by the Bluetooth SIG, may be incompatible with your device. • Do not use the Bluetooth feature for illegal purposes (for example, pirating copies of files or illegally tapping communications for commercial purposes). Samsung is not responsible for the repercussion of illegal use of the Bluetooth feature.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Pairing with other Bluetooth devices 1 On the Settings screen, tap **Connections** → **Bluetooth** and tap the switch to turn it on. The detected devices will be listed. 2 Select a device to pair with. If the device you want to pair with is not on the list, set the device to enter Bluetooth pairing mode. Refer to the other device's user manuals. Your phone is visible to other devices while the Bluetooth settings screen is open. 3 Accept the Bluetooth connection request on your phone to confirm. The devices will be connected when the other device accepts the Bluetooth connection request. To unpair the devices, tap next to the device name to unpair and tap **Unpair**. **Sending and receiving data** Many apps support data transfer through Bluetooth. You can share data, such as contacts or media files, with other Bluetooth devices. The following actions are an example of sending an image to another device. 1 Open the **Gallery** app and select an image. 2 Tap → **Bluetooth** and select a device to receive the image. If the device you want to pair with is not in the list, turn on its visibility option. 3 Accept the Bluetooth connection request on the other device. Galaxy S23 Series User Guide at pg. 124-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

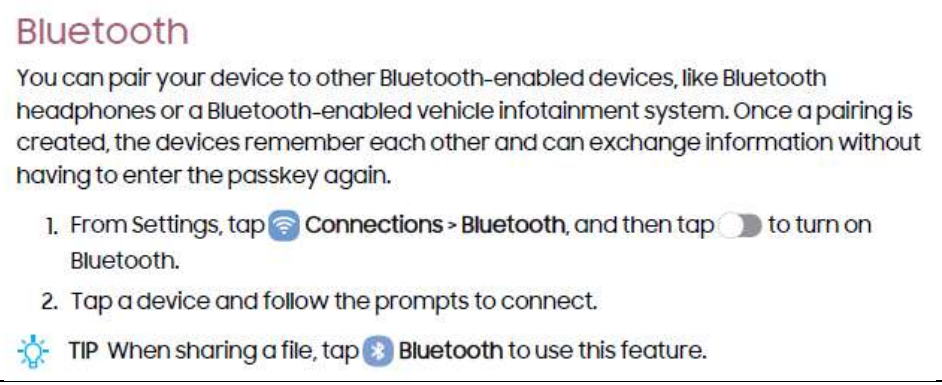
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power [dBm]	Avg Conducted Power [mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power [dBm]	Peak Conducted Power [mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. TIP When sharing a file, tap Bluetooth to use this feature.

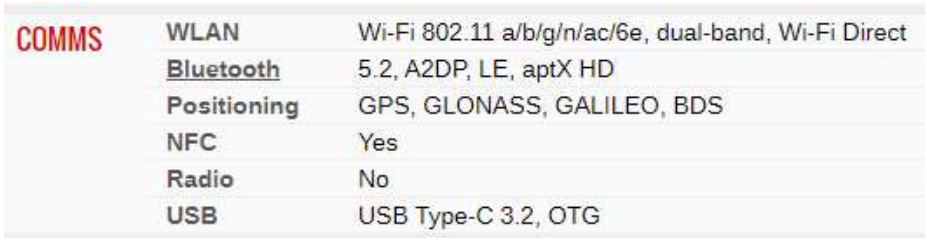
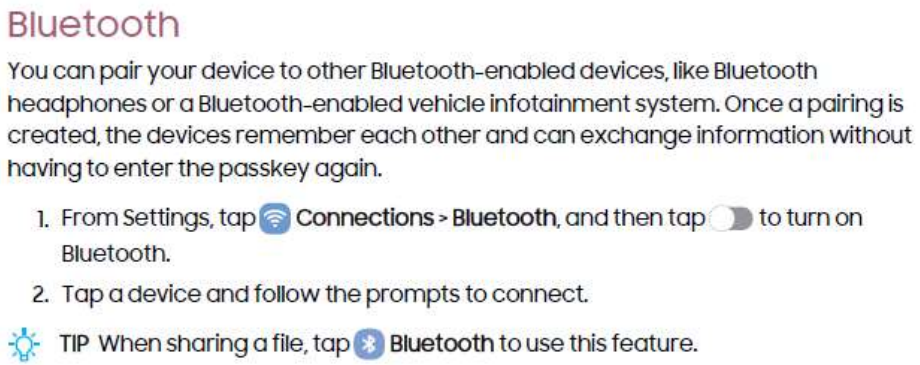
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
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GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
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NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

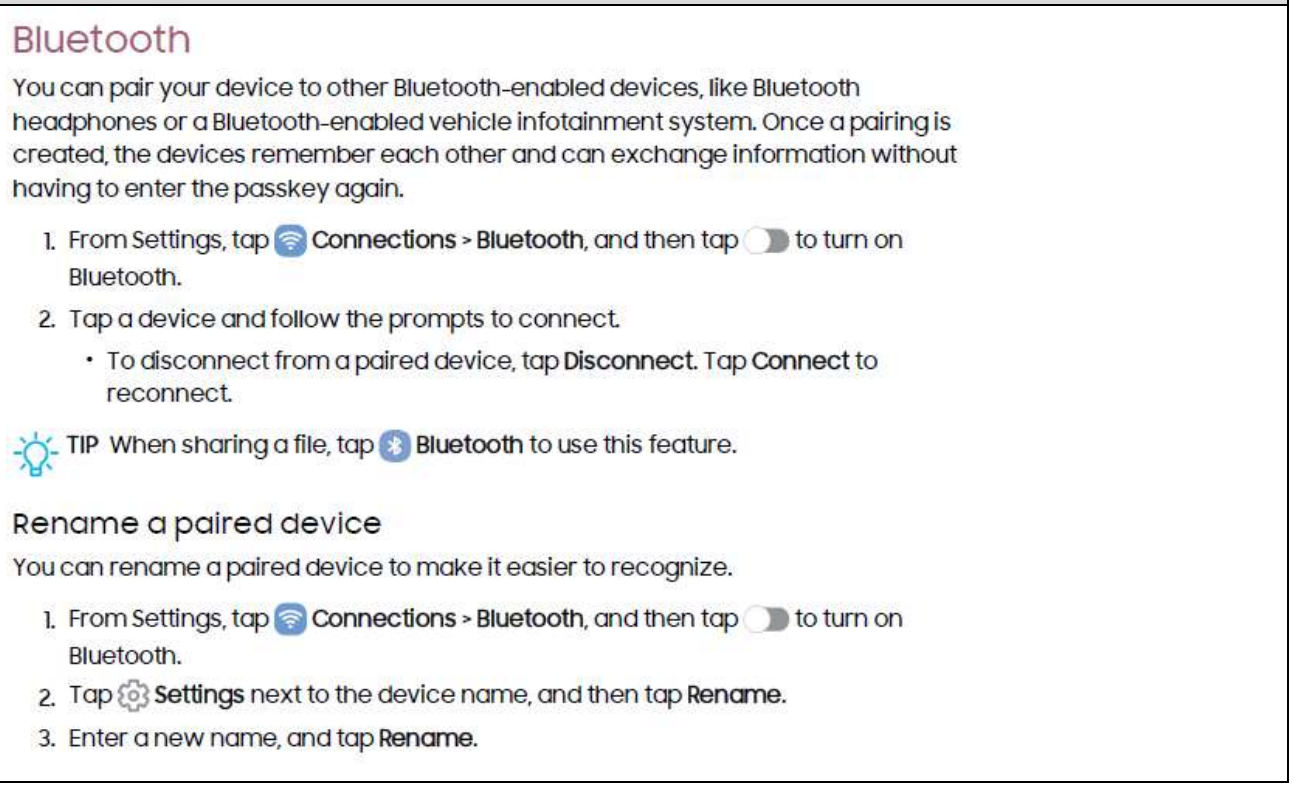
Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Unpair from a Bluetooth device When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Phone name:** Change the name of your device for Bluetooth connections. • **Received files:** View a list of files received using Bluetooth. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

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	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy A54 User Guide at pg. 103-105.

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Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

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9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

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	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

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and fading.

Two modulation modes are defined. A mandatory mode, called Basic Rate, uses a shaped, binary FM modulation to minimize transceiver complexity. An optional mode, called Enhanced Data Rate, uses PSK modulation and has two variants: π/4-DQPSK and 8DPSK. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate, 2 Mb/s for Enhanced Data Rate using π/4-DQPSK and 3 Mb/s for Enhanced Data Rate using 8DPSK.

Bluetooth

2 FREQUENCY BANDS AND CHANNEL ARRANGEMENT

The Bluetooth system operates in the 2.4 GHz ISM band. This frequency band is 2400 - 2483.5 MHz.

Regulatory Range	RF Channels
2.400-2.4835 GHz	f=2402+k MHz, k=0,…,78

Table 2.1: Operating frequency bands

RF channels are spaced 1 MHz and are ordered in channel number k as shown in Table 2.1.

Bluetooth devices are classified into three power classes based on their highest output power capabilities.

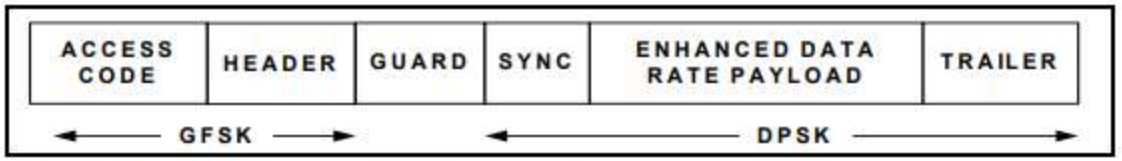
Power Class	Maximum Output Power (Pmax)	Nominal Output Power	Minimum Output Power[1]	Power Control
1	100 mW (20 dBm)	N/A	1 mW (0 dBm)	Pmin<+4 dBm to Pmax Optional: Pmin[2] to Pmax
2	2.5 mW (4 dBm)	1 mW (0 dBm)	0.25 mW (-6 dBm)	Optional: Pmin[2] to Pmax
3	1 mW (0 dBm)	N/A	N/A	Optional: Pmin[2] to Pmax

Table 3.1: Power classes

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	3.1 BASIC RATE **3.1.1 Modulation Characteristics** The Modulation is GFSK (Gaussian Frequency Shift Keying) with a bandwidth-bit period product BT=0.5. The Modulation index shall be between 0.28 and 0.35. A binary one shall be represented by a positive frequency deviation, and a binary zero shall be represented by a negative frequency deviation. The symbol timing shall be less than ±20 ppm.

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	3.2.1 Modulation Characteristics During access code and packet header transmission the Basic Rate GFSK modulation mode shall be used. During the transmission of the synchronization sequence, payload, and trailer sequence a PSK type of modulation with a data rate of 2 Mb/s or optionally 3 Mb/s shall be used. The following subsections specify the PSK modulation for this transmission. ***3.2.1.1 Modulation Method Overview*** The PSK modulation format defined for the 2 Mb/s transmission shall be π/4 rotated differential encoded quaternary phase shift keying (π/4-DQPSK). The PSK modulation format defined for the 3 Mb/s transmission shall be differential encoded 8-ary phase shift keying (8DPSK). The modulation shall employ square-root raised cosine pulse shaping to generate the equivalent lowpass information-bearing signal v(t). The output of the transmitter shall be a bandpass signal that can be represented as $$S(t) = Re\left[v(t)e^{j2\pi F_c t}\right] \quad \text{(EQ 1)}$$ with F_c denoting the carrier frequency. ***3.2.1.2 Differential Phase Encoding*** For the M-ary modulation, the binary data stream $\{b_n\}$, n=1,2,3, ...N, shall be mapped onto a corresponding sequence {Sk}, k=1,2, ...N/$\log_2$(M) of complex valued signal points. M=4 applies for 2 Mb/s and M=8 applies for 3 Mb/s. Gray coding shall be applied as shown in Table 3.4 and Table 3.5. In the event that the length of the binary data stream N is not an integer multiple of log2(M), the last symbol of the sequence $\{S_k\}$ shall be formed by appending data zeros to the appropriate length. The signal points S_k shall be defined by: $$S_k = S_{k-1}e^{j\varphi_k} \qquad k = 1, 2, ..N/\log_2(M) \quad \text{(EQ 2)}$$ $$S_0 = e^{j\phi} \qquad \text{with } \phi \in [0, 2\pi) \quad \text{(EQ 3)}$$ Receiver:

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	4.2.1 Actual Sensitivity Level The actual sensitivity level shall be defined as the input level for which a raw bit error rate (BER) of 0.01% is met. The requirement for a Bluetooth π/4-DQPSK and 8DPSK Enhanced Data Rate receiver shall be an actual sensitivity level of –70 dBm or better. The receiver shall achieve the –70 dBm sensitivity level with any Bluetooth transmitter compliant to the Enhanced Data Rate transmitter specification as defined in Section 3.2. **4.2.6 Reference Signal Definition** A 2 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = π/4-DQPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB A 3 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = 8DPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 1, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/

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	Data is transmitted over the air in packets. Two modes are defined: a mandatory mode called Basic Rate and an optional mode called Enhanced Data Rate. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate. Enhanced Data Rate has a primary modulation mode that provides a gross air data rate of 2 Mb/s, and a secondary modulation mode that provides a gross air data rate of 3 Mb/s. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 354, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ The general Enhanced Data Rate packet format is shown in Figure 1.3. Each packet consists of 6 entities: the access code, the header, the guard period, the synchronization sequence, the Enhanced Data Rate payload and the trailer. The access code and header use the same modulation mode as for Basic Rate packets while the synchronization sequence, the Enhanced Data Rate payload and the trailer use the Enhanced Data Rate modulation mode. The guard time allows for the transition between the modulation modes.  *Figure 1.3: Standard Enhanced Data Rate packet format* *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 355, https://www.bluetooth.com/specifications/specs/core-specification-5-0/

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	6.5 PACKET TYPES The packets used on the piconet are related to the logical transports on which they are used. Four logical transports with distinct packet types are defined (see Section 4): • SCO logical transport • eSCO logical transport • ACL logical transport • CSB logical transport. To indicate the different packets on a logical transport, the 4-bit TYPE code is used. The packet types are divided into four segments. The first segment is reserved for control packets. All control packets occupy a single time slot. The second segment is reserved for packets occupying a single time slot. The third segment is reserved for packets occupying three time slots. The fourth segment is reserved for packets occupying five time slots. The slot occupancy is reflected in the segmentation and can directly be derived from the type code. Table 6.2 summarizes the packets defined for the SCO, eSCO, ACL, and CSB logical transport types; a dash means the value is reserved for future use. All packet types with a payload shall use GFSK modulation unless specified otherwise in the following sections. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 410, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ For example, the following screenshots show exemplary Accused Samsung '590 Products using a Bluetooth communication chip to transmit video information by using Bluetooth file sharing:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

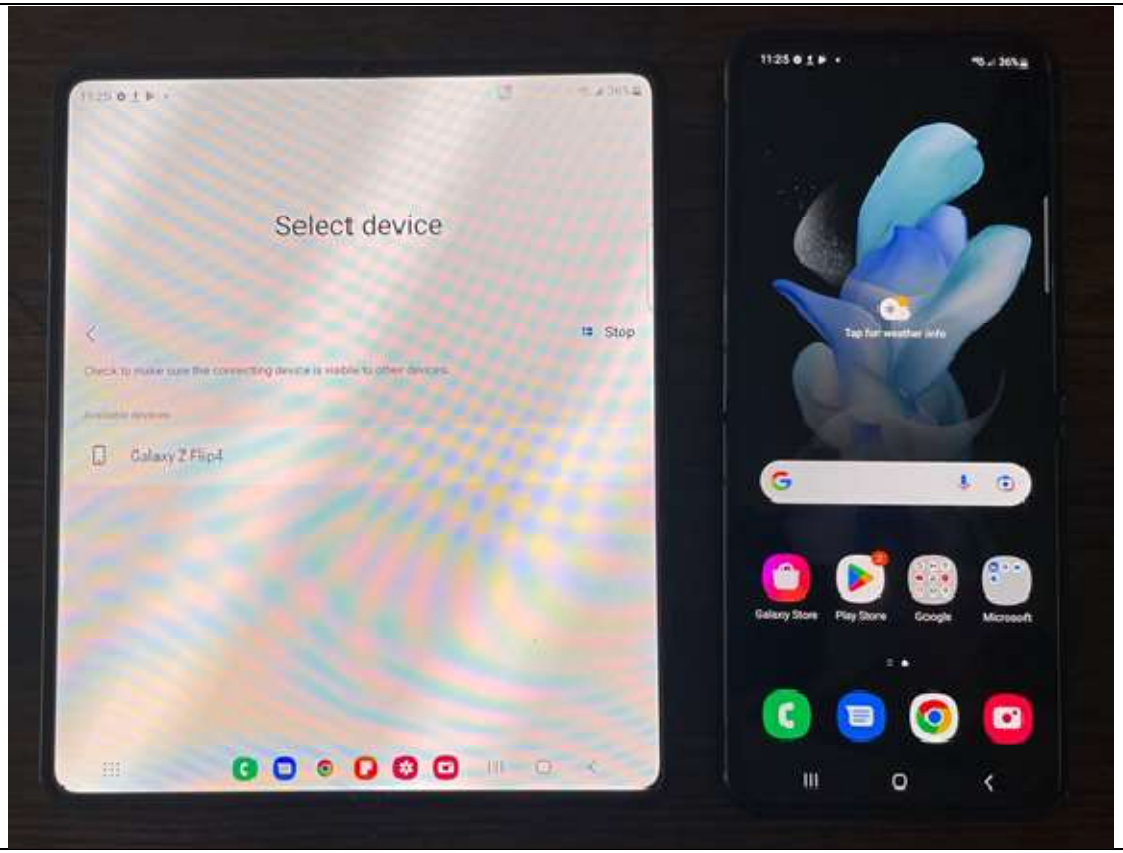
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

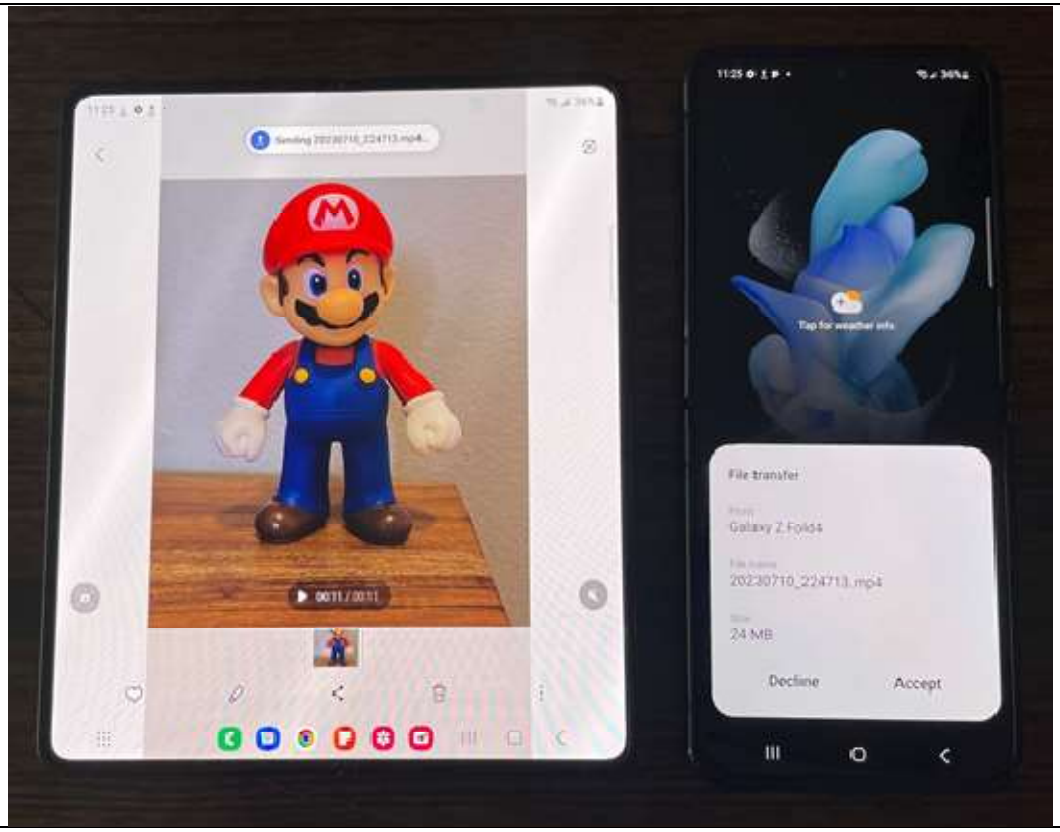


Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

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Select device
Stop
Galaxy Z Flip4
Tap for weather info
Galaxy Store
Play Store
Google
Microsoft


Tap for weather info
File transfer
Galaxy Z Fold4
20230710_224713.mp4
24 MB
Decline
Accept

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

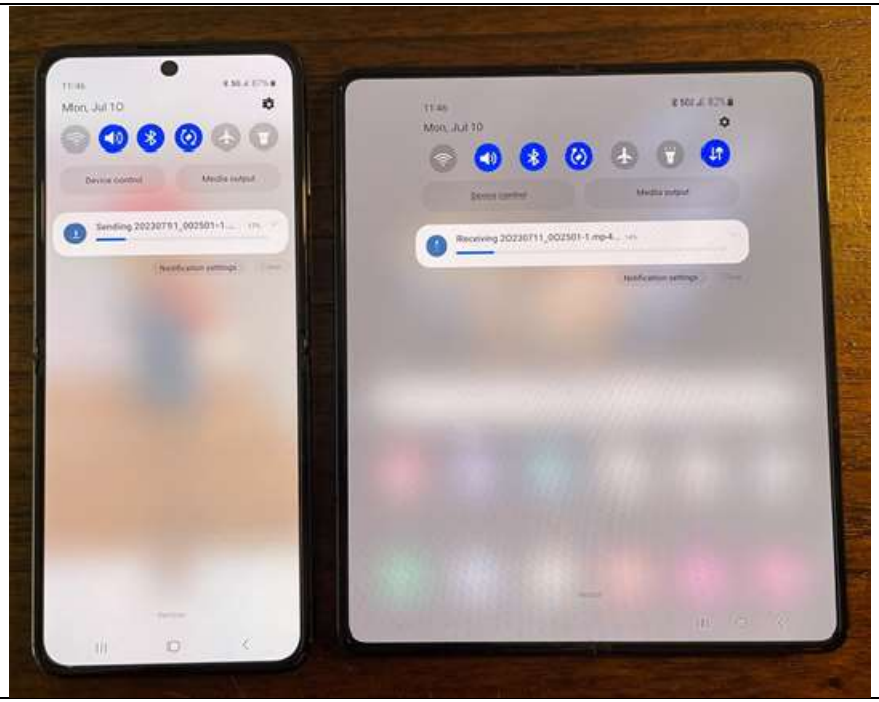
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Bluetooth communication chip and operate in a similar manner.
[9.f] implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from	Each of the Accused Samsung '590 Products performs a method of implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, and connecting, by radio, to an internet or a home network to transmit and receive information using the second transmission frequency band, via a second radio communication circuit. For example, each of Accused Samsung '590 Products includes a cellular communication chip implementing a second transmission scheme having a second modulation scheme different from

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
the first transmission frequency band; [9.g] connecting, by radio, to an internet or a home network to transmit and receive information using the second transmission frequency band, via a second radio communication circuit;	the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the cellular communication chip capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band. Specifically, the Accused Samsung '590 Products use a cellular communication chip configured to operate in one or more of 2G/3G/LTE/5G protocols to connect to the external display apparatus (*e.g.*, connect to another smartphone via email/MMS/phone call/Internet) accessing to an internet or a home network (*e.g.*, connect to the internet via cellular data services), and receiving digital information (*e.g.*, receiving digital information via the Internet, email, and/or MMS by using cellular data services). **Galaxy S23 Ultra:** For example, the Galaxy S23 Ultra is configured for at least one or more of GSM, 3G, 4G LTE, and 5G cellular communications in order to connect to another device, access the Internet, and receive digital information by using cellular data services. For example, the Galaxy S23 Ultra comprises a cellular communication chip and processor and/or CPU that is capable of these functions (*e.g.*, via a multi media message (MMS) or email over cellular network). NETWORK Technology: GSM / CDMA / HSPA / EVDO / LTE / 5G (COLLAPSE) 2G bands: GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only) CDMA 800 / 1900 & TD-SCDMA 3G bands: HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 CDMA2000 1xEV-DO 4G bands: 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA 5G bands: 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International 1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA Speed: HSPA, LTE-A (up to 7CA), 5G Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

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Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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Table 9-20

LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	NETWORK Technology: GSM / CDMA / HSPA / EVDO / LTE / 5G (COLLAPSE ▲) 2G bands: GSM 850 / 900 / 1800 / 1900 CDMA 800 / 1900 3G bands: HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 HSDPA 850 / 900 / 1900 / 2100 CDMA2000 1xEV-DO 4G bands: 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 5G bands: 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International SA/NSA/Sub6/mmWave - USA Speed: HSPA, LTE-A (6CA), 5G Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

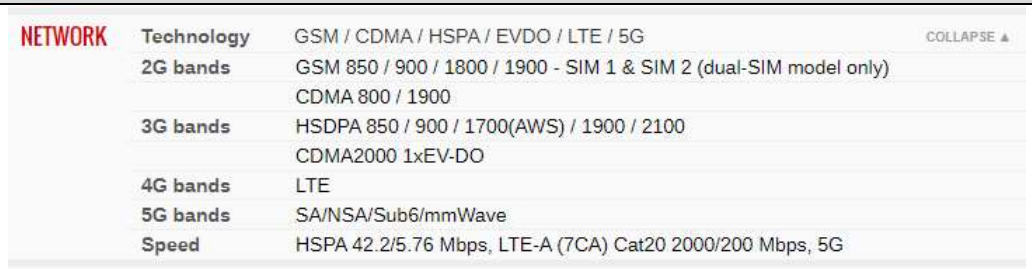
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

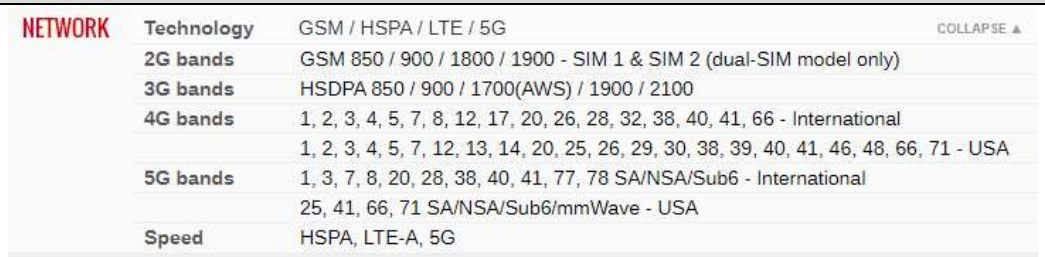
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **Cellular Frequency Bandwidth and Modulation/Demodulation Method:** ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **2G:**

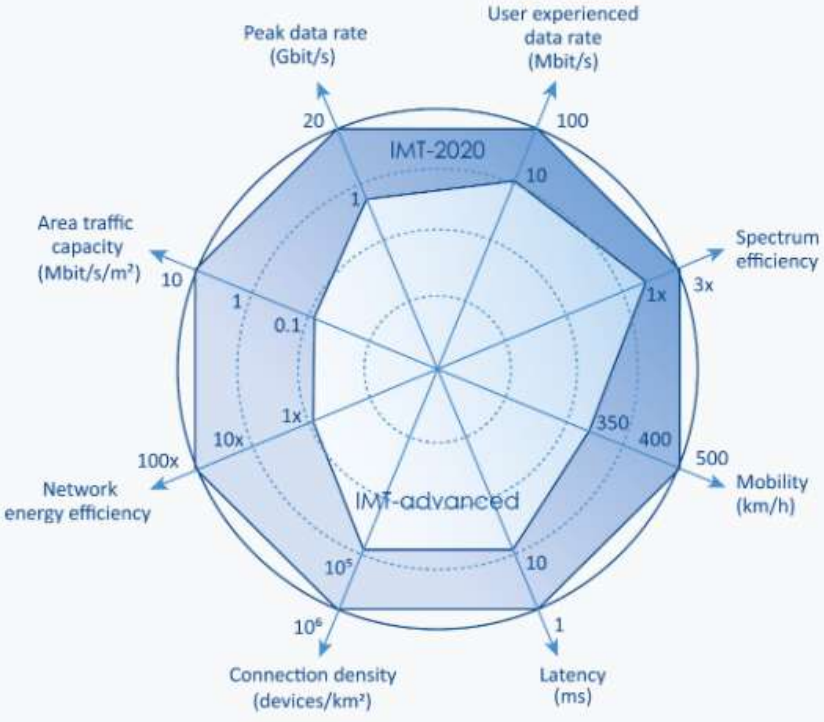
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Global System for Mobile communication (GSM) The technology behind the Global System for Mobile communication (GSM™) uses Gaussian Minimum Shift Keying (GMSK) modulation a variant of Phase Shift Keying (PSK) with Time Division Multiple Access (TDMA) signalling over Frequency Division Duplex (FDD) carriers. The physical layer is specified in 3GPP TS 45.001 and the logical channels in 3GPP TS 45.002. The channel coding is specified in 3GPP TS 45.003 and the modulation is specified in 3GPP TS 45.004. Although originally designed for operation in the 900 MHz band, it was soon adapted for 1800 MHz. The introduction of GSM into North America meant further adaptation to the 800 and 1900 MHz bands. Over the years, the versatility of GSM has resulted in the specifications being adapted to many more frequency bands to meet niche markets. A full list can be found in 3GPP TS 45.005. GSM has a channel spacing of 200kHz and was designed principally for voice telephony, but a range of bearer services was defined (a subset of those available for fixed line Integrated Services Digital Networks, ISDN), allowing circuit-switched data connections at up to 9600 bits/s. At the time of the original system design, this rate compared favourably to those available over fixed connections. However, with the passage of time, fixed connection data rates increased dramatically. The GSM channel structure and modulation technique did not permit faster rates, and thus the High Speed Circuit-Switched Data (HSCSD) service was introduced in the GSM Phase 2+. **Enhanced Data rates for Global Evolution (EDGE)** As its name suggests, EDGE (Enhanced Data rates for Global Evolution) is an enhancement of the GSM™ radio access technology to provide faster bit rates for data applications, both circuit- and packet-switched. As an enhancement of the existing GSM physical layer, EDGE is realized via modifications of the existing layer 1 3GPP specifications TS 45.000 rather than by separate, stand-alone specifications. The increased data rate is accomplished by a new modulation technique (8PSK as opposed to GSM/GPRS's GMSK, yielding a three-fold increase in bit rate for an identical symbol rate) coupled with new channel coding, resulting in improved spectral efficiency. This is important, because it allows EDGE to be introduced piecemeal into existing GSM networks without disrupting the frequency reuse plan of the existing deployment.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	By way of illustration, the General Packet Radio Service (GPRS) can offer a data rate of 115 (and a theoretical data rate of 171) kbit/s whereas EDGE on top of GPRS can increase this theoretical data rate to 384 kbit/s. This is comparable with the rate for early implementations of Wideband Code Division Multiple Access (W-CDMA) of the 3rd generation of UMTS and a reason why EDGE is considered to be the bridge between the 2nd and the 3rd generation of mobile communication systems. https://www.etsi.org/technologies/mobile/2g **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111): • **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h • **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h • **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h

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	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

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	LONG TERM EVOLUTION (LTE)  Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

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	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example: • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM • LTE DL 4 Rx antenna ports https://www.etsi.org/technologies/mobile/4g **5G:**

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	So 5G should deliver significantly increased operational performance (e.g. increased spectral efficiency, higher data rates, low latency), as well as superior user experience (near to fixed network but offering full mobility and coverage). 5G needs to cater for massive deployment of Internet of Things, while still offering acceptable levels of energy consumption, equipment cost and network deployment and operation cost. It needs to support a wide variety of applications and services. Comparison of key capabilities of IMT-Advanced (4th generation) with IMT-2020 (5th generation) according to ITU-R M.2083: 

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The minimum requirements:

- for peak data rate: Downlink: 20 Gbit/s, Uplink: 10 Gbit/s
- for peak spectral efficiencies: Downlink: 30 bit/s/Hz, Uplink: 15 bit/s/Hz
- user plane latency (single user, small packets): 4 ms for eMBB, 1 ms for URLLC
- control plane latency (idle => active): 10-20ms

Other requirements:

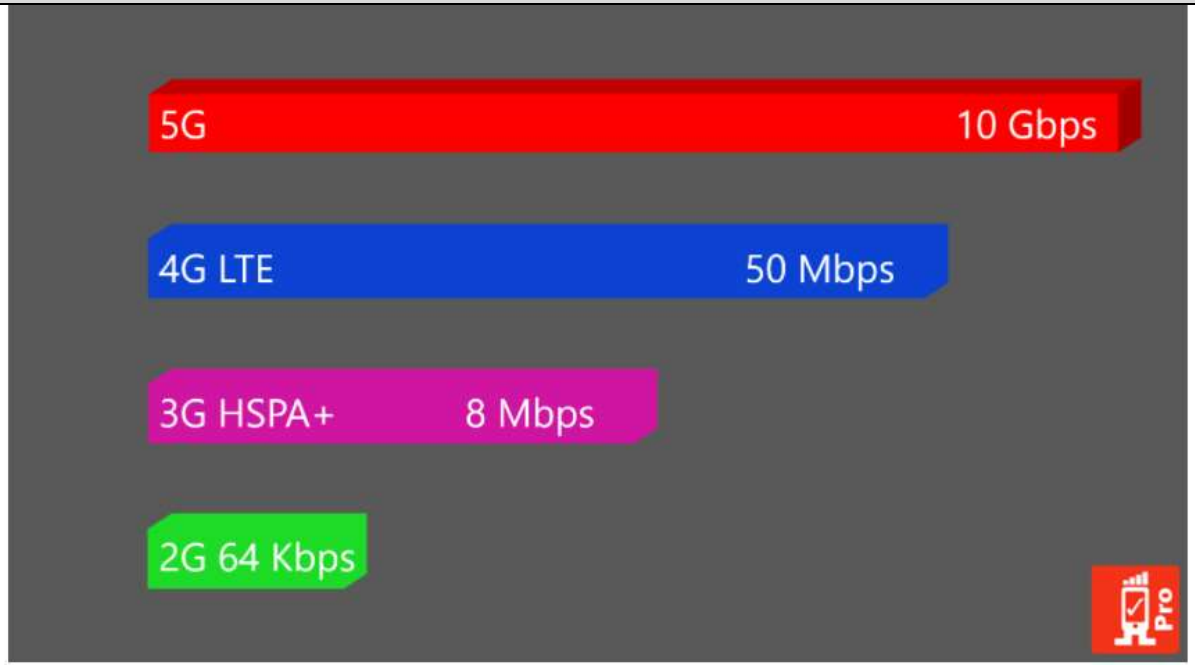
- maximum aggregated system bandwidth: at least 100 MHz, up to 1GHz in higher frequency bands (above 6GHz)
- mobility: up to 500km/h in rural eMBB

- Add support of NR DL 256QAM for frequency range 2 (FR2)

https://www.etsi.org/technologies/mobile/5g

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

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https://rantcell.com/comparison-of-2g-3g-4g-5g.html

Further, AIDA64 reports confirm that the Accused Samsung '590 Products include one or more processors to connect to an external display apparatus, access the Internet, and receive digital information (*e.g.*, via MMS protocol over cellular network and/or via email or phone call):

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

For example, the following screenshots show exemplary Accused Samsung '590 Products using a cellular communication chip to transmit and receive digital video information via MMS and similar functionality also applies to transmitting and receiving digital video via Internet or home network:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) – WiFi off	Video Information Receiving Device (Samsung Galaxy A54 5G) – WiFi off



Video Information Transmitting Device (Samsung Galaxy A54 5G) – WiFi off	Video Information Receiving Device (Samsung Galaxy S23 Ultra) – WiFi off

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



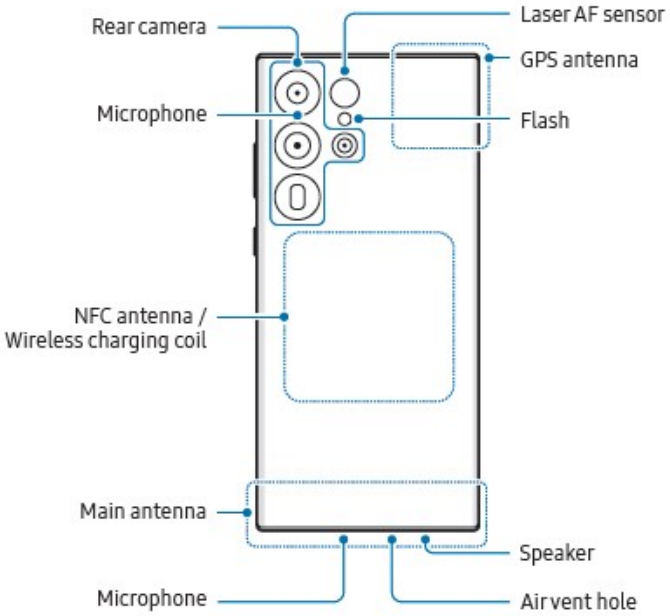
Video Information Transmitting Device (Samsung Galaxt ZFold 4) – WiFi off	Video Information Receiving Device (Samsung Galaxy ZFlip 4) – WiFi off

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

Video Information Transmitting Device (Samsung Galaxy ZFlip 4) – WiFi off	Video Information Receiving Device (Samsung Galaxt ZFold 4) – WiFi off

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a cellular chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/. **Doctrine of Equivalents:** To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a second radio communication circuit, each

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	of these products include software, hardware, or a combination of the two that perform the equivalent functions of connecting by radio to the external display apparatus, accessing to an internet or a home network, and receiving digital information. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, they use an integrated Bluetooth/Wi-Fi chipset and/or cellular communication chipset to perform these functions by using wireless transmissions. The performance of this function achieves substantially the same result, for example, connecting to an external display apparatus, accessing to an internet or a home network, and receiving digital information.
[9.h] transmitting, via a third radio communication circuit, information using a third transmission frequency band;	Each of the Accused Samsung '590 Products performs a method of transmitting, via a third radio communication circuit, information using a third transmission frequency band. For example, each of the Accused Samsung '590 Products includes a NFC communication chip capable of transmitting information (*e.g.*, Samsung Pay and/or Samsung Wallet) and using a third transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Series User Guide at pg. 6 (Galaxy S23 Ultra device layout). **NFC and contactless payments** You can use your phone to read near field communications tags (NFC) that contain information about products. You can also use this feature to make payments and buy tickets for transportation or events after downloading the required apps. The device contains a built-in NFC antenna. Handle the device carefully to avoid damaging the NFC antenna.

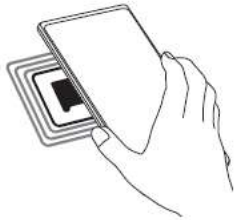
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Reading information from NFC tags

Use the NFC feature to read product information from NFC tags.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

2 Place the NFC antenna area on the back of your device near an NFC tag.
The information from the tag appears.



Ensure that the device's screen is turned on and unlocked. Otherwise, the device will not read NFC tags or receive data.

Making payments with the NFC feature

Before you can use the NFC feature to make payments, you must register for a mobile payment service. To register or get more information about services, contact your service provider.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

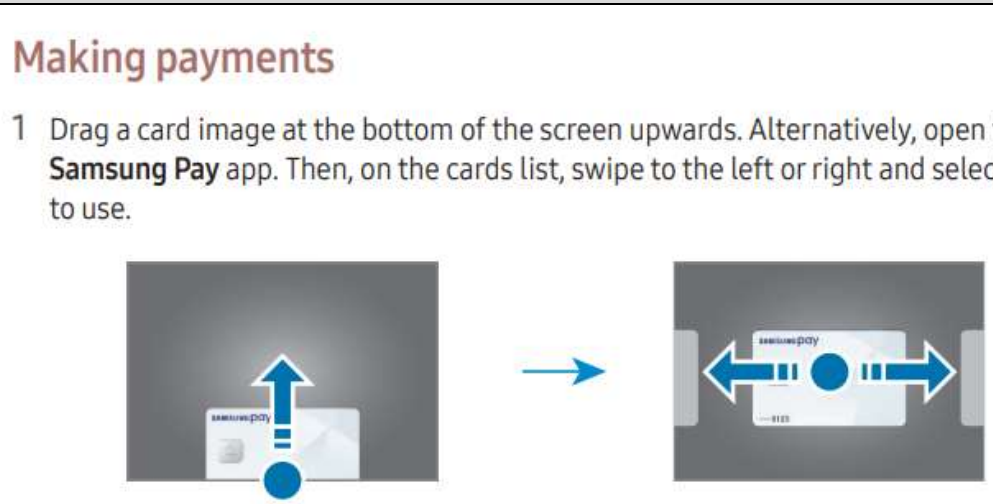
2 Touch the NFC antenna area on the back of your device to the NFC card reader.

To set the default payment app, open the Settings screen and tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment**, and then select an app.

- The payment services list may not include all available payment apps.
- If you update the payment app or install a new one, the payment services that you used before may not work properly. If that is the case, on the Settings screen, tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment** or **Others**, and then select another app instead of the updated or newly installed app. Or, deselect the selected app.

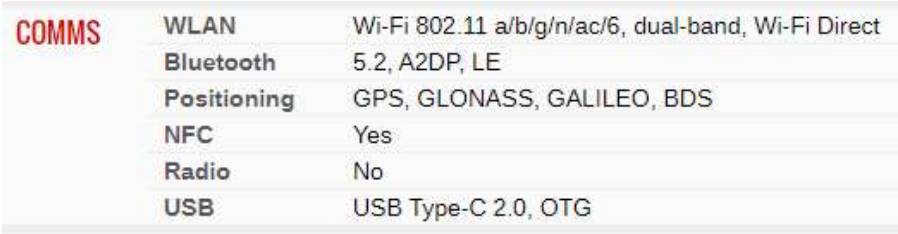
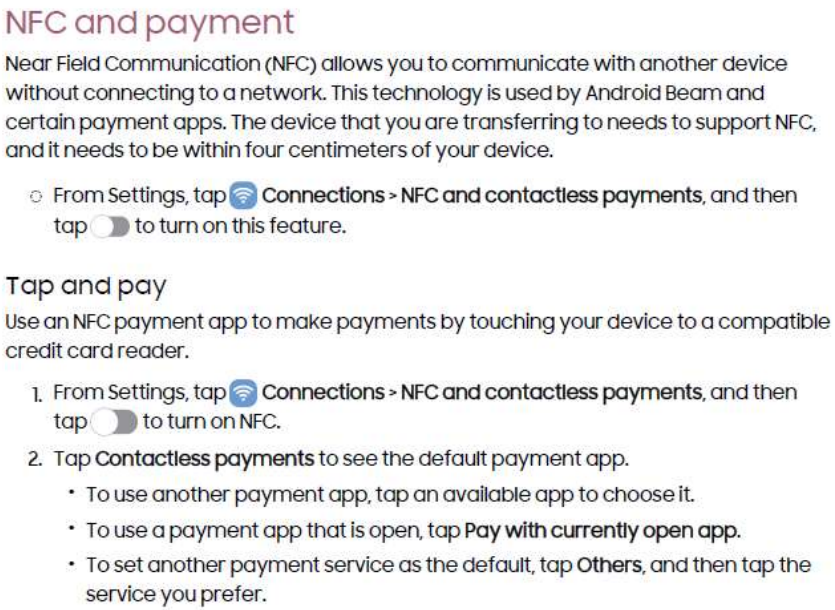
Galaxy S23 Series User Guide at pgs. 125-126.

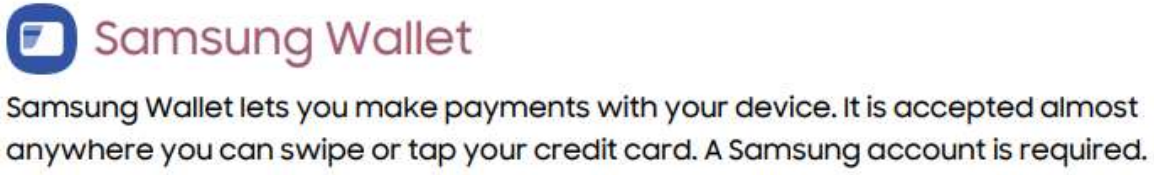
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Setting up Samsung Pay When running this app for the first time or restarting it after performing a data reset, follow the on-screen instructions to complete the initial setup. 1 Open the **Samsung Pay** app. 2 Sign in to your Samsung account and read and agree to the terms and conditions. 3 Register your fingerprint and a PIN to use when making payments. This PIN will be used to verify various actions in Samsung Pay, such as making payments and unlocking the app. **Registering cards** Open the **Samsung Pay** app and follow the on-screen instructions to complete your card registration.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Series User Guide at pgs. 94-95.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

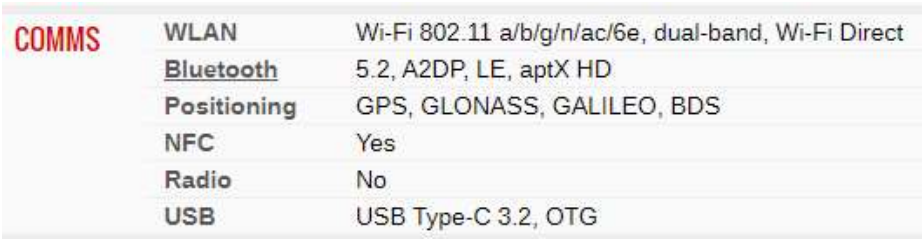
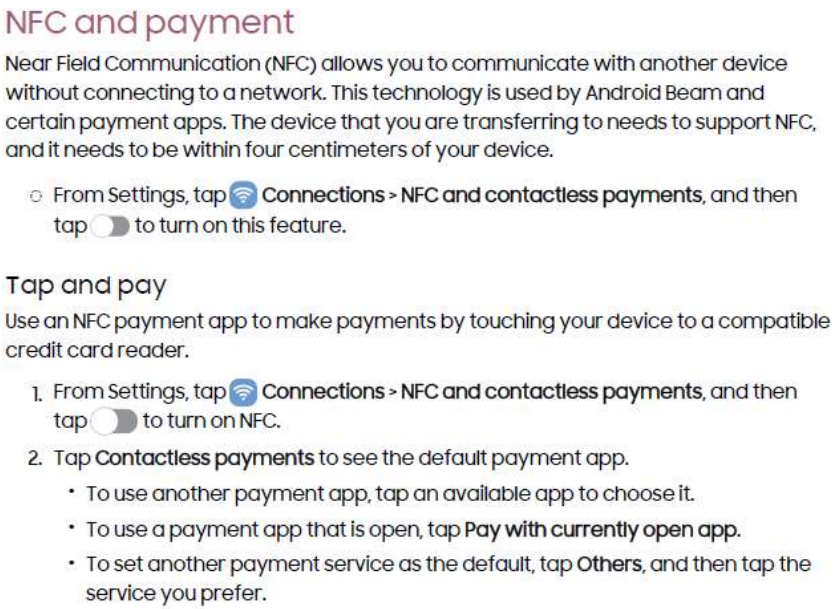
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:**  Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

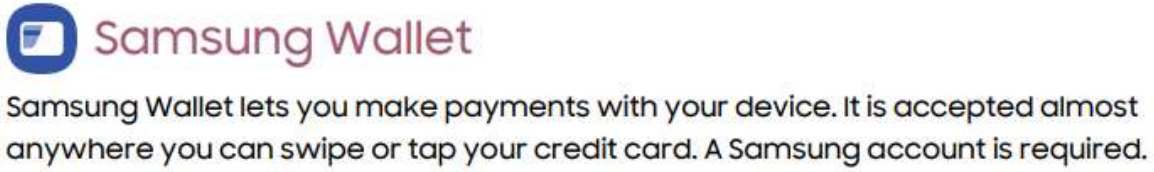
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
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UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

NFC and payment

Near Field Communication (NFC) allows you to communicate with another device without connecting to a network. This technology is used by Android Beam and certain payment apps. The device that you are transferring to needs to support NFC, and it needs to be within four centimeters of your device.

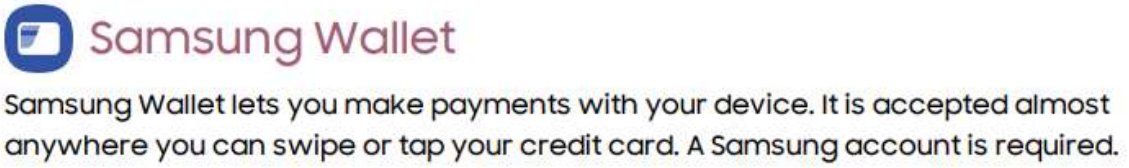
- From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on this feature.

Tap and pay

Use an NFC payment app to make payments by touching your device to a compatible credit card reader.

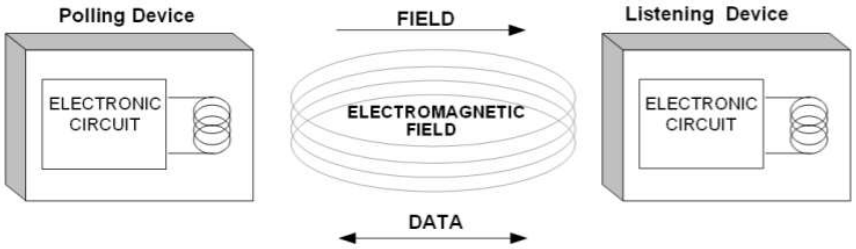
1. From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on NFC.
2. Tap **Contactless payments** to see the default payment app.
   - To use another payment app, tap an available app to choose it.
   - To use a payment app that is open, tap **Pay with currently open app**.
   - To set another payment service as the default, tap **Others**, and then tap the service you prefer.

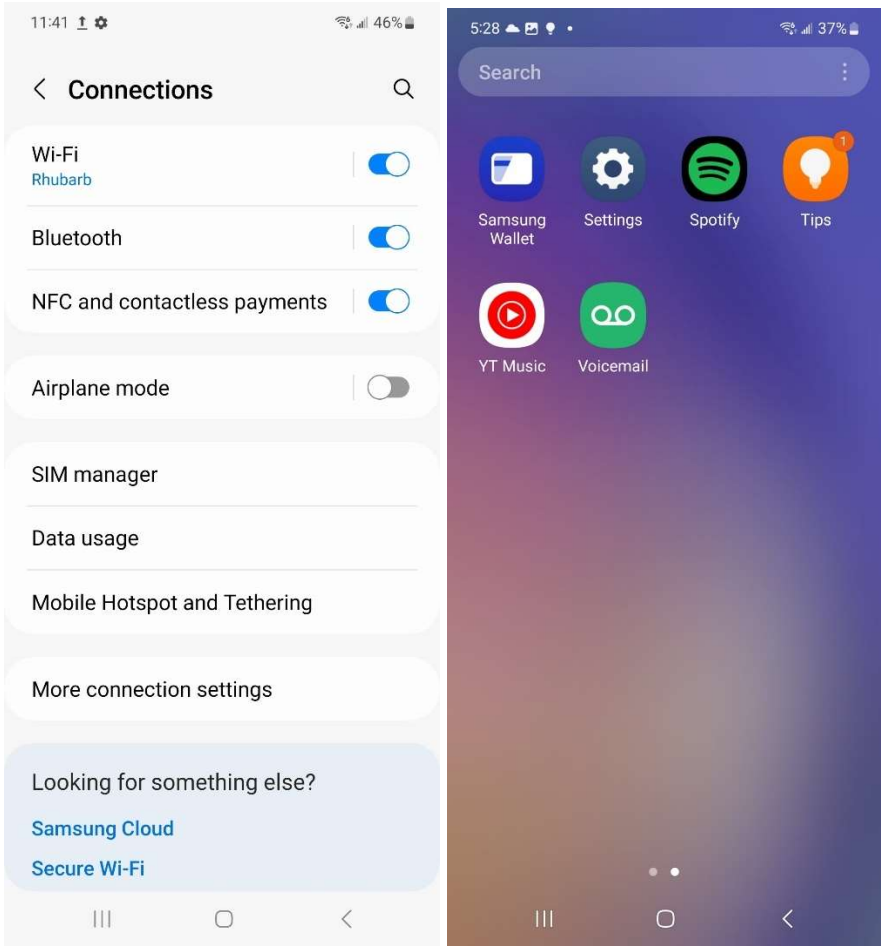
Galaxy A54 User Guide at pg. 105.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 57.

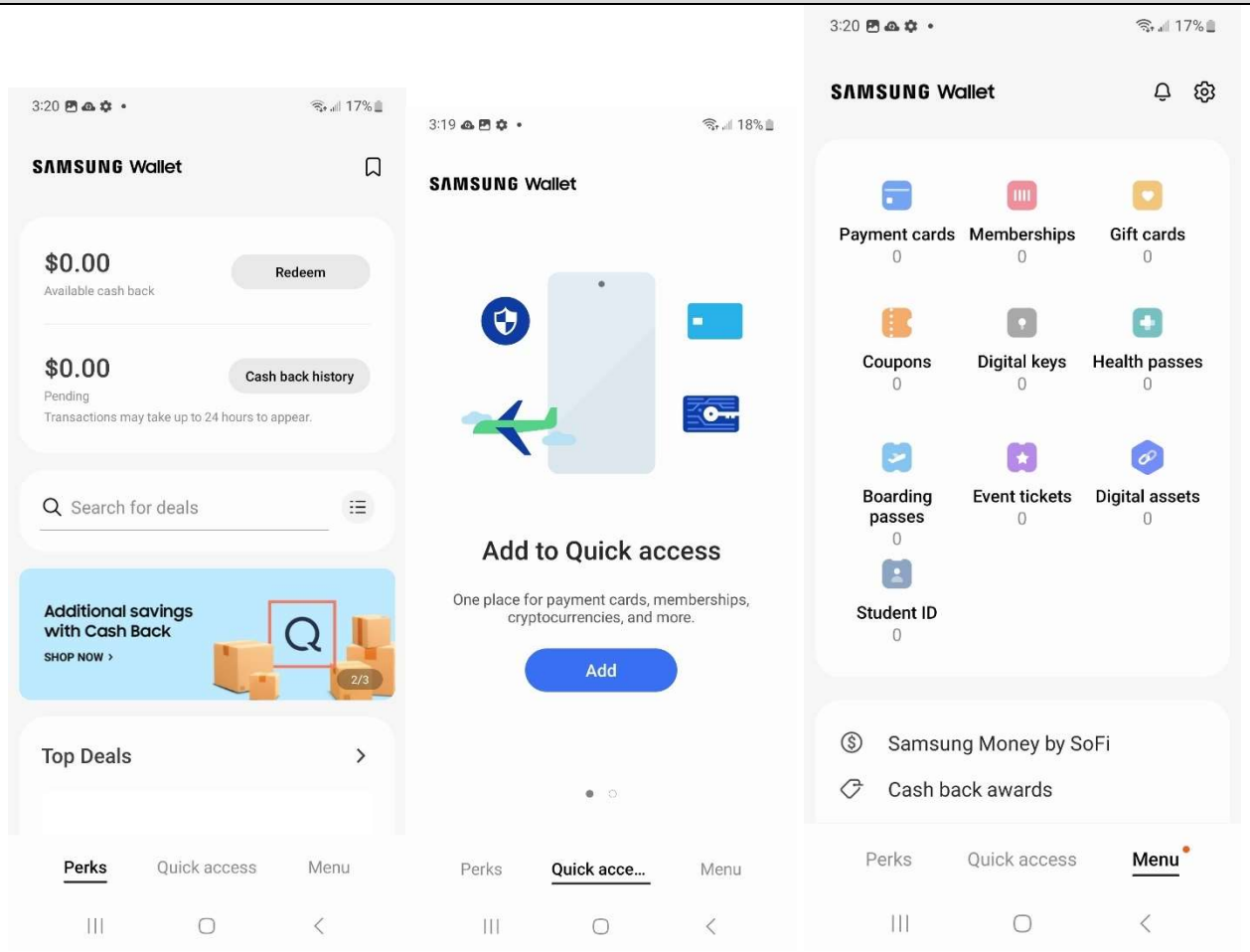
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

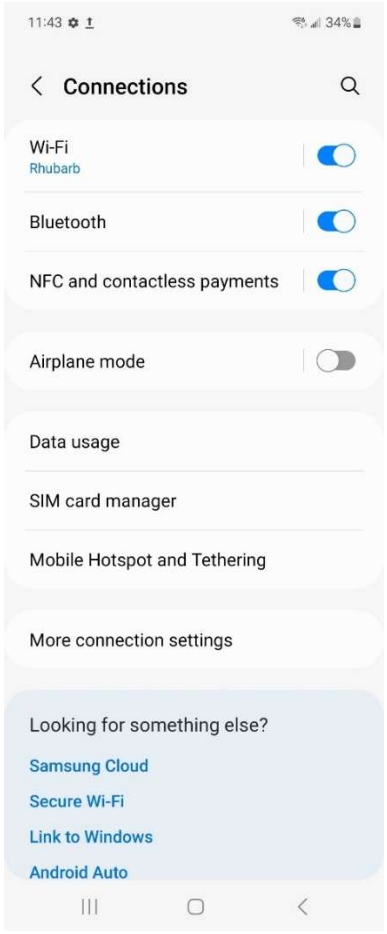
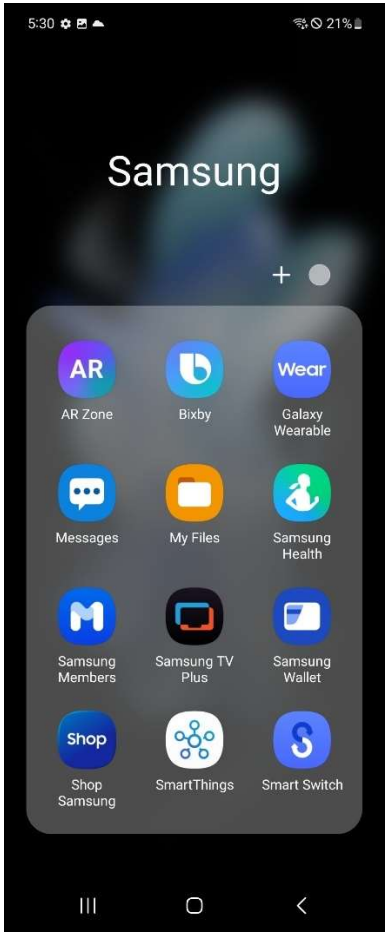
Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **NFC Frequency Bandwidth:** 3 Basics of Data Transmission with NFC Like the RFID Standards 14443 and FeliCa NFC uses an inductive coupling. Similar to the transformer principle, the magnetic near-field of two conductor coils is used to couple the polling device (initiator) and listening device (target).  *Figure 1: Polling device (initiator) and listening device (target) configuration [15]* The operating frequency is 13.56 MHz, and a bitrate of 106 kbit/s (partly also 212 kbit/s and 424 kbit/s) is used. Modulation schemes are amplitude on/off keying (OOK) with different modulation depth (100 % or 10 %) and BPSK. *See* https://cdn.rohde-schwarz.com/pws/dl_downloads/dl_application/application_notes/1ma182/1MA182_5E_NFC_WHITE_PAPER.pdf For example, the following screenshots show exemplary Accused Samsung '590 Products using a NFC communication chip to transmit information by using Samsung Pay and/or Samsung Wallet applications:

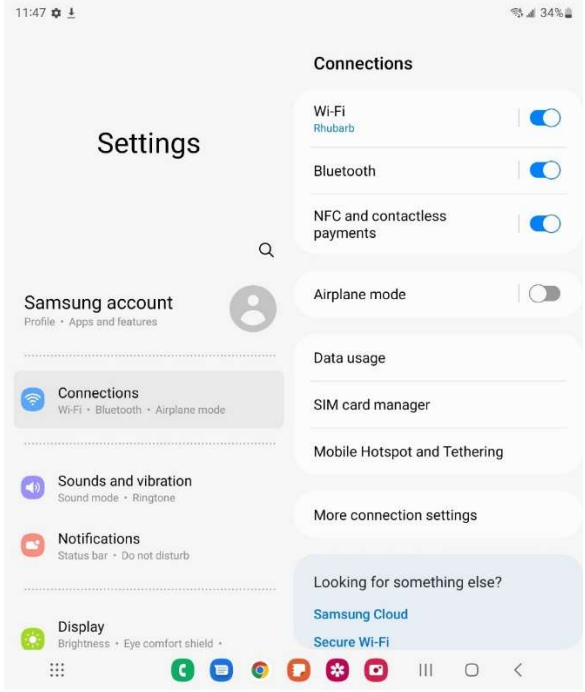
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G: 

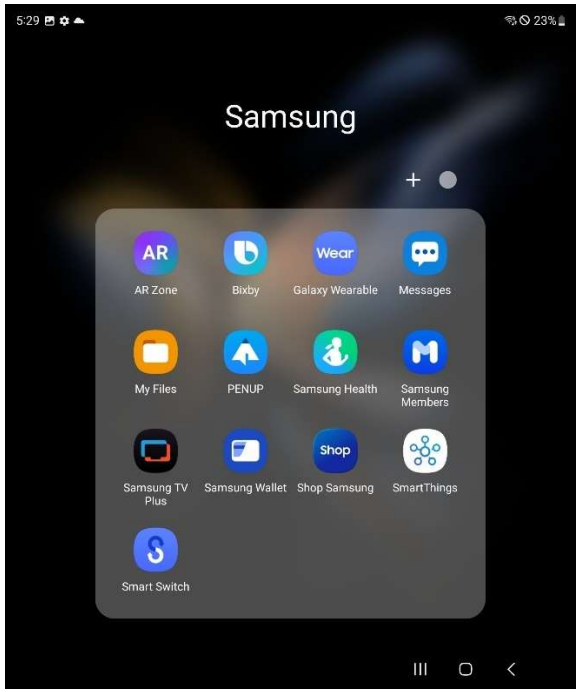
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy ZFlip 4:   Samsung Galaxy ZFold 4:

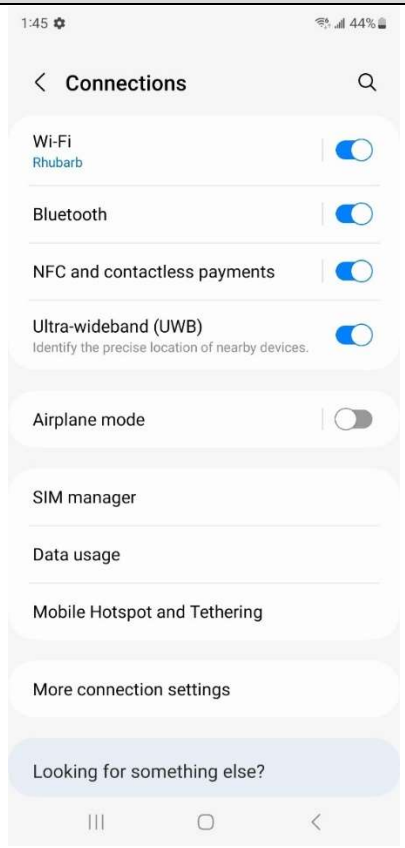
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

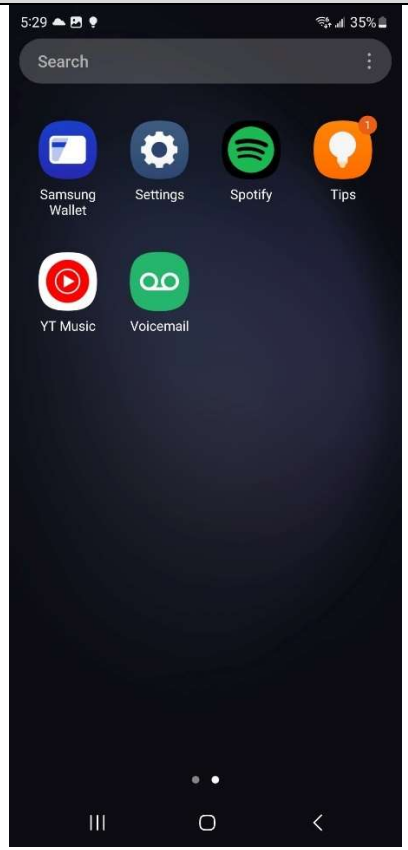




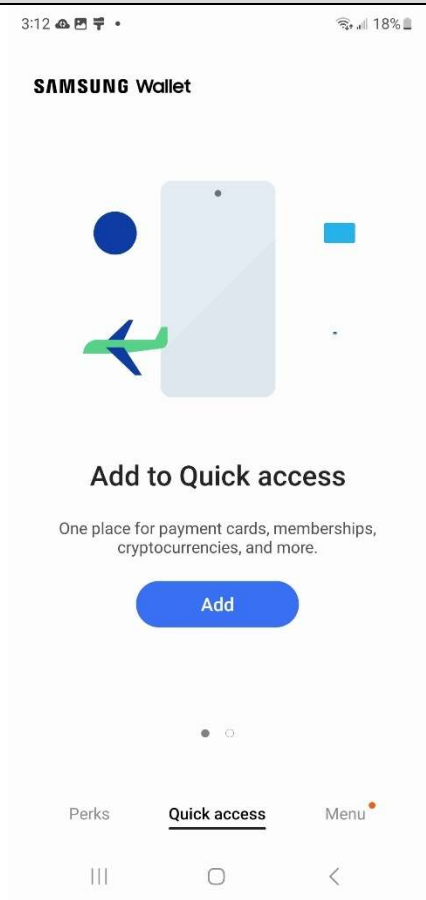
Samsung Galaxy S23 Ultra:

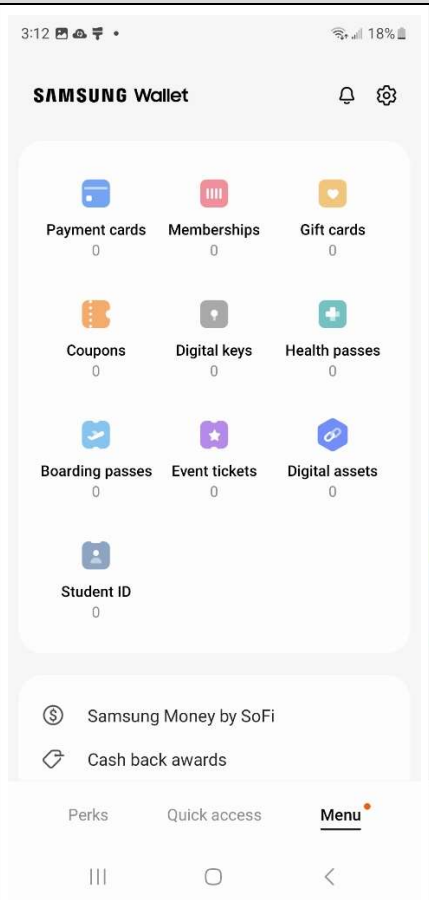
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

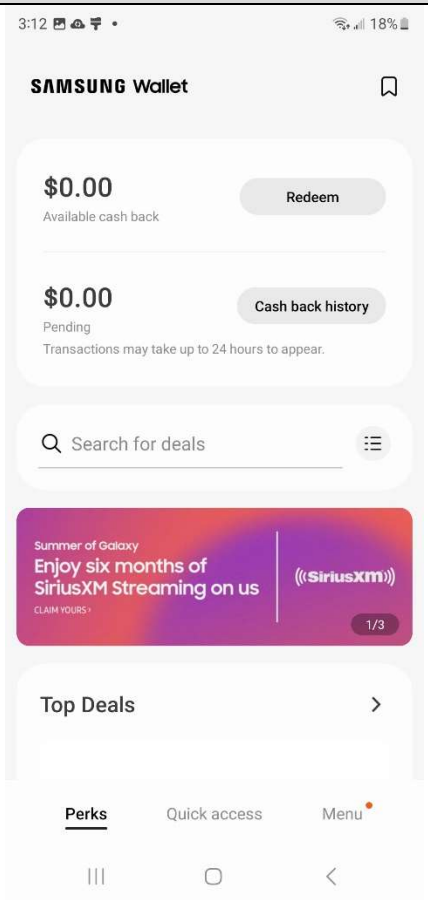




U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement





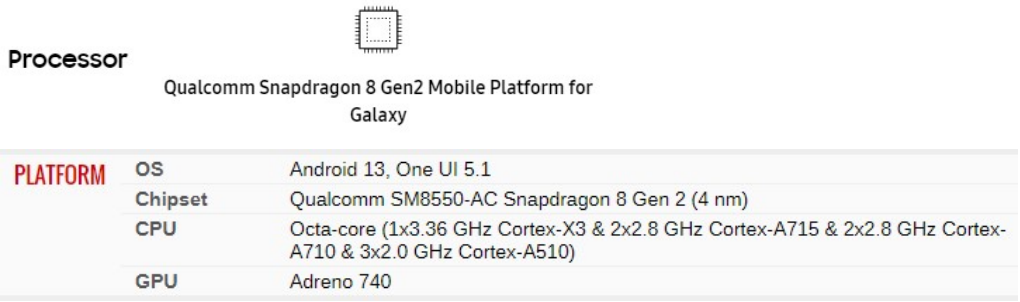


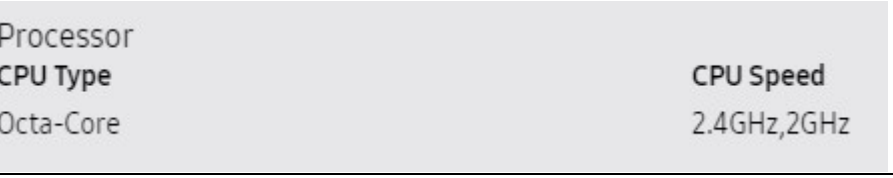
See also Appendix 8 showing that the remaining Accused Samsung '590 Products include a NFC communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00089063/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[9.i] controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits, wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the first radio communication circuit, a connection is assigned to the first radio communication circuit for transmitting the video information,	Each of the Accused Samsung '590 Products performs a method of controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits, wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the first radio communication circuit, a connection is assigned to the first radio communication circuit for transmitting the video information. For example, each of the Accused Samsung '590 Products includes a chipset (*e.g.*, Samsung Exynos) that includes one or more processors (*e.g.*, CPU) that executed the operating system source code to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits for various functions and/or applications (*e.g.*, Quickshare, Bluetooth file share, email, MMS, Samsung Wallet).

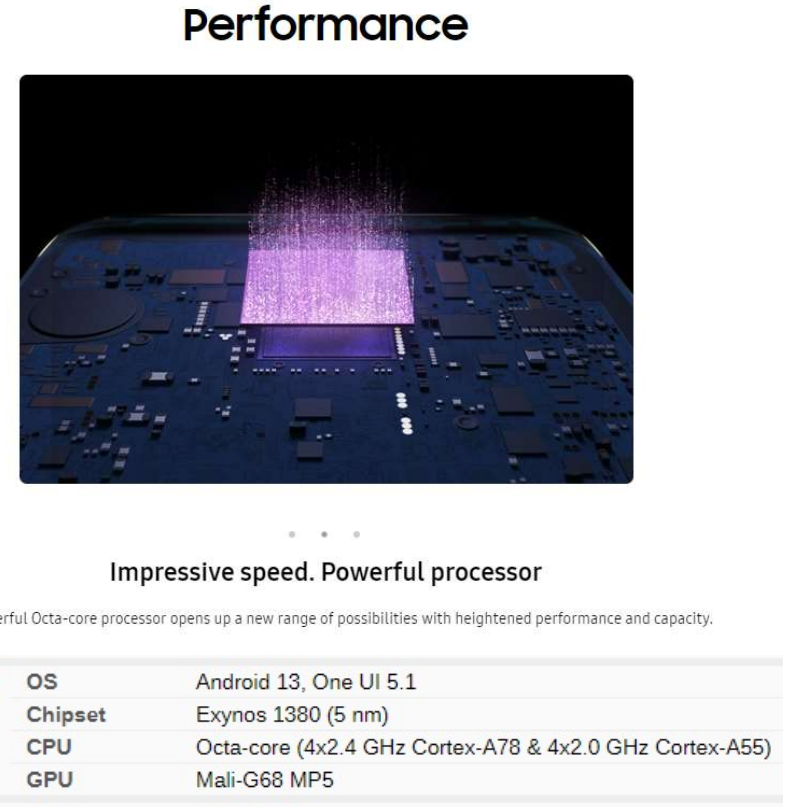
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

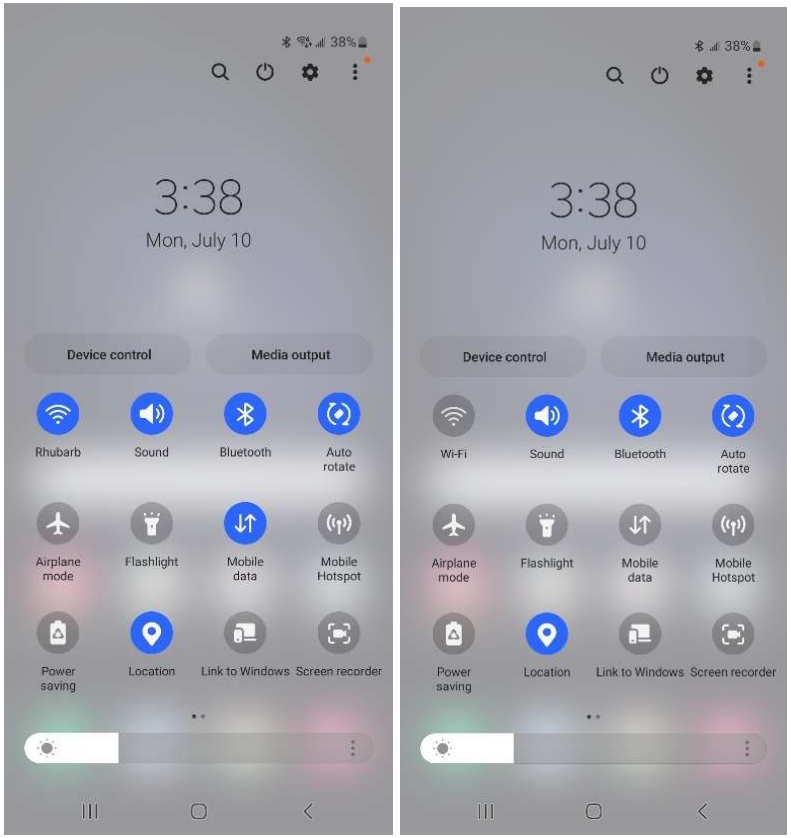
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

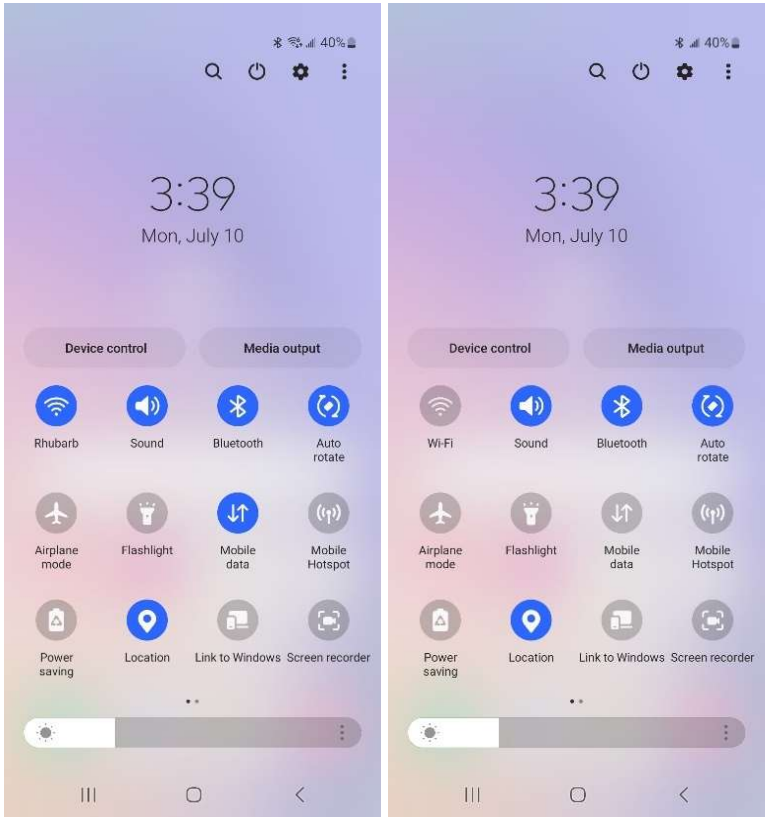
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

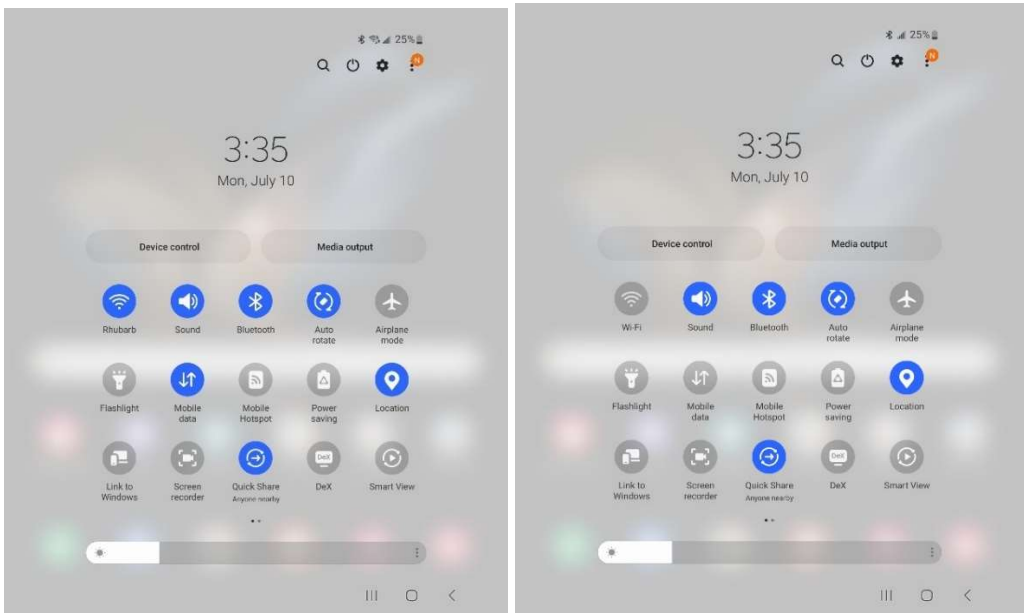


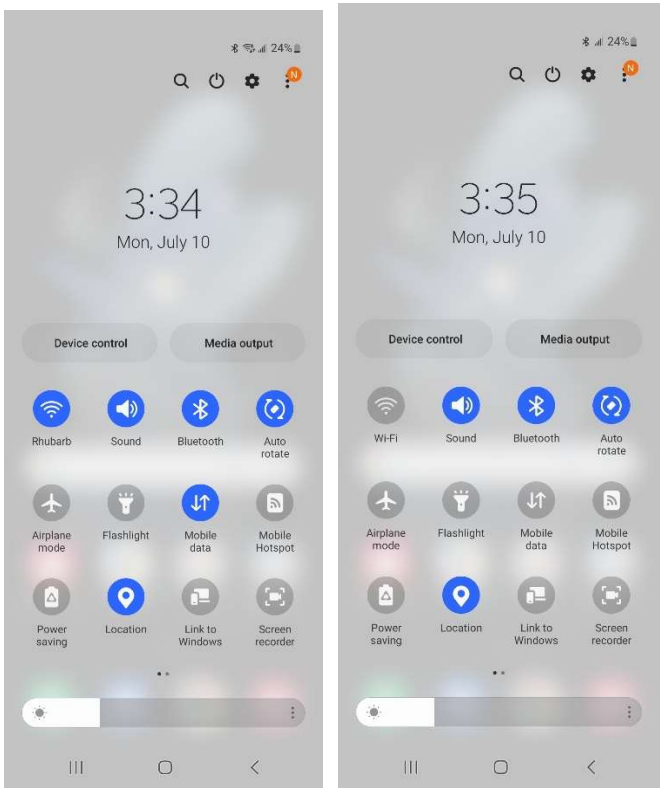
Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

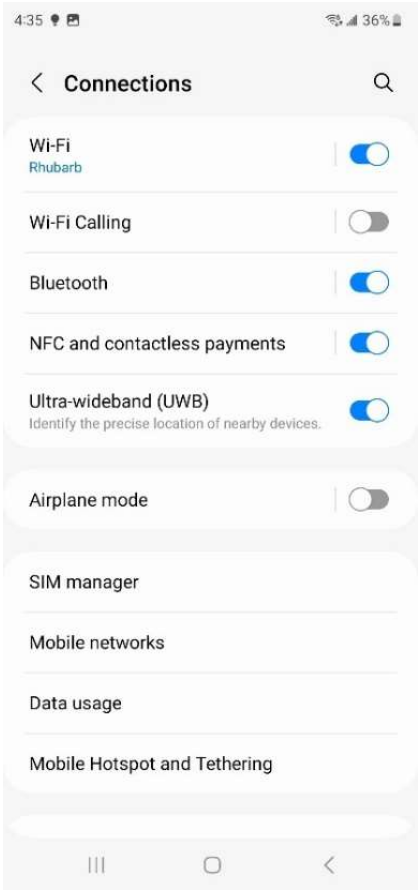
For example, the following screenshots show exemplary Accused Samsung '590 Products using a controller (*e.g.*, application processor or CPU) to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication chips by turning them on/off through the quick control menu:

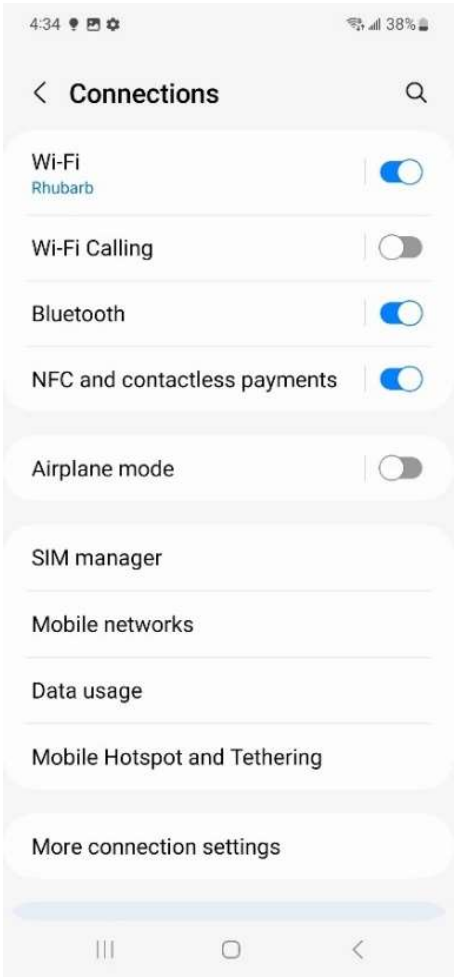
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

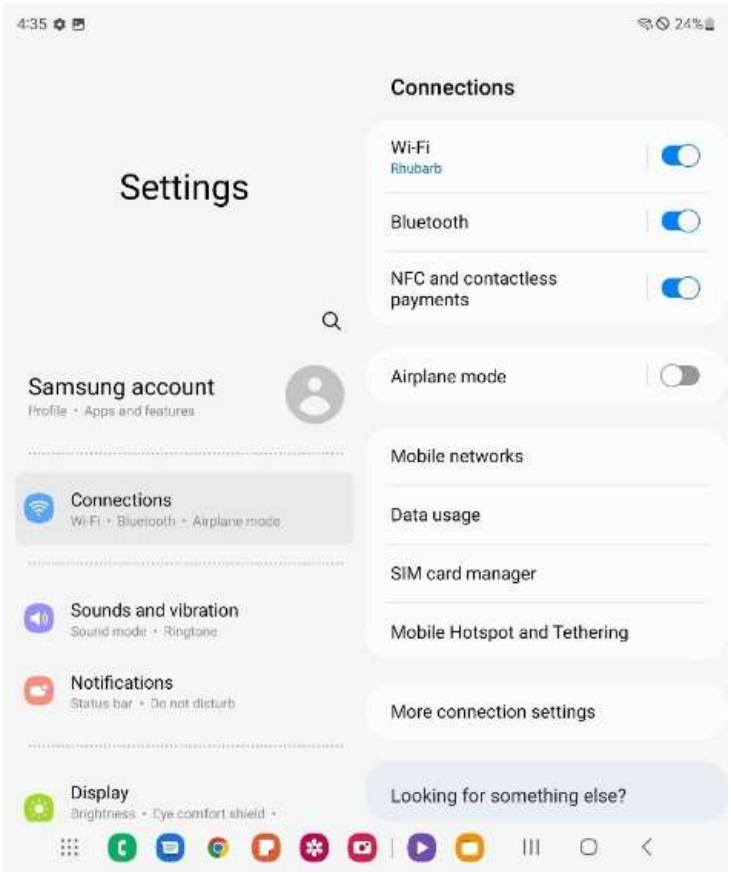
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

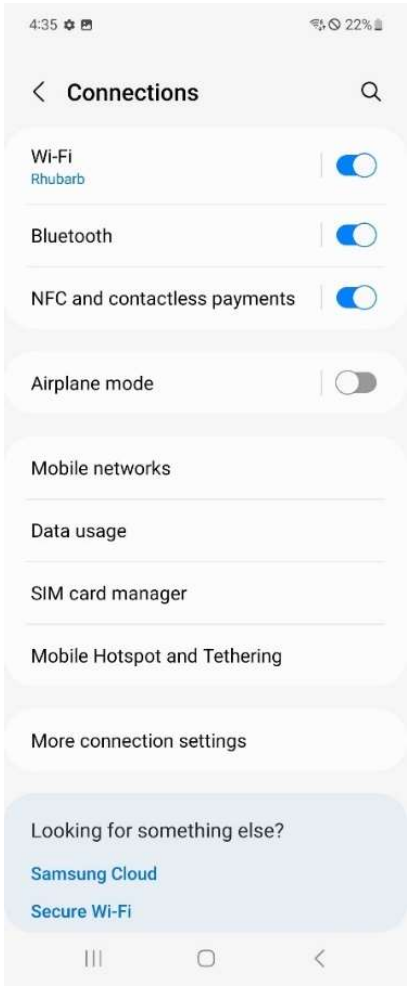
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)  As an additional example of controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into "Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

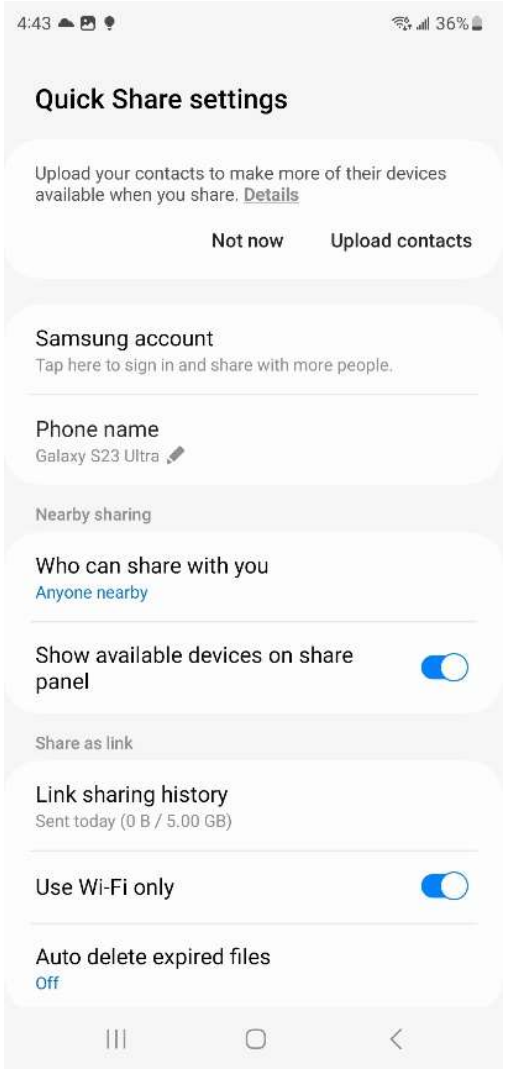
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

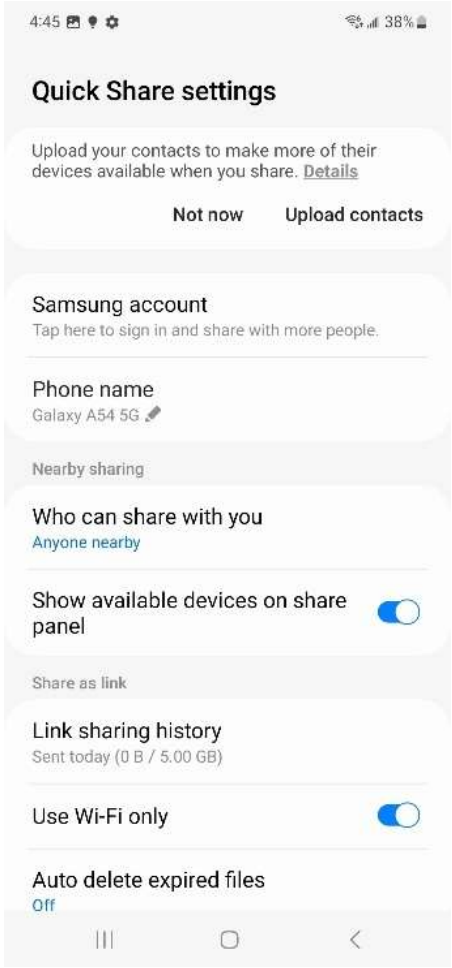
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of the controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products receive instructions from the user to use "Quick Share," "Samsung Pay," "Bluetooth File Share," and/or access the internet which will be accepted by the operating system executing on the one or more CPUs and based on such execution the controller will control the assignment of the connection by sending the instructions to one of the WiFi, NFC, Bluetooth, and cellular circuits, respectively. **First Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Wi-Fi and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the Wi-Fi communication circuit, the controller assigns a connection to the Wi-Fi communication circuit for transmitting the video by using Wi-Fi (e.g., Quick Share) to share files. For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share "Wi-Fi only" and then sending data through the Quick Share application. Also, "an indication" from a user to control assignment to the cellular communication chip is turning the cellular or Wi-Fi connection on/off from the quick menu. For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share to transmit video from the options under the share menu.

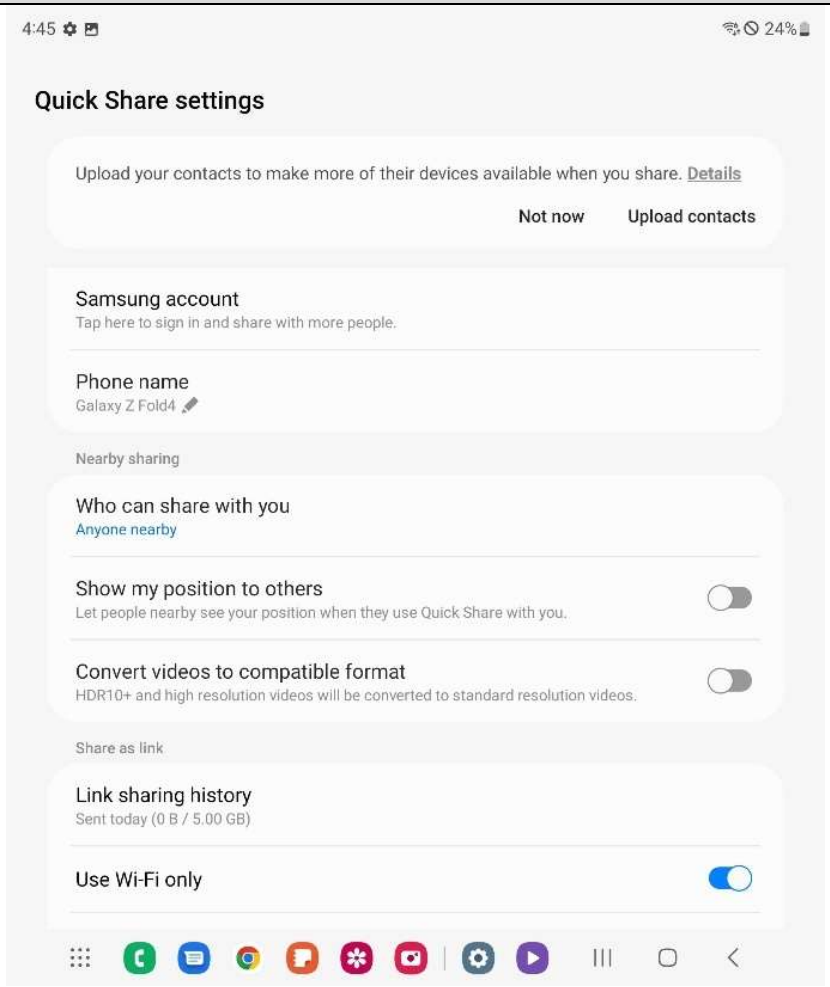
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ For example, the following screenshots show exemplary Accused Samsung '590 Products selecting Quick Share "Wi-Fi only" and then sending data through the Quick Share application:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy 23 Ultra: 

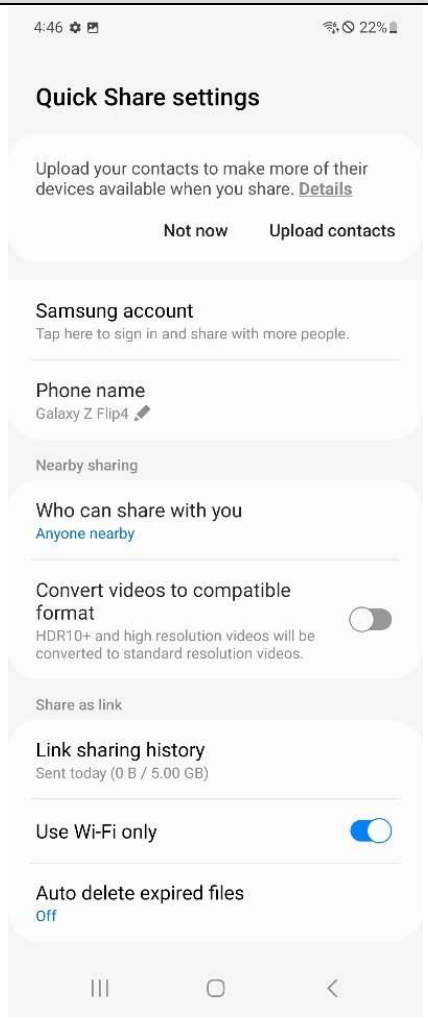
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Samsung Galaxy ZFlip 4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

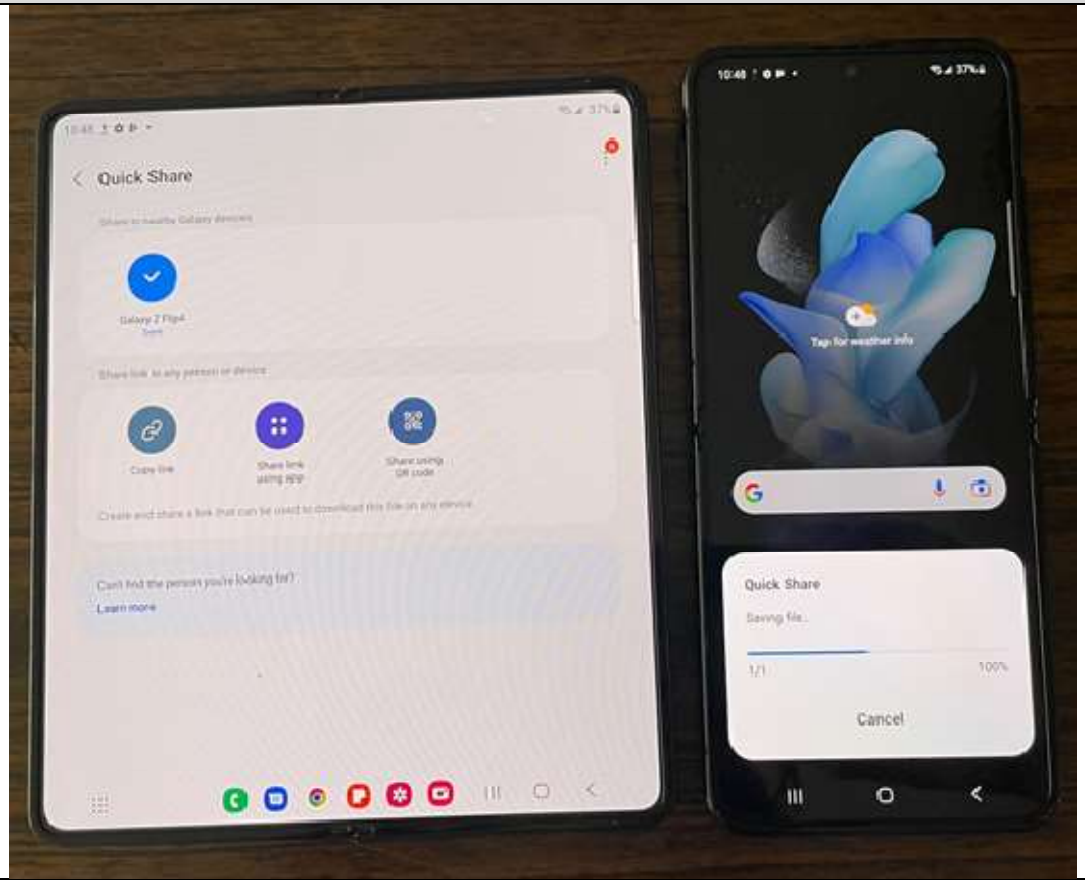
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

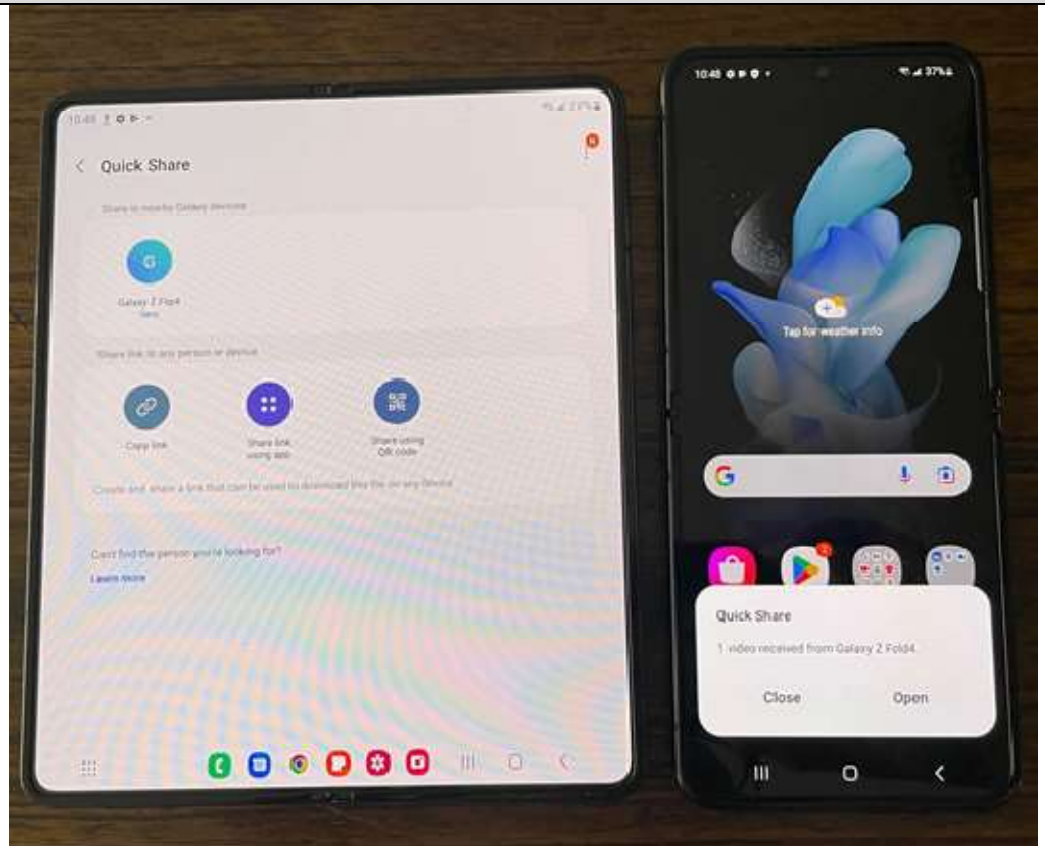
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
	Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)	


1 item
Quick Share
Bluetooth
Drive
Gmail
LinkedIn
Maps
Meet
Galaxy Store
Play Store
Google
Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

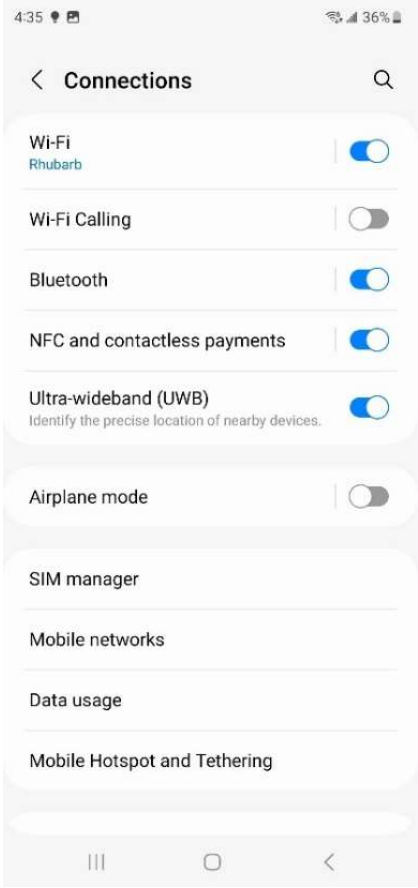


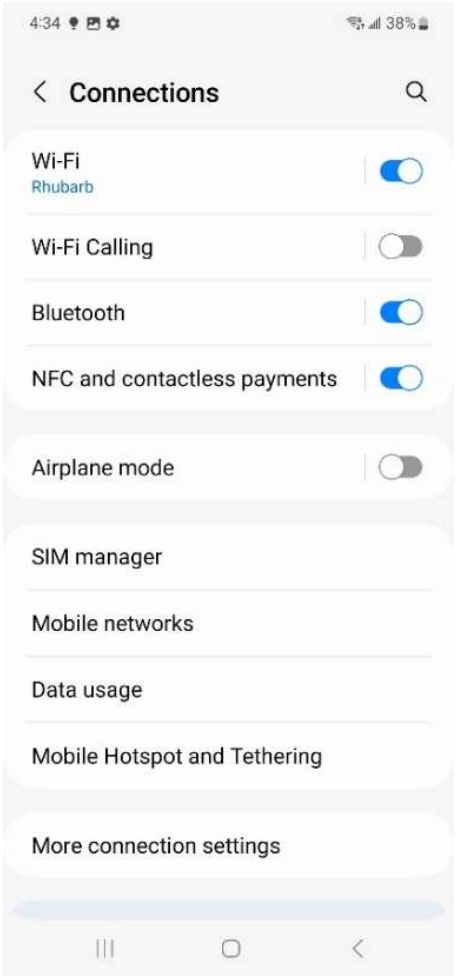
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

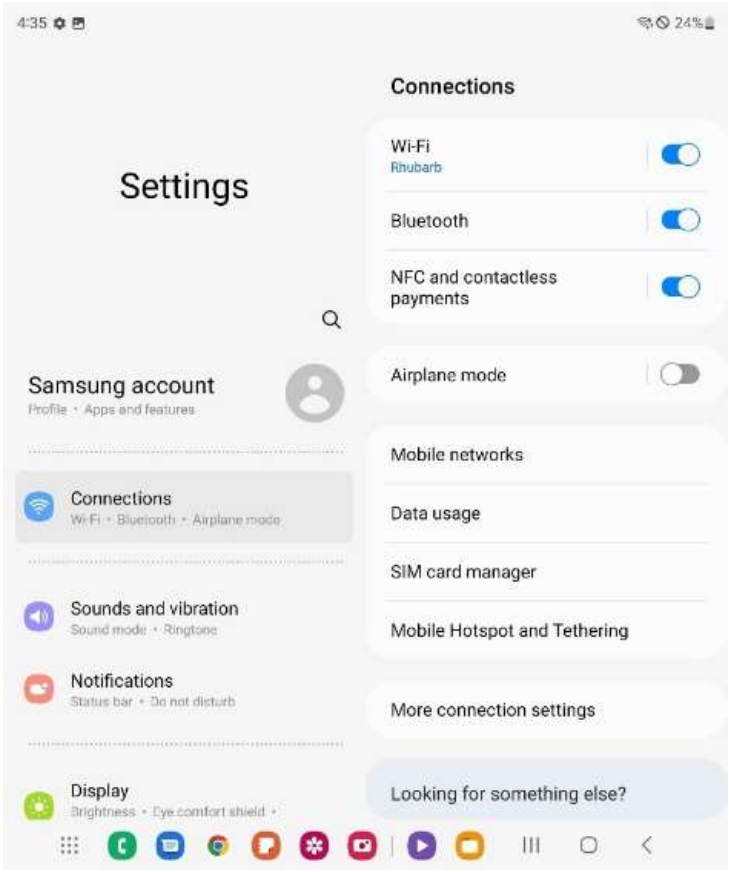
	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

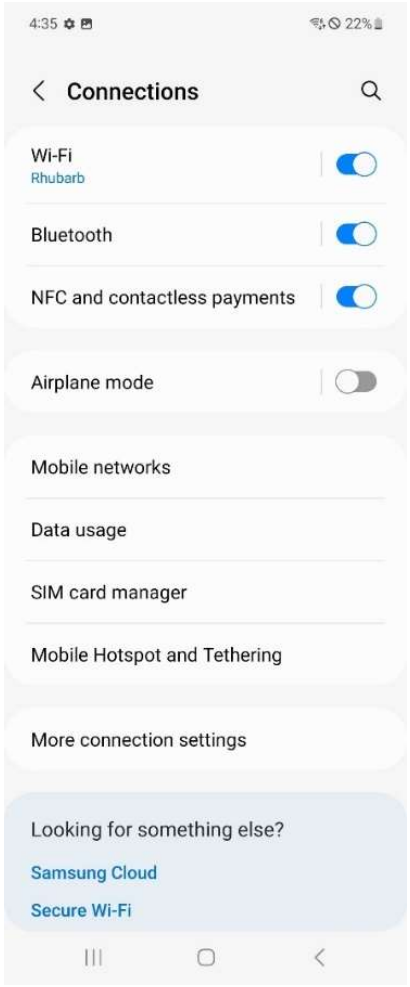
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 For example, the following screenshots show exemplary Accused Samsung '590 Products turning Wi-Fi on/off and cellular on/off (e.g., using the "Settings" and/or using quick menu options): User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

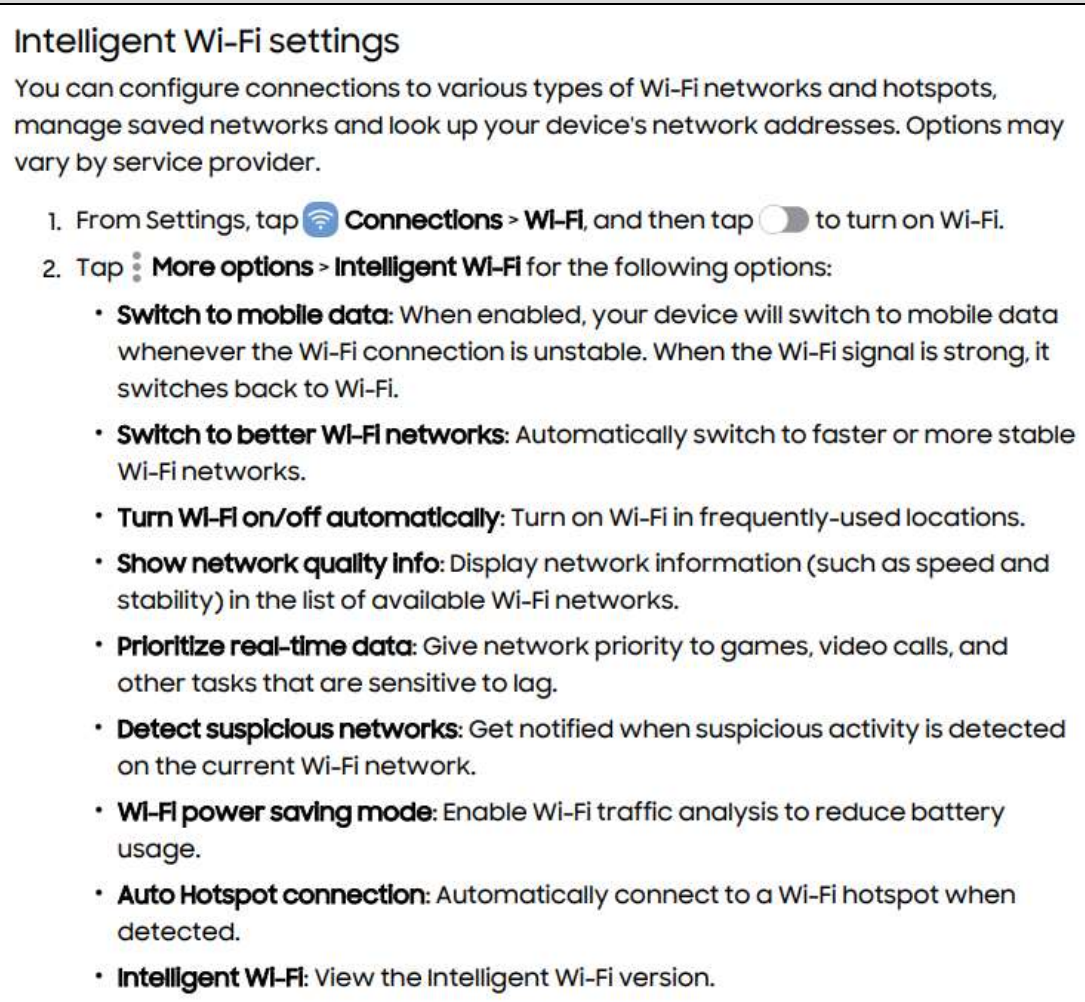
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

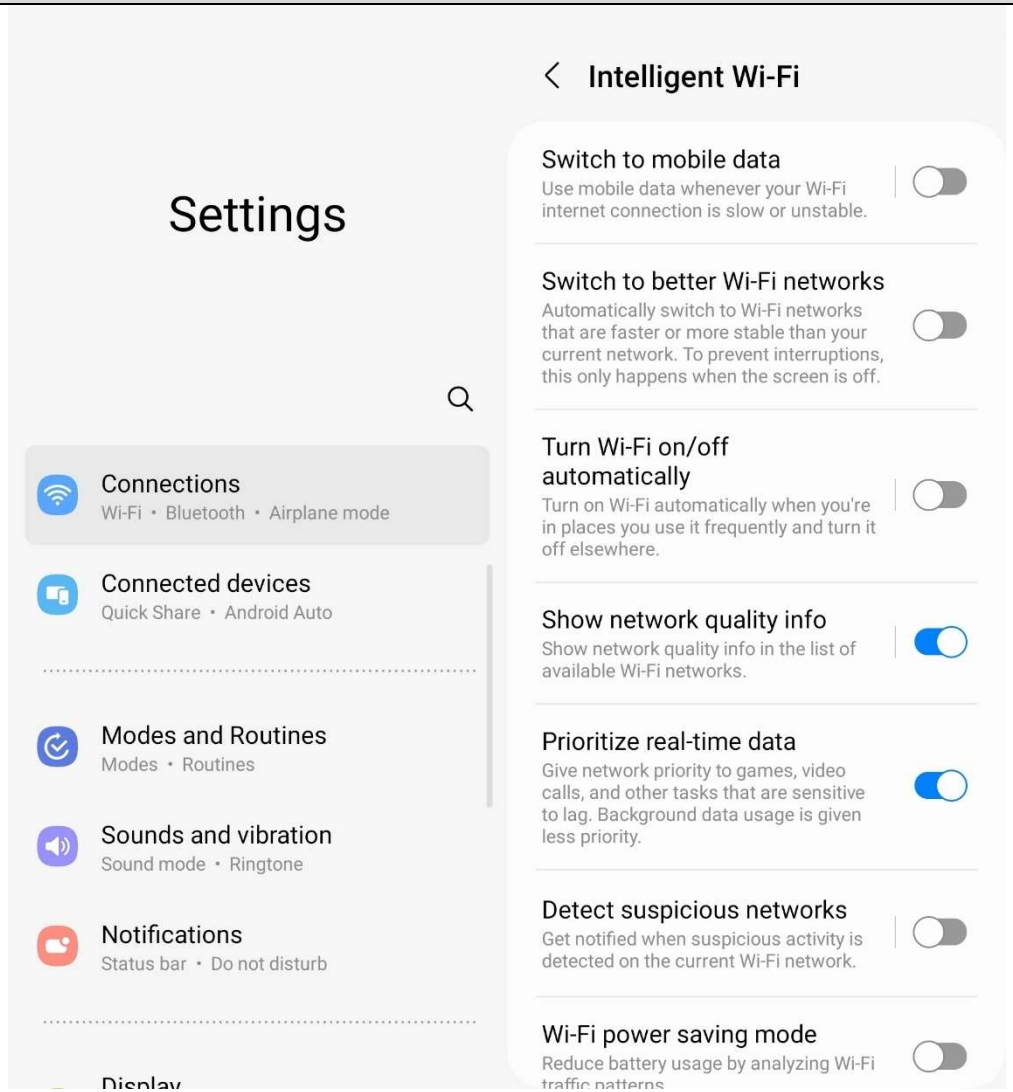
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of "an indication" from a user to control assignment, the user can turn Wi-Fi on and turn cellular connection off to indicate that the user wants to use Wi-Fi for communications. As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Wi-Fi off to indicate that the user wants to use cellular connection for communications. Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Switch to mobile data," under the Intelligent Wi-Fi tab, so the user is indicating to assign a connection to the cellular communication chip when the Wi-Fi connection is unstable. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 User Guide at pg. 122.

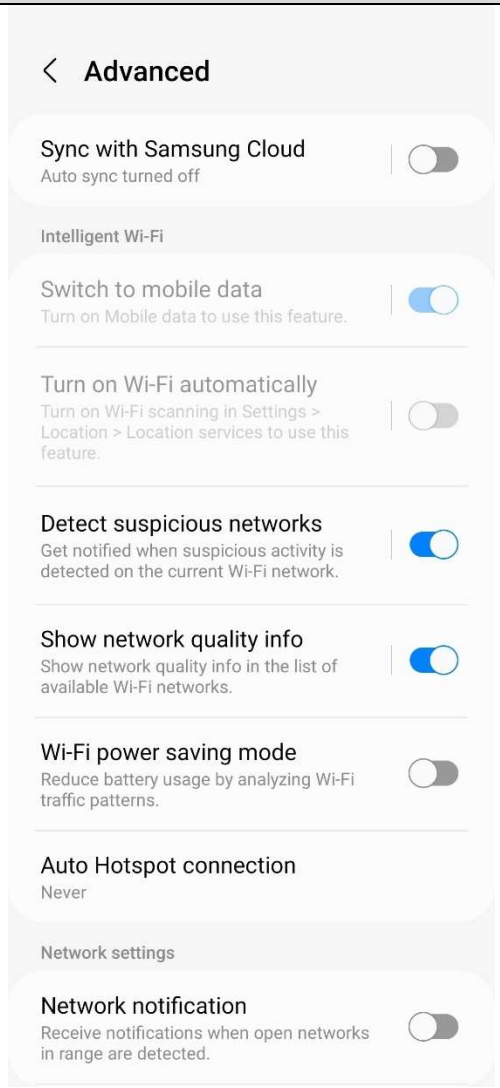
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



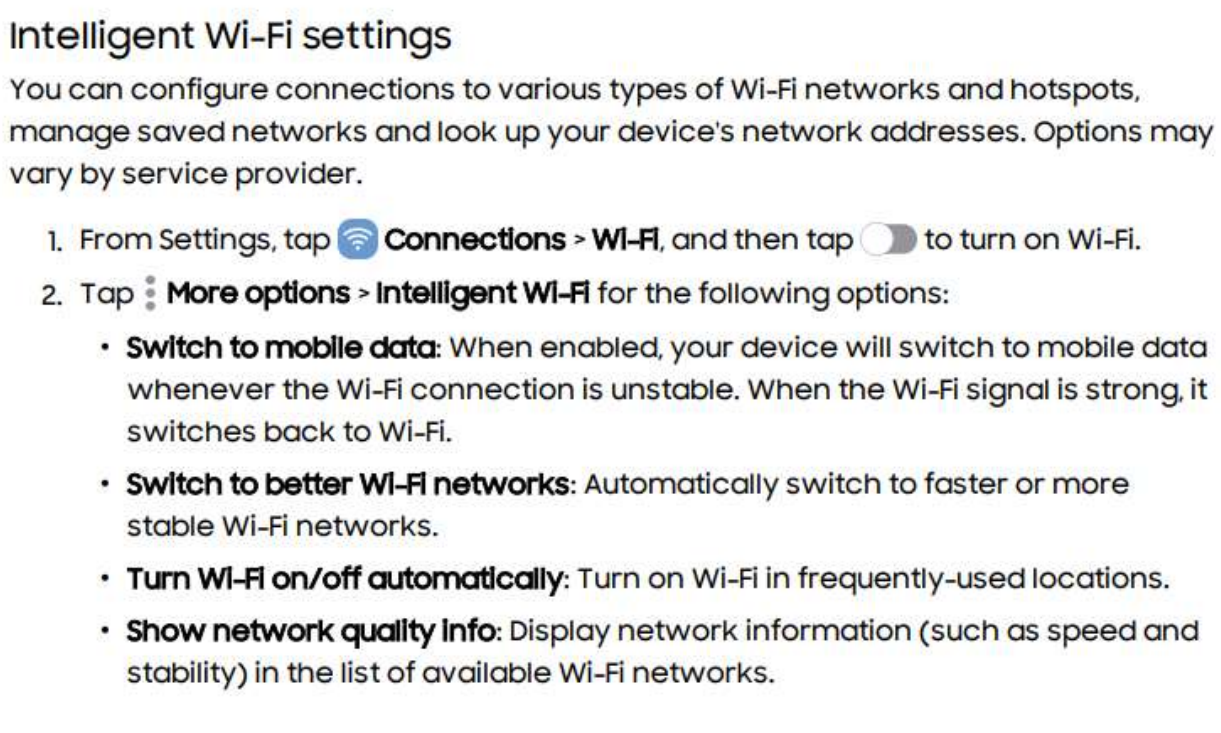
Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. • **Prioritize real-time data**: Give network priority to games, video calls, and other tasks that are sensitive to lag. • **Detect suspicious networks**: Get notified when suspicious activity is detected on the current Wi-Fi network. • **Wi-Fi power saving mode**: Enable Wi-Fi traffic analysis to reduce battery usage. • **Auto Hotspot connection**: Automatically connect to a Wi-Fi hotspot when detected. • **Intelligent Wi-Fi**: View the Intelligent Wi-Fi version. Galaxy Z Flip4 User Guide at pg. 122.

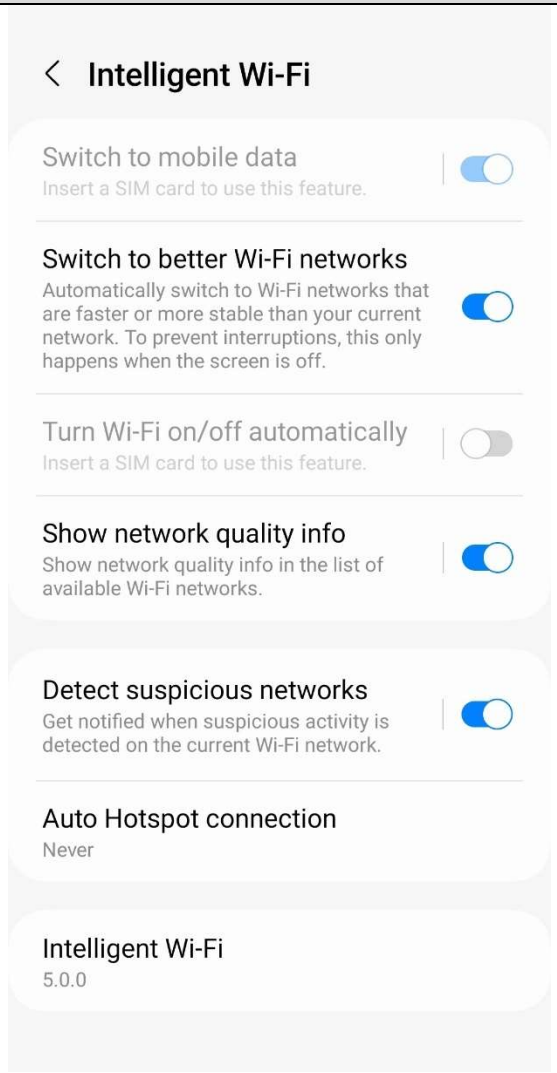
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G:  Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. Galaxy A54 G User Guide at pg. 101.

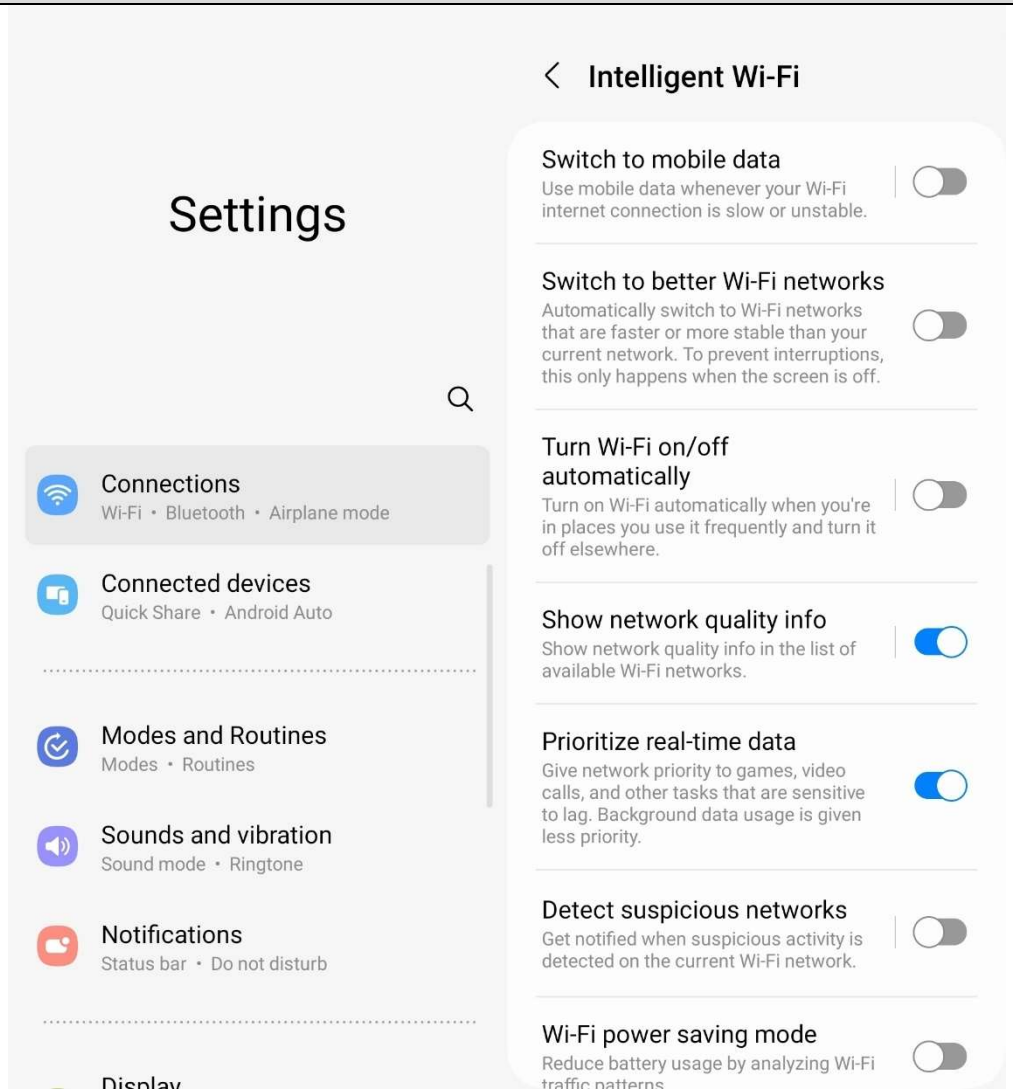
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



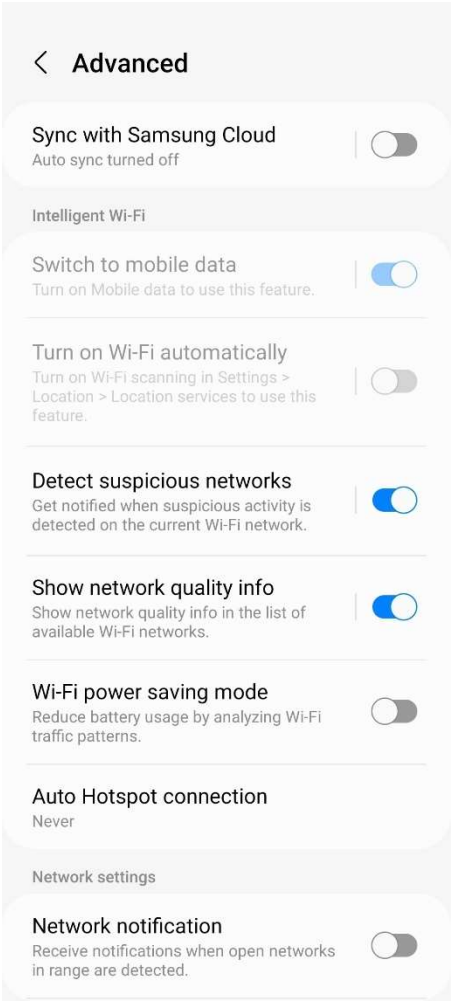
Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

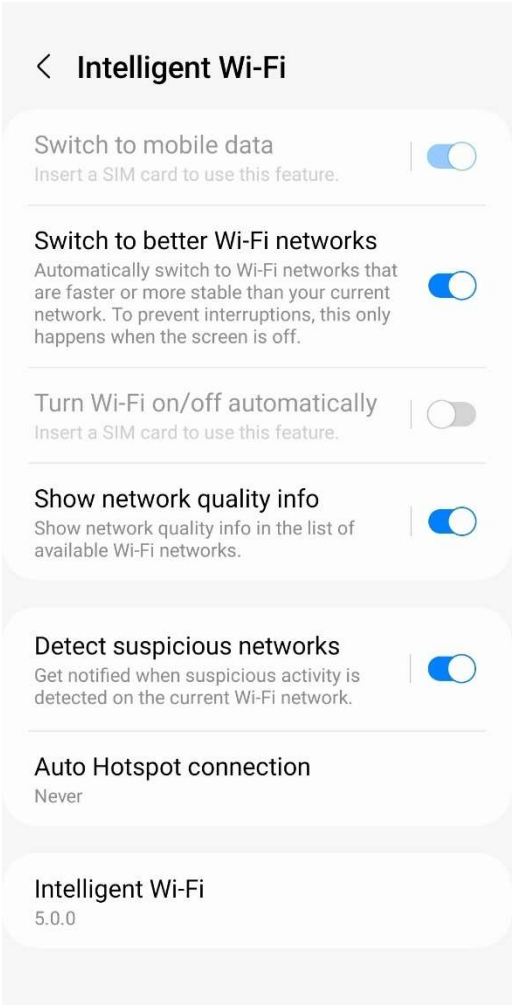
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Turn Wi-Fi on/off automatically," so the user is indicating to switch on Wi-Fi in frequently used areas. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

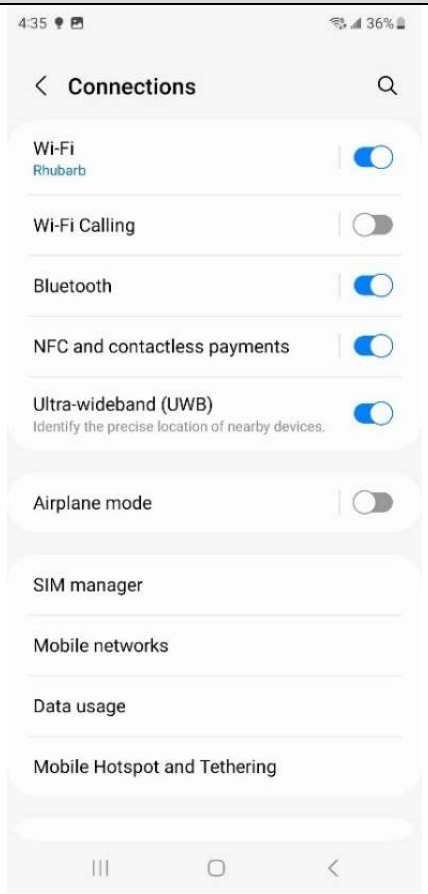


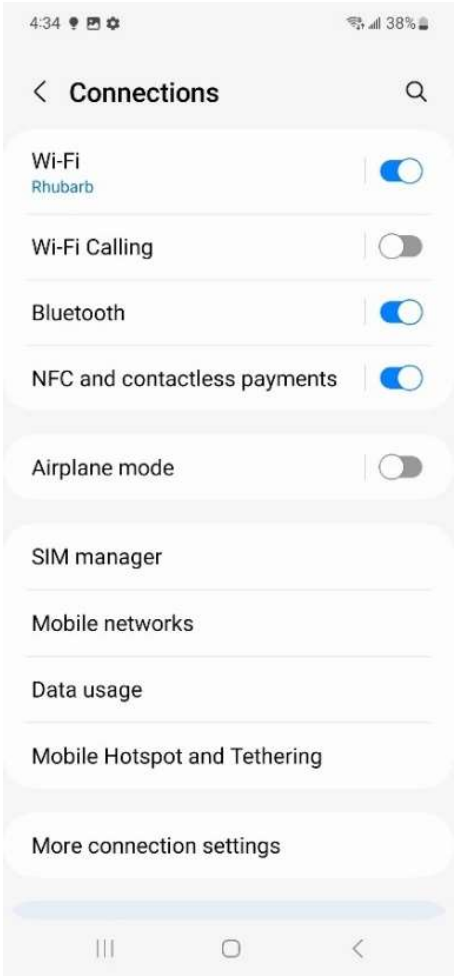
Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

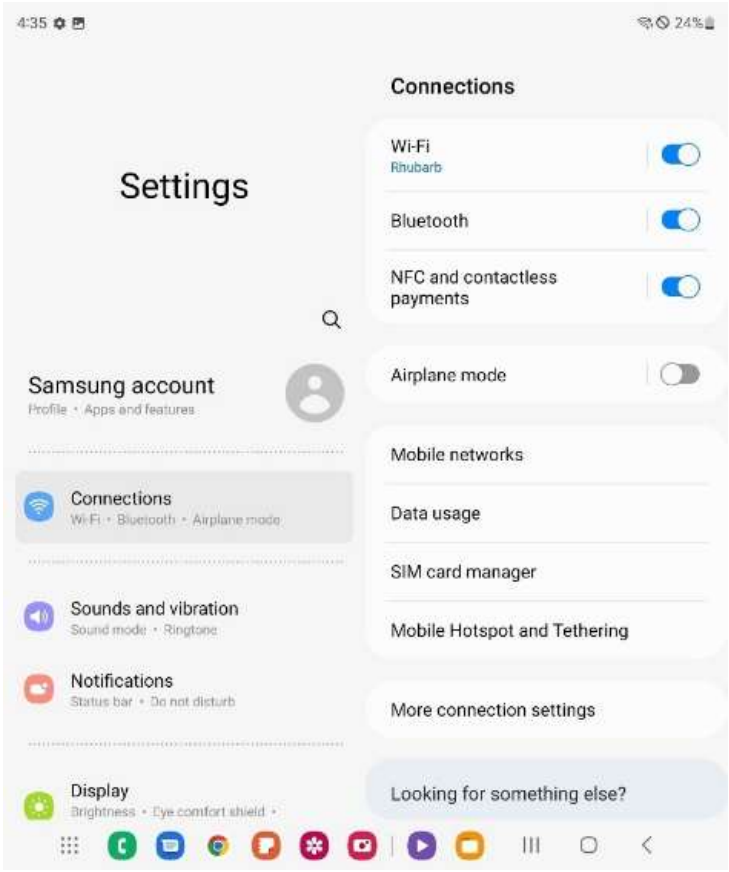
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

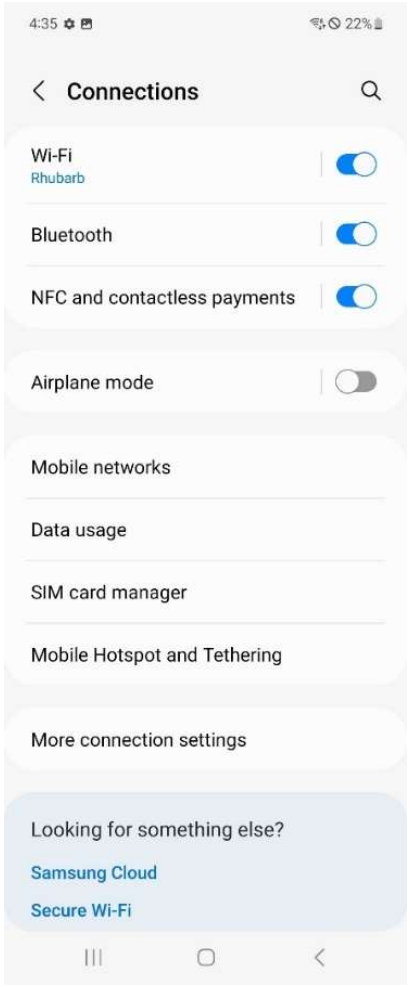
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting "Avoid bad Wi-Fi connections," so the user is indicating to assign a connection to the cellular communication chip when there are bad Wi-Fi connections. **Second Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Bluetooth and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the Bluetooth communication circuit, the controller assigns a connection to the Bluetooth communication circuit for transmitting the video by using Bluetooth to share files. For example, "an indication" from a user to control assignment to the Bluetooth communication chip is turning Bluetooth on/off, and "an indication" from a user to control assignment to the cellular communication chip is turning the cellular connection on/off from the quick menu. For example, the following screenshots show exemplary Accused Samsung '590 Products turning Bluetooth on/off and cellular on/off: User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>As an additional example of "an indication" from a user to control assignment, the user can turn Bluetooth on and turn cellular connection off to indicate that the user wants to use Bluetooth for communications.

As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Bluetooth off to indicate that the user wants to use cellular connection for communications.

Further, the user can provide an indication to transmit video information using the Bluetooth communication circuit by selecting "Bluetooth" share, and the controller then assigns a connection to the Bluetooth communication circuit for transmitting the video.

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

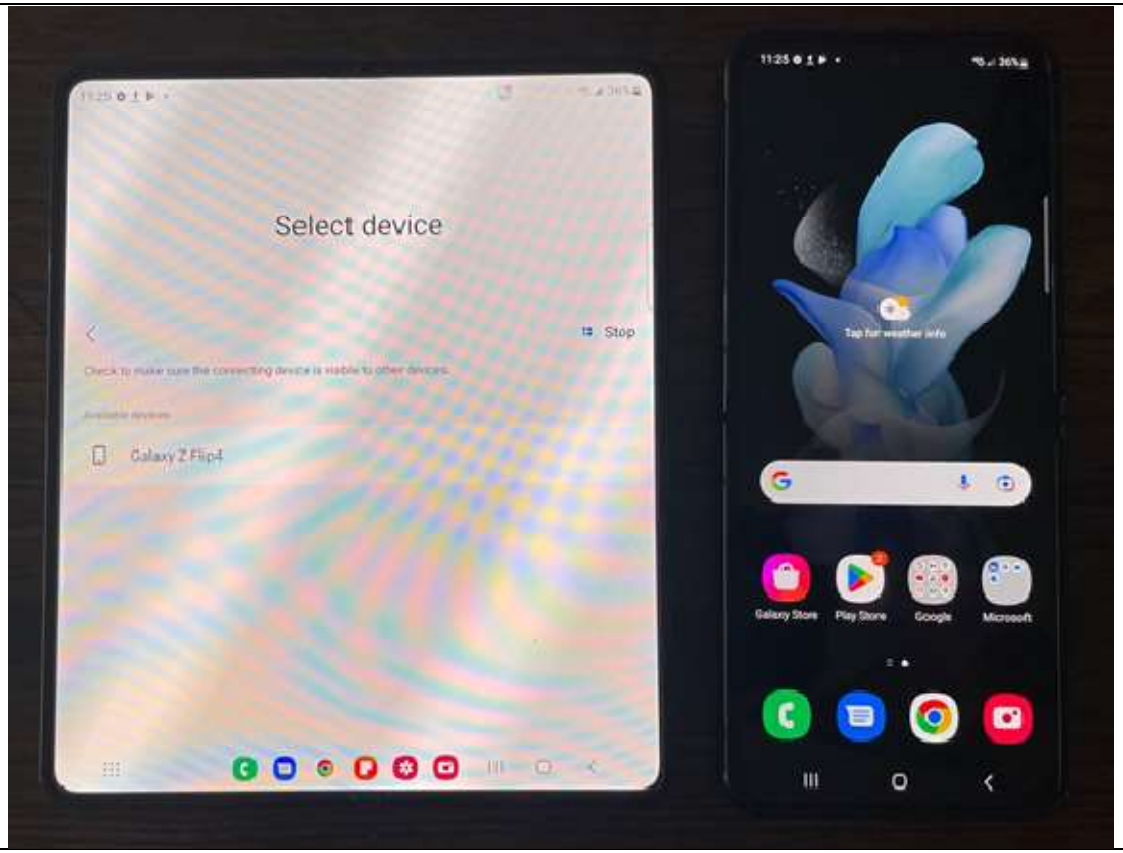
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

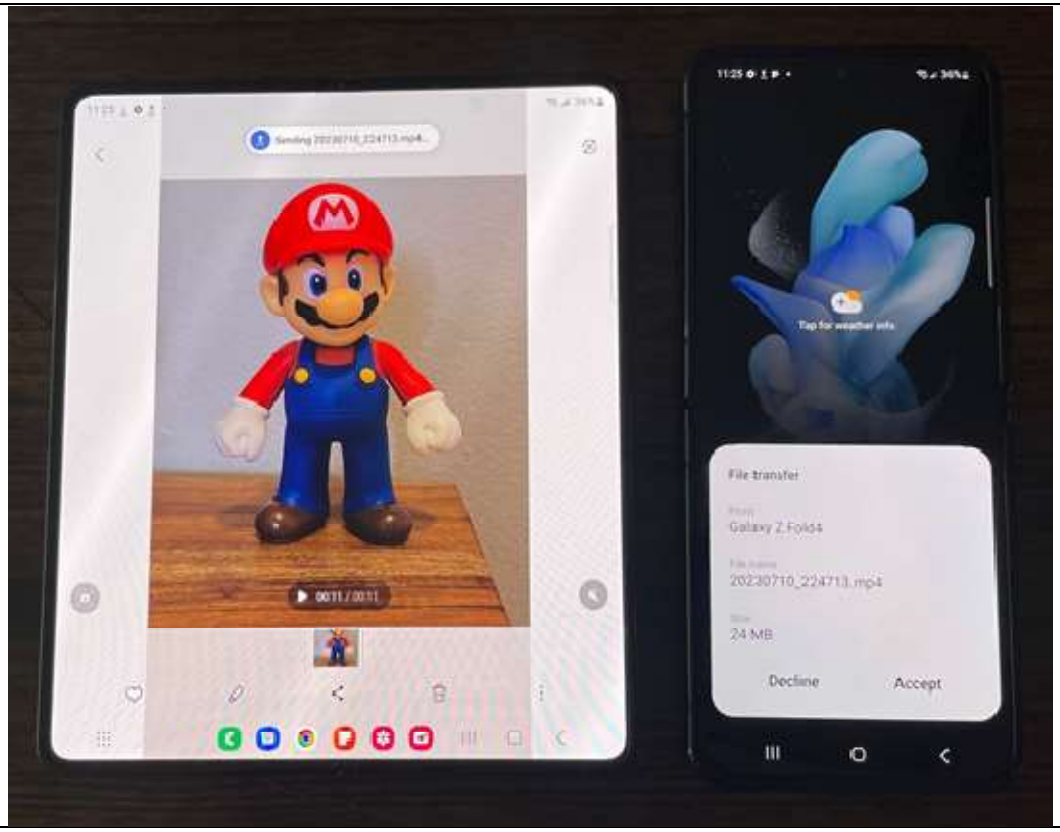
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft


Tap for weather info
File transfer
Galaxy Z Fold4
20230710_224713.mp4
24 MB
Decline
Accept

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



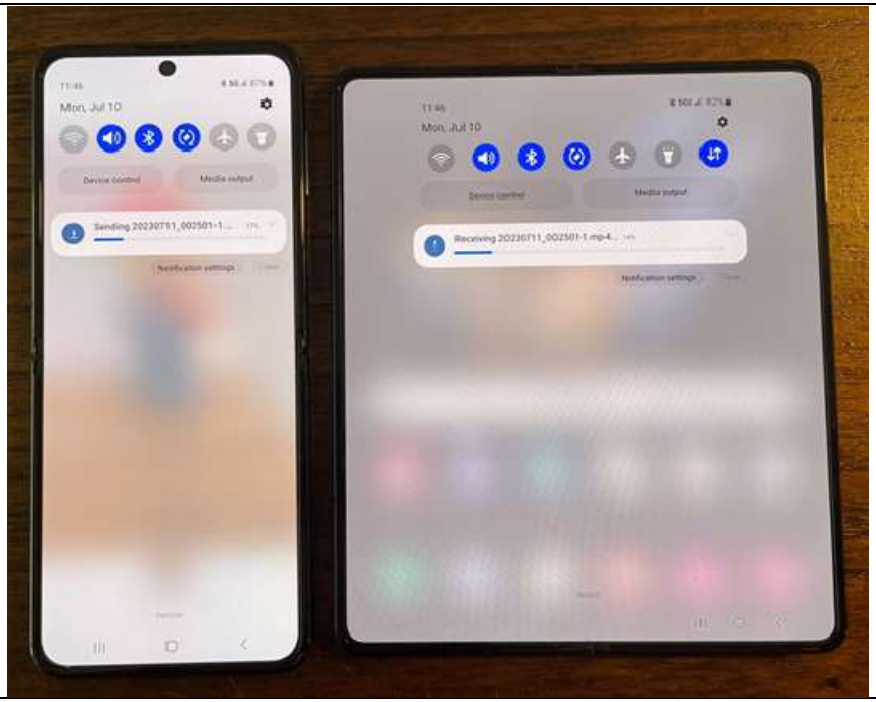
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 Galaxy Store Microsoft 23.2 MB Decline Accept	


Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls assignment of connection in response to a user selecting options via the touch interface (display) in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.
[9.j] wherein the transmitting and connecting is controlled so that the first radio communication circuit is configured to transmit video	Each of the Accused Samsung '590 Products performs a method wherein the transmitting and connecting is controlled so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
information and the second radio communication circuit is configured to connect to the internet or the home network simultaneously;	**First Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control the transmission of video information via the Wi-Fi communication chip (e.g., Quick Share) and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:** **1.7 Simultaneous Transmission Capabilities** According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

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60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

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Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

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12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

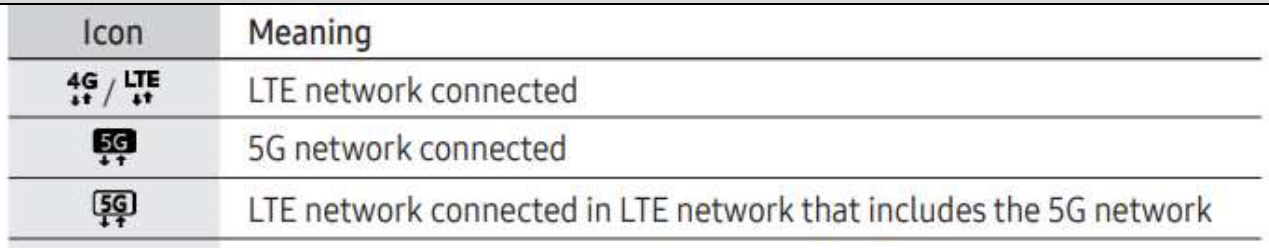
Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network

Galaxy S23 Ultra User Guide, pg. 30.

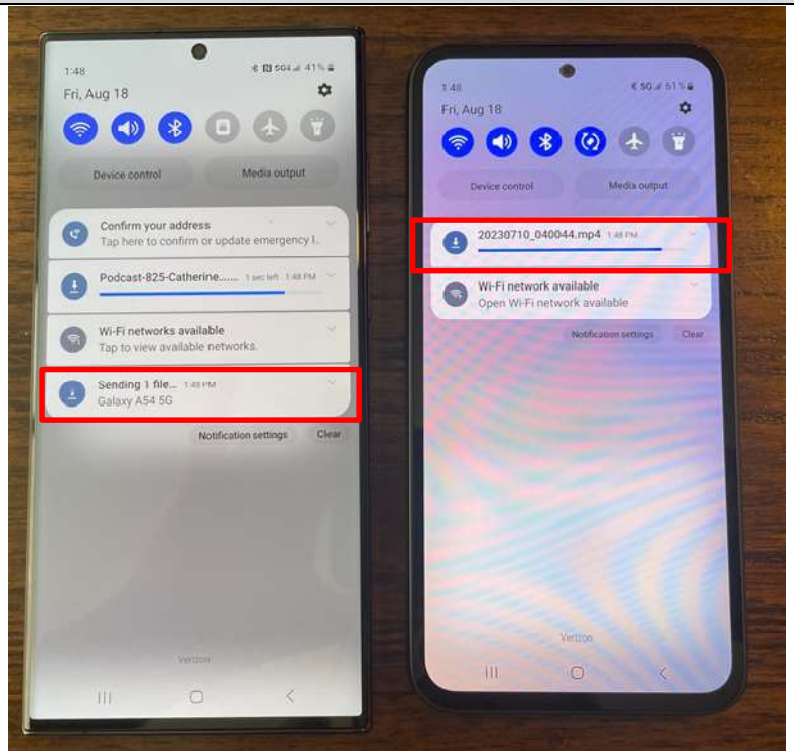
In addition, the Wi-Fi communication chip is used to transmit video information via "Quick Share" while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content over cellular network as Wi-Fi router is switched off indicating that data services are being provides simultaneously over cellular network. For example, the Accused Samsung '590 Products transmit video information over Quick Share while simultaneously connecting to the Internet over cellular network to send or receive emails/MMS, receive a stream of video, doing a video call and/or other services that require cellular data:

First theory:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

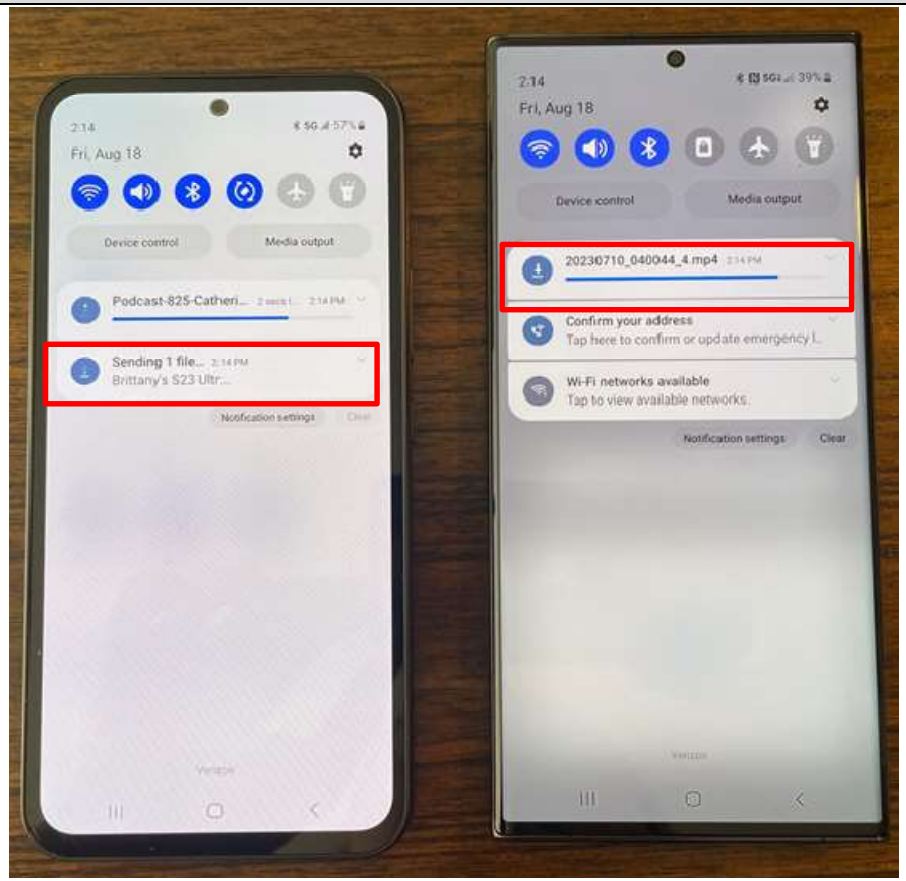
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

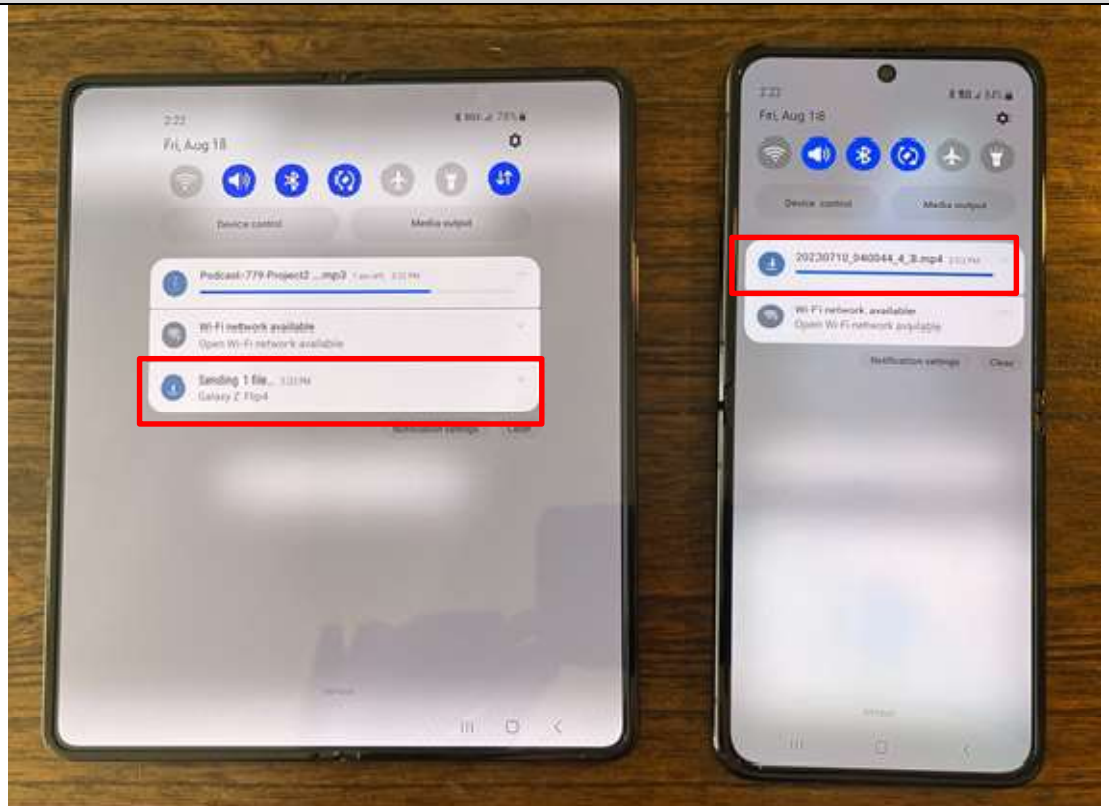


Video Information Transmitting Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

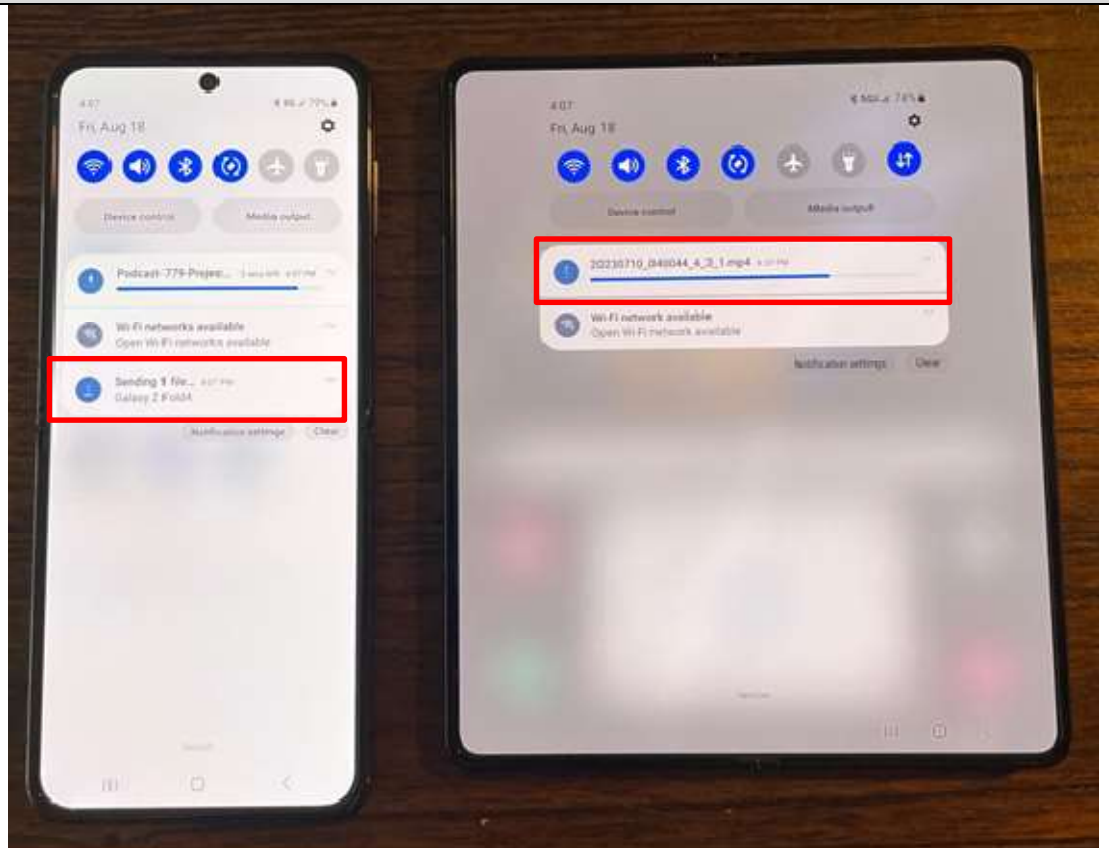
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control the transmission of video information via the Bluetooth communication chip and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	1.7 Simultaneous Transmission Capabilities According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

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Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

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60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

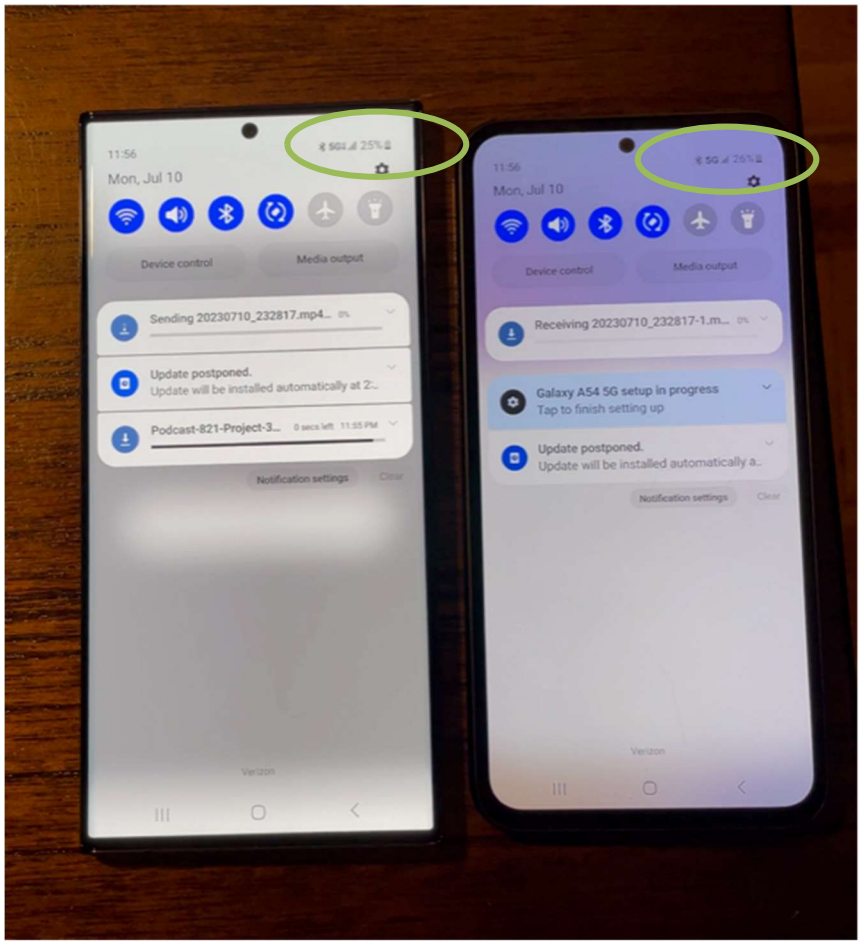
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network
	Wi-Fi connected
	Bluetooth feature turned on

Galaxy S23 Ultra User Guide, pg. 30.

The Bluetooth communication chip is used to transmit video information via Bluetooth file share while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content as Wi-Fi is switched off (similar functionality also applies to receiving e-mail or MMS or streaming video or doing a video call over a cellular network while transmitting a Bluetooth file simultaneously):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)



<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>
<table>
<tr><td>Video Information Transmitting Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)</td><td>Video Information Receiving Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)</td></tr>
</table>
</td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

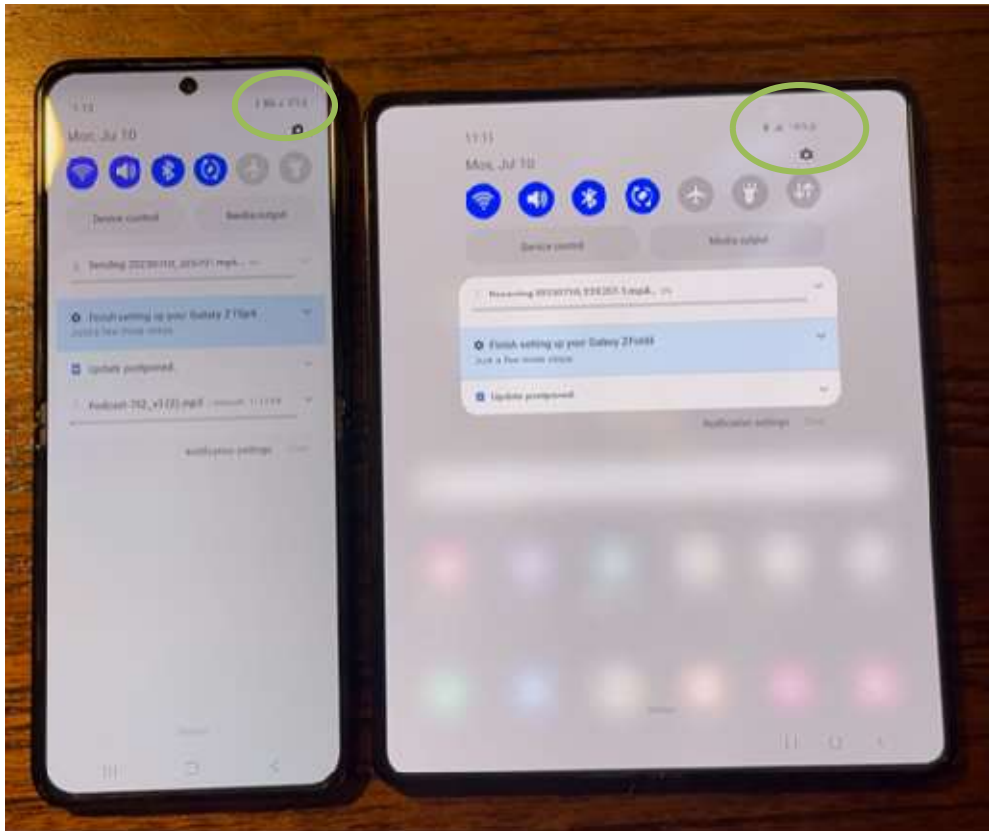


Video Information Transmitting Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls simultaneous communication by WiFi or Bluetooth and cellular circuits in a similar manner when implementing Samsung QuickShare/Bluetooth File Share and connecting to the Internet. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Doctrine of Equivalents To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling each of the first and second radio communication circuit so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, the Accused Samsung '590 Products include an application processor/CPU which executes the operating system and source code for various applications to control Bluetooth, Wi-Fi, and cellular functionalities occurring simultaneous. The performance of this function achieves substantially the same result, for example, simultaneous transmission of video information with connection to the internet or home network.
[9.k] receiving, via the second or third radio communication circuits a signal from the internet indicating that an update for an operating system is available; [9.l] executing the update process; [9.m] and storing an updated operating system after execution of the update process.	Each of the Accused Samsung '590 Products performs a method of receiving, via the second or third radio communication circuits, a signal from the internet indicating that an update for an operating system is available, executing the update process, and storing an updated operating system after execution of the update process. For example, the operating system can be updated by connecting to the Internet via cellular communication circuits. **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Software update

Update your device's software through the firmware over-the-air (FOTA) service. You can also schedule software updates.

On the Settings screen, tap **Software update**.

- **Download and install**: Check for and install updates manually.
- **Auto download over Wi-Fi**: Set the device to download updates automatically when connected to a Wi-Fi network.
- **Last update**: Check out information about the last software update.

If emergency software updates are released for your device's security and to block new types of security threats, they will be installed automatically without your agreement.

Security updates information

Security updates are provided to strengthen the security of your device and protect your personal information. For security updates for your model, visit security.samsungmobile.com.

The website supports only some languages.

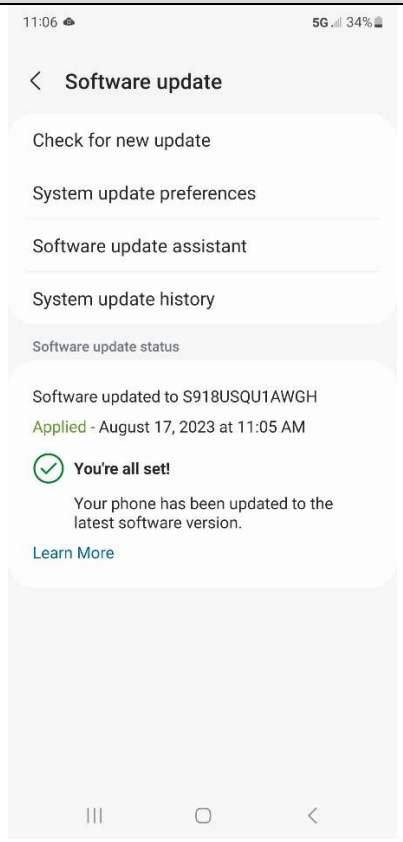
Galaxy S23 Series User Guide at pg. 163.

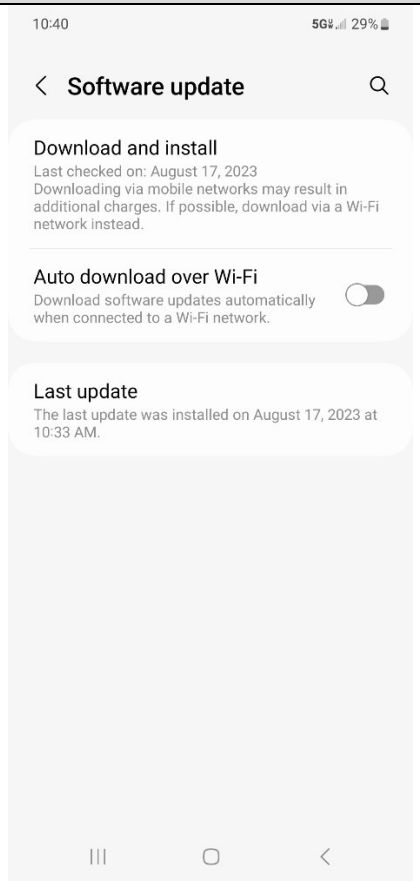
Galaxy Z Flip4:

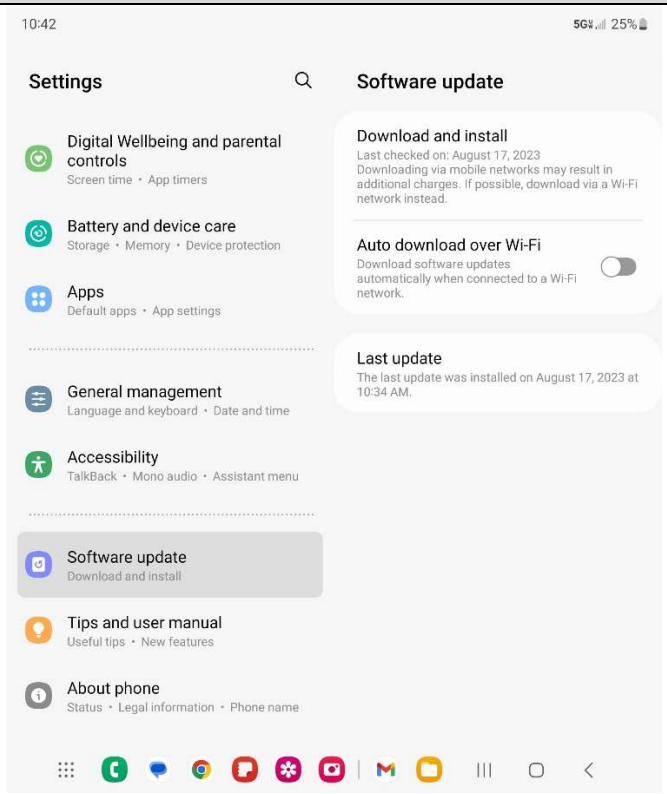
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy Z Fold4:**

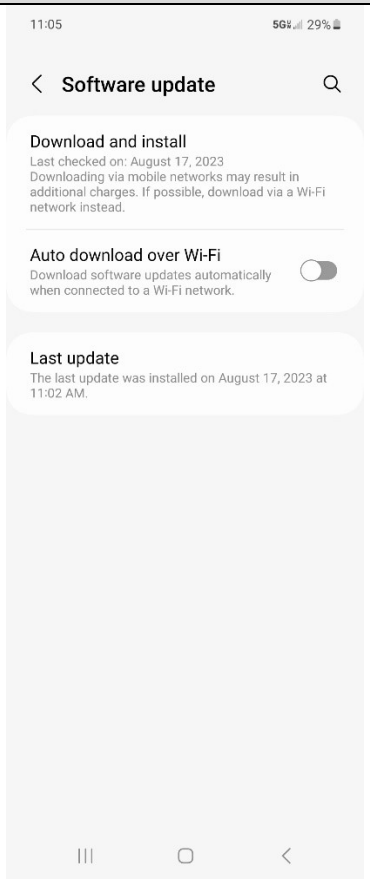
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy A54 5G:**

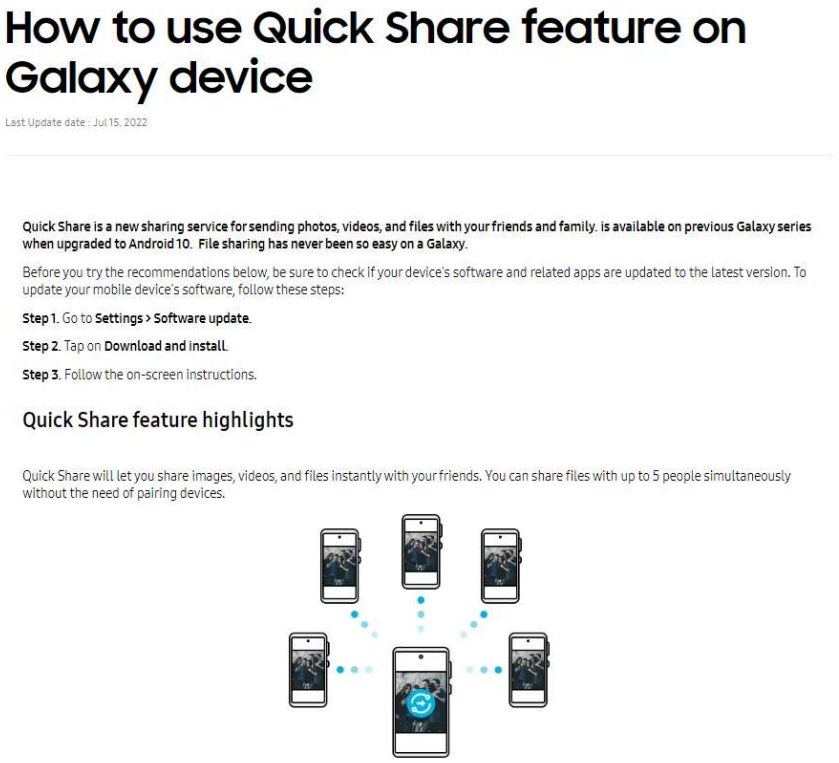
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Auto download over Wi-Fi**: Automatically download software updates when the device is connected to a Wi-Fi network. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy A54 User Guide at pg. 146. For example, the following screenshots show exemplary Accused Samsung '590 Products using the second radio communication circuits ("Download and install" option) to receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available: Galaxy S23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy ZFold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy ZFlip 4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for receiving a signal from the Internet and updating the operating system in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00077582/.
[10. preamble] A method, comprising:	Each of the Accused Samsung '590 Products performs a method of implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[10.a] implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band;	**First Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band.  How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update.** **Step 2.** Tap on **Download and install.** **Step 3.** Follow the on-screen instructions. Quick Share feature highlights Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

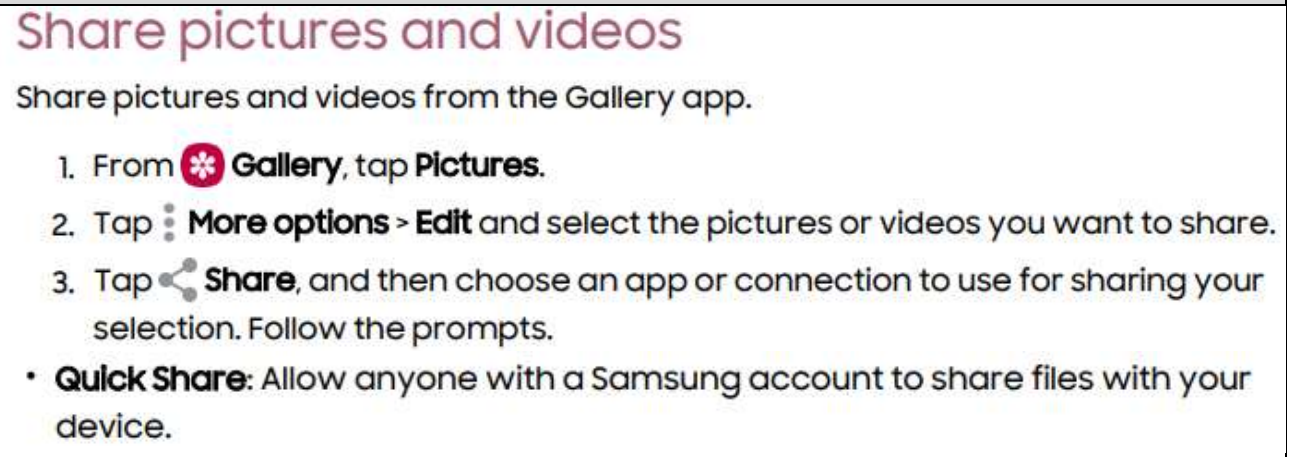
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	# Sharing content Share content by using various sharing options. The following actions are an example of sharing images. 1 Open the **Gallery** app and select an image. 2 Tap and select a sharing method you want. You may incur additional charges when sharing files through the mobile network. ## Quick Share ### Sharing content with nearby devices Share content with nearby devices through Wi-Fi Direct or Bluetooth, or with some SmartThings supported devices. 1 Open the **Gallery** app and select an image. 2 On the other device, open the notification panel, swipe downwards, and then tap (**Quick Share**) to turn it on. If you cannot find (**Quick Share**) on the quick panel, tap and drag the button over to add it.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3 Tap → **Quick Share** and select a device to receive the image. 4 Accept the file transfer request on the other device. This feature does not support sharing videos with TVs or SmartThings supported devices. To watch videos on TV, use the Smart View feature. **Setting who can find your phone** Set who is allowed to find and send content to your phone. 1 Open the notification panel, swipe downwards, and then tap (**Quick Share**). 2 Select an option. • **No one**: Do not allow others to find your phone. • **Contacts only**: Only allow Samsung users in your contacts to share with your phone. • **Anyone nearby**: Allow any nearby devices to share with your phone. **Sharing through Web link** Upload large files to the Samsung storage server and share them with others through Web link. 1 Open the **Gallery** app and select an image. 2 Tap → **Quick Share** and select an option you want under **Share to any device**. • **Copy link**: Share the link copied to the clipboard. • **Share link using app**: Share the link by selecting an app. • **Share using QR code**: Share the link with the created QR code. Galaxy S23 Series User Guide at pg. 111-112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

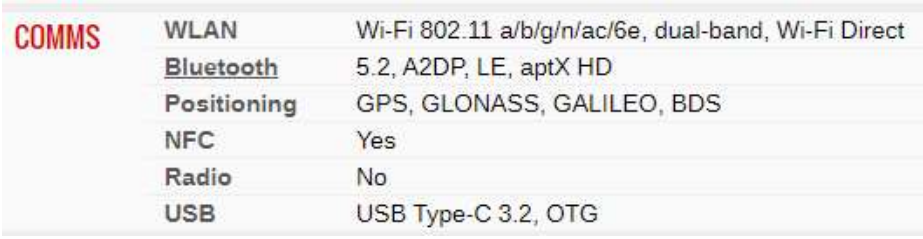
Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

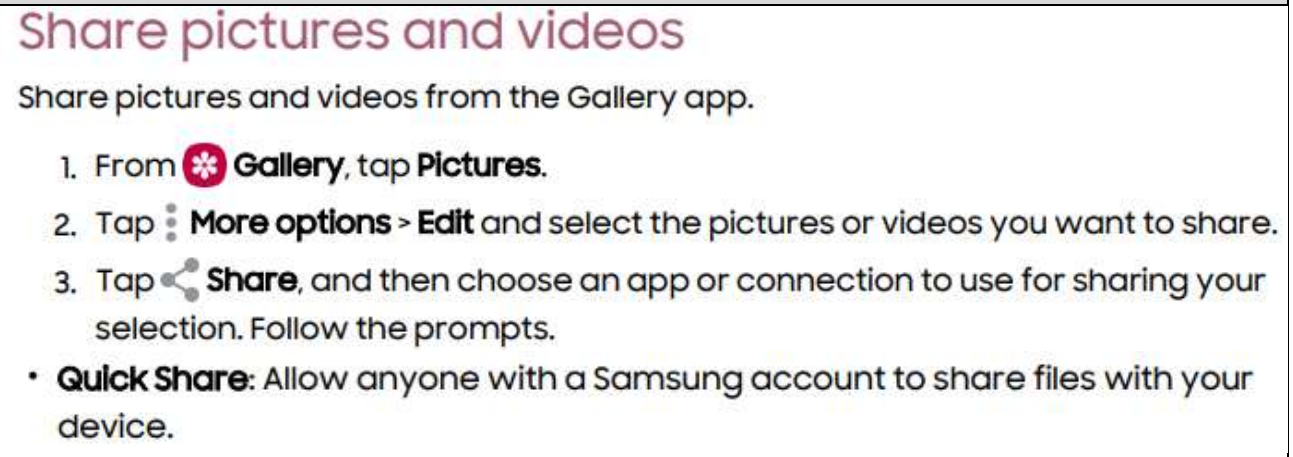
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

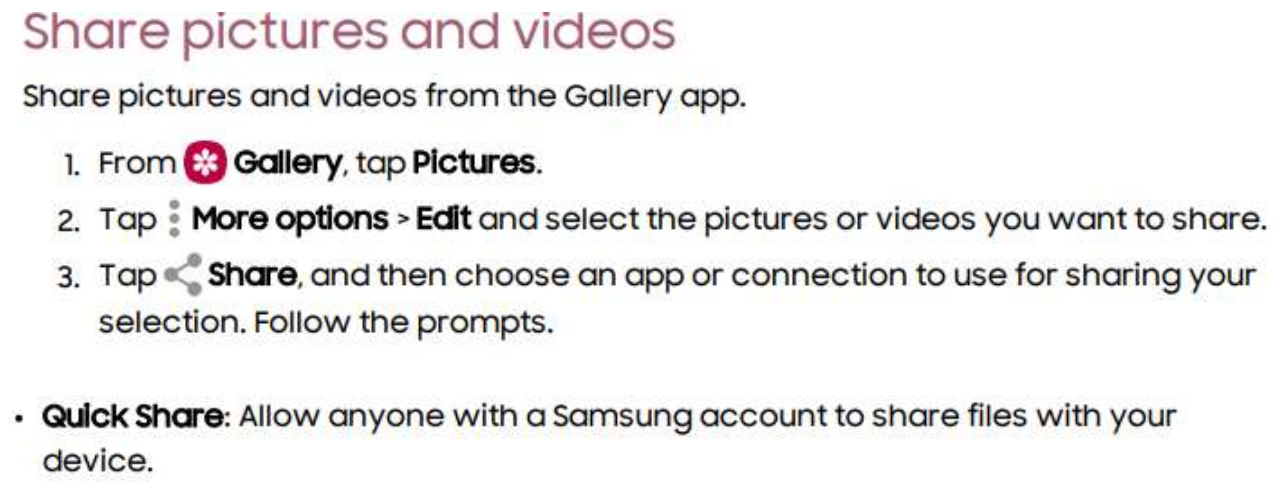
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE, aptX HD Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes (market/region dependent) Radio: No USB: USB Type-C 2.0, OTG Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 49, 112.

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Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

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	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

See also Appendix 8 showing that the remaining Accused Samsung '590 Products include a Wi-Fi communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/.

Second Infringement Theory:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php. Bluetooth Use Bluetooth to exchange data or media files with other Bluetooth-enabled devices. Precautions for using Bluetooth • Samsung is not responsible for the loss, interception, or misuse of data sent or received through Bluetooth. • Always ensure that you share and receive data with devices that are trusted and properly secured. If there are obstacles between the devices, the operating distance may be reduced. • Some devices, especially those that are not tested or approved by the Bluetooth SIG, may be incompatible with your device. • Do not use the Bluetooth feature for illegal purposes (for example, pirating copies of files or illegally tapping communications for commercial purposes). Samsung is not responsible for the repercussion of illegal use of the Bluetooth feature.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Pairing with other Bluetooth devices 1 On the Settings screen, tap **Connections** → **Bluetooth** and tap the switch to turn it on. The detected devices will be listed. 2 Select a device to pair with. If the device you want to pair with is not on the list, set the device to enter Bluetooth pairing mode. Refer to the other device's user manuals. Your phone is visible to other devices while the Bluetooth settings screen is open. 3 Accept the Bluetooth connection request on your phone to confirm. The devices will be connected when the other device accepts the Bluetooth connection request. To unpair the devices, tap next to the device name to unpair and tap **Unpair**. **Sending and receiving data** Many apps support data transfer through Bluetooth. You can share data, such as contacts or media files, with other Bluetooth devices. The following actions are an example of sending an image to another device. 1 Open the **Gallery** app and select an image. 2 Tap → **Bluetooth** and select a device to receive the image. If the device you want to pair with is not in the list, turn on its visibility option. 3 Accept the Bluetooth connection request on the other device. Galaxy S23 Series User Guide at pg. 124-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

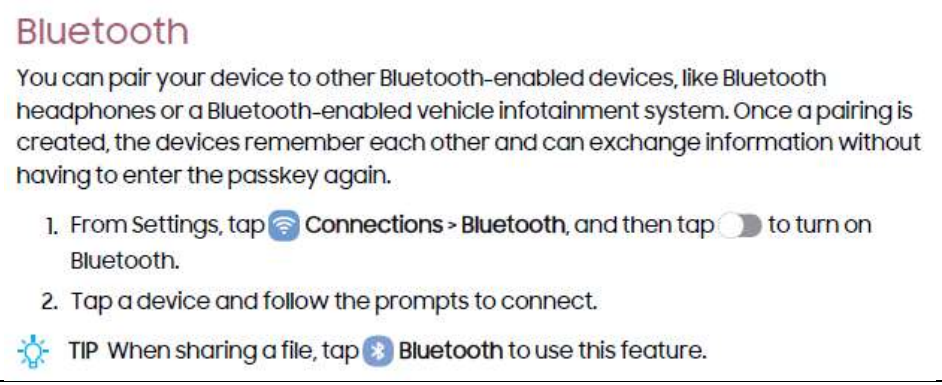
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power	
				[dBm]	[mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. TIP When sharing a file, tap Bluetooth to use this feature.

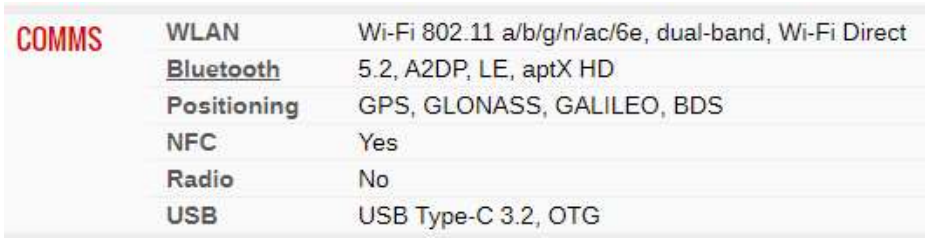
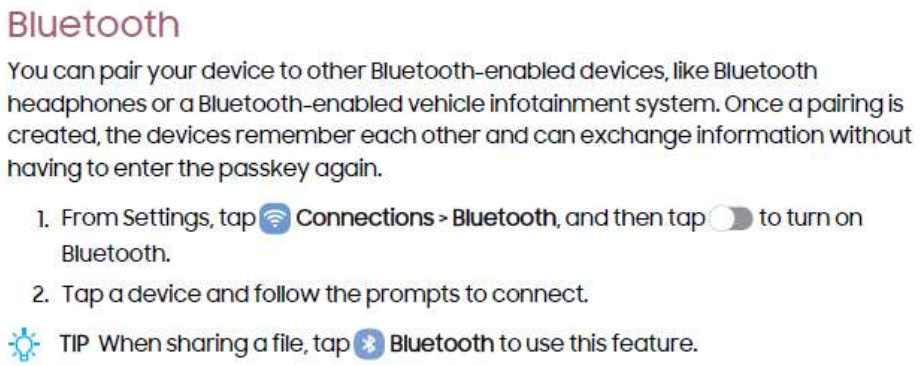
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

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	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-  11737.php

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6e, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE, aptX HD
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 3.2, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

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Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

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	Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. • To disconnect from a paired device, tap **Disconnect**. Tap **Connect** to reconnect. **TIP** When sharing a file, tap **Bluetooth** to use this feature. **Rename a paired device** You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**.

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	Unpair from a Bluetooth device When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Phone name:** Change the name of your device for Bluetooth connections. • **Received files:** View a list of files received using Bluetooth. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

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Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

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9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

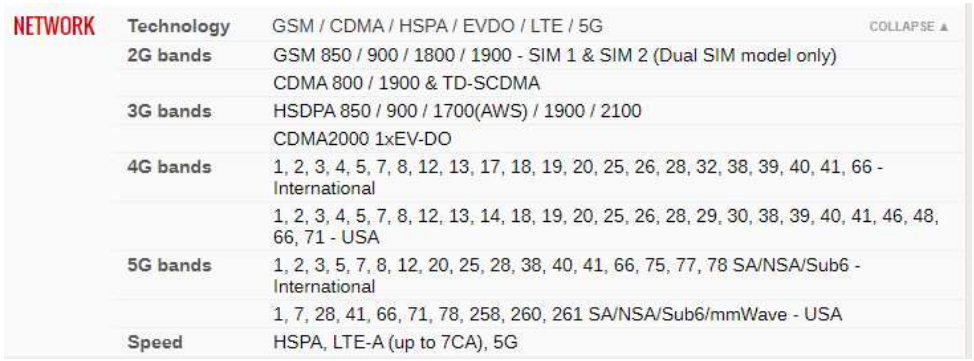
Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

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	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include a Bluetooth communication chip and operate in a similar manner.
[10.b] implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band;	Each of the Accused Samsung '590 Products performs a method of implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band. For example, each of Accused Samsung '590 Products includes a cellular communication chip implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band. Specifically, the Accused Samsung '590 Products use a cellular communication chip configured to operate in one or more of 2G/3G/LTE/5G protocols. **Galaxy S23 Ultra:** For example, the Galaxy S23 Ultra is configured for at least one or more of GSM, 3G, 4G LTE, and 5G cellular communications. For example, the Galaxy S23 Ultra comprises a cellular communication chip and processor and/or CPU.  NETWORK Technology — GSM / CDMA / HSPA / EVDO / LTE / 5G (COLLAPSE) 2G bands — GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only) CDMA 800 / 1900 & TD-SCDMA 3G bands — HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 CDMA2000 1xEV-DO 4G bands — 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA 5G bands — 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International 1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA Speed — HSPA, LTE-A (up to 7CA), 5G Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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Table 9-20

LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

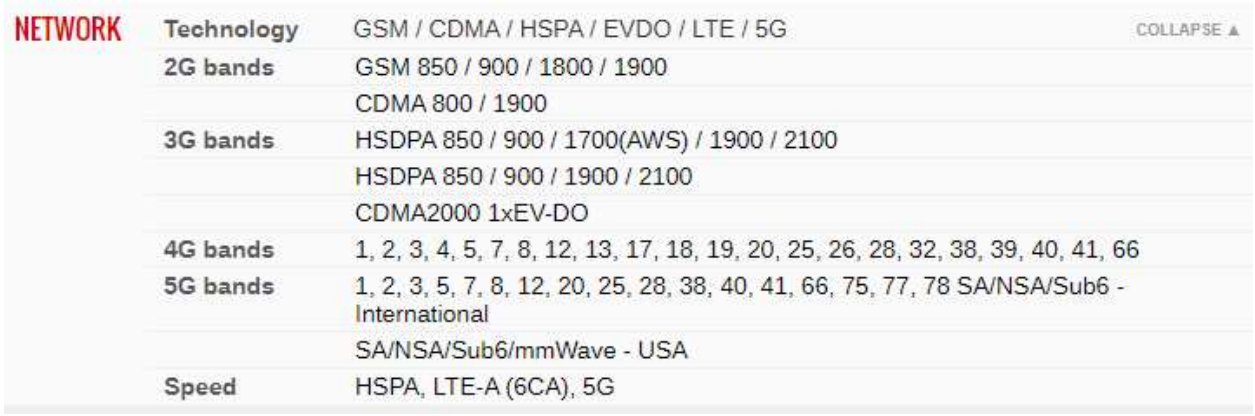
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Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

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	 Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

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LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

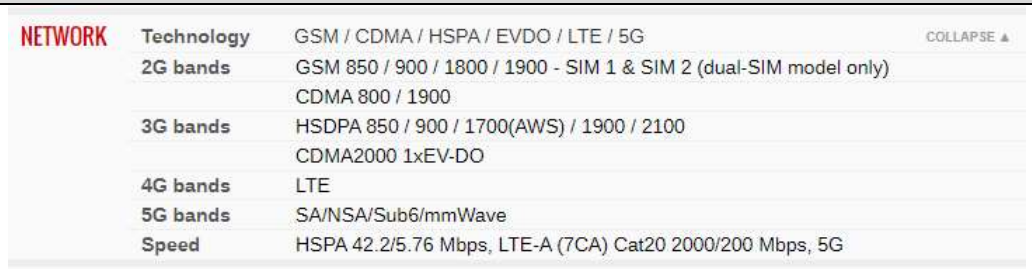
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

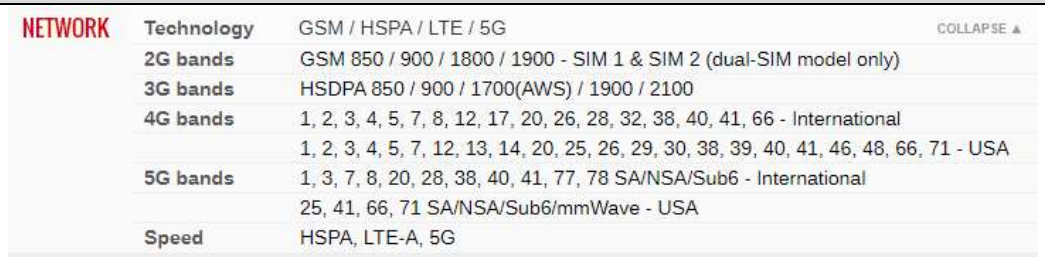
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■ QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **Cellular Frequency Bandwidth and Modulation/Demodulation Method:** ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **2G:**

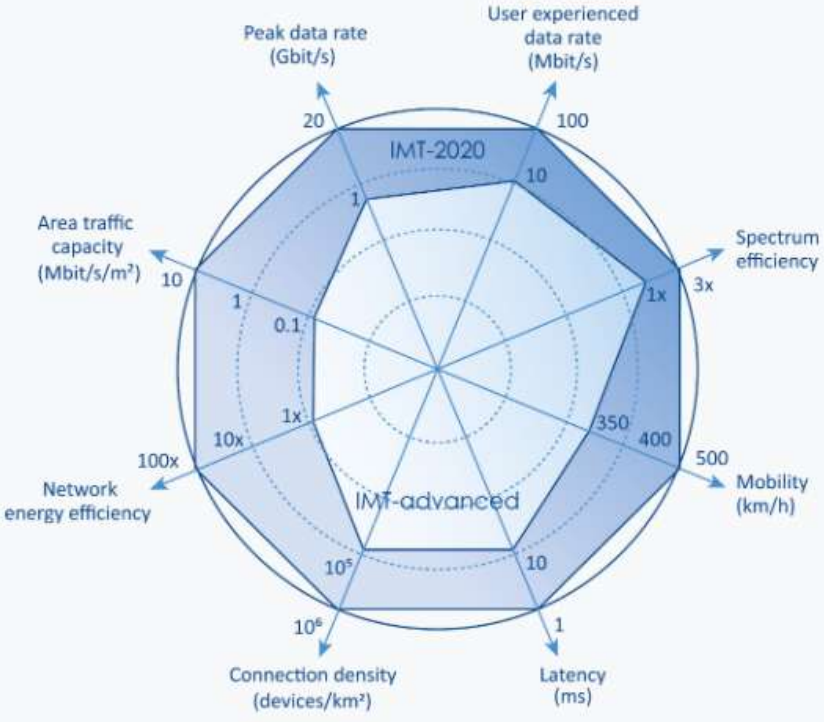
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Global System for Mobile communication (GSM) The technology behind the Global System for Mobile communication (GSM™) uses Gaussian Minimum Shift Keying (GMSK) modulation a variant of Phase Shift Keying (PSK) with Time Division Multiple Access (TDMA) signalling over Frequency Division Duplex (FDD) carriers. The physical layer is specified in 3GPP TS 45.001 and the logical channels in 3GPP TS 45.002. The channel coding is specified in 3GPP TS 45.003 and the modulation is specified in 3GPP TS 45.004. Although originally designed for operation in the 900 MHz band, it was soon adapted for 1800 MHz. The introduction of GSM into North America meant further adaptation to the 800 and 1900 MHz bands. Over the years, the versatility of GSM has resulted in the specifications being adapted to many more frequency bands to meet niche markets. A full list can be found in 3GPP TS 45.005. GSM has a channel spacing of 200kHz and was designed principally for voice telephony, but a range of bearer services was defined (a subset of those available for fixed line Integrated Services Digital Networks, ISDN), allowing circuit-switched data connections at up to 9600 bits/s. At the time of the original system design, this rate compared favourably to those available over fixed connections. However, with the passage of time, fixed connection data rates increased dramatically. The GSM channel structure and modulation technique did not permit faster rates, and thus the High Speed Circuit-Switched Data (HSCSD) service was introduced in the GSM Phase 2+. **Enhanced Data rates for Global Evolution (EDGE)** As its name suggests, EDGE (Enhanced Data rates for Global Evolution) is an enhancement of the GSM™ radio access technology to provide faster bit rates for data applications, both circuit- and packet-switched. As an enhancement of the existing GSM physical layer, EDGE is realized via modifications of the existing layer 1 3GPP specifications TS 45.000 rather than by separate, stand-alone specifications. The increased data rate is accomplished by a new modulation technique (8PSK as opposed to GSM/GPRS's GMSK, yielding a three-fold increase in bit rate for an identical symbol rate) coupled with new channel coding, resulting in improved spectral efficiency. This is important, because it allows EDGE to be introduced piecemeal into existing GSM networks without disrupting the frequency reuse plan of the existing deployment.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	By way of illustration, the General Packet Radio Service (GPRS) can offer a data rate of 115 (and a theoretical data rate of 171) kbit/s whereas EDGE on top of GPRS can increase this theoretical data rate to 384 kbit/s. This is comparable with the rate for early implementations of Wideband Code Division Multiple Access (W-CDMA) of the 3rd generation of UMTS and a reason why EDGE is considered to be the bridge between the 2nd and the 3rd generation of mobile communication systems. https://www.etsi.org/technologies/mobile/2g **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111): • **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h • **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h • **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	LONG TERM EVOLUTION (LTE) Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example: • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM • LTE DL 4 Rx antenna ports https://www.etsi.org/technologies/mobile/4g **5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	So 5G should deliver significantly increased operational performance (e.g. increased spectral efficiency, higher data rates, low latency), as well as superior user experience (near to fixed network but offering full mobility and coverage). 5G needs to cater for massive deployment of Internet of Things, while still offering acceptable levels of energy consumption, equipment cost and network deployment and operation cost. It needs to support a wide variety of applications and services. Comparison of key capabilities of IMT-Advanced (4th generation) with IMT-2020 (5th generation) according to ITU-R M.2083: 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

The minimum requirements:

- for peak data rate: Downlink: 20 Gbit/s, Uplink: 10 Gbit/s
- for peak spectral efficiencies: Downlink: 30 bit/s/Hz, Uplink: 15 bit/s/Hz
- user plane latency (single user, small packets): 4 ms for eMBB, 1 ms for URLLC
- control plane latency (idle => active): 10-20ms

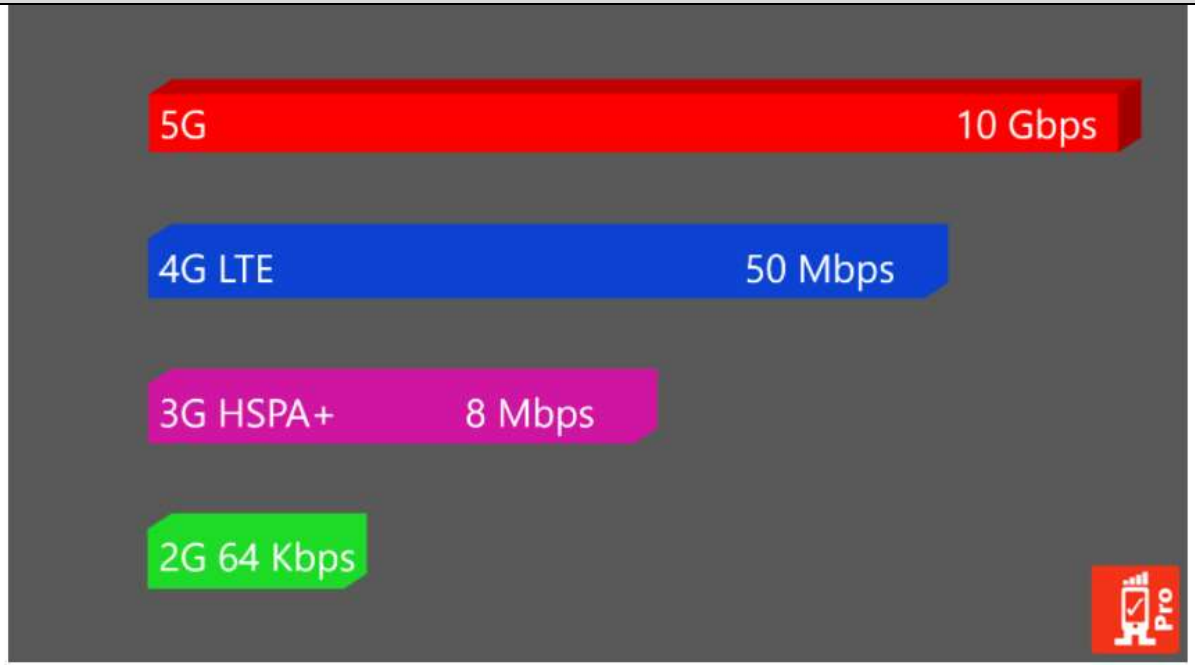
Other requirements:

- maximum aggregated system bandwidth: at least 100 MHz, up to 1GHz in higher frequency bands (above 6GHz)
- mobility: up to 500km/h in rural eMBB

- Add support of NR DL 256QAM for frequency range 2 (FR2)

https://www.etsi.org/technologies/mobile/5g

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 https://rantcell.com/comparison-of-2g-3g-4g-5g.html *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a cellular chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/.
[10.c] receiving video information by radio using the first transmission frequency band, via a first radio communication circuit and connecting by radio to an internet or a home network to	Each of the Accused Samsung '590 Products performs a method of receiving video information by radio using the first transmission frequency band, via a first radio communication circuit, and connecting by radio to an internet or home network to transmit and receive information using the second transmission frequency band, via a second radio communication circuit. **First Infringement Theory**:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
transmit and receive information using the second transmission frequency band, via a second radio communication circuit;	For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip capable of receiving video information via Wi-Fi communications (e.g., Quick Share) using the first transmission frequency band. **How to use Quick Share feature on Galaxy device** Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

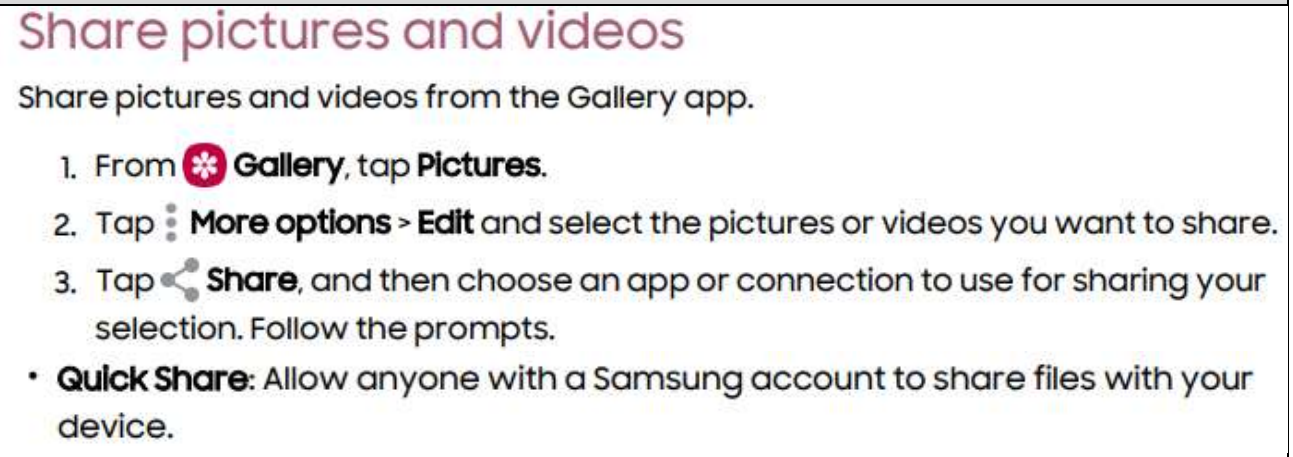
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	# Sharing content Share content by using various sharing options. The following actions are an example of sharing images. 1 Open the **Gallery** app and select an image. 2 Tap and select a sharing method you want. You may incur additional charges when sharing files through the mobile network. ## Quick Share ### Sharing content with nearby devices Share content with nearby devices through Wi-Fi Direct or Bluetooth, or with some SmartThings supported devices. 1 Open the **Gallery** app and select an image. 2 On the other device, open the notification panel, swipe downwards, and then tap (**Quick Share**) to turn it on. If you cannot find (**Quick Share**) on the quick panel, tap and drag the button over to add it.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3 Tap → **Quick Share** and select a device to receive the image. 4 Accept the file transfer request on the other device. This feature does not support sharing videos with TVs or SmartThings supported devices. To watch videos on TV, use the Smart View feature. **Setting who can find your phone** Set who is allowed to find and send content to your phone. 1 Open the notification panel, swipe downwards, and then tap (**Quick Share**). 2 Select an option. • **No one**: Do not allow others to find your phone. • **Contacts only**: Only allow Samsung users in your contacts to share with your phone. • **Anyone nearby**: Allow any nearby devices to share with your phone. **Sharing through Web link** Upload large files to the Samsung storage server and share them with others through Web link. 1 Open the **Gallery** app and select an image. 2 Tap → **Quick Share** and select an option you want under **Share to any device**. • **Copy link**: Share the link copied to the clipboard. • **Share link using app**: Share the link by selecting an app. • **Share using QR code**: Share the link with the created QR code. Galaxy S23 Series User Guide at pg. 111-112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

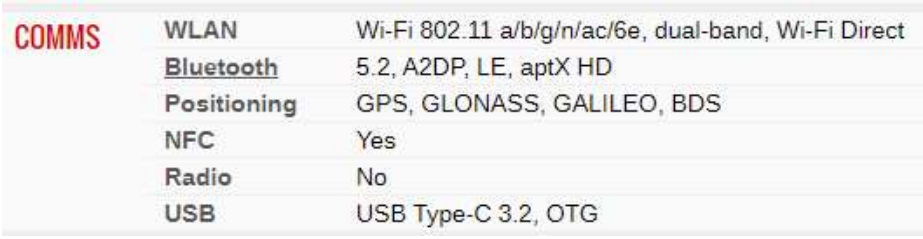
Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

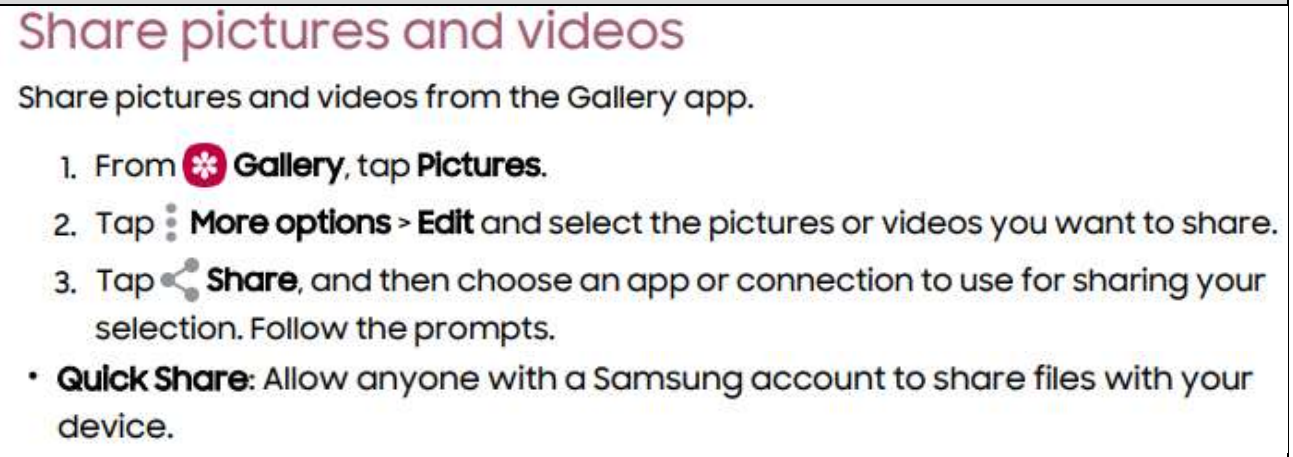
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
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UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
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LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
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LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
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LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
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LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
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U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
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NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
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NR Band n261	Data	27500 - 28350 MHz

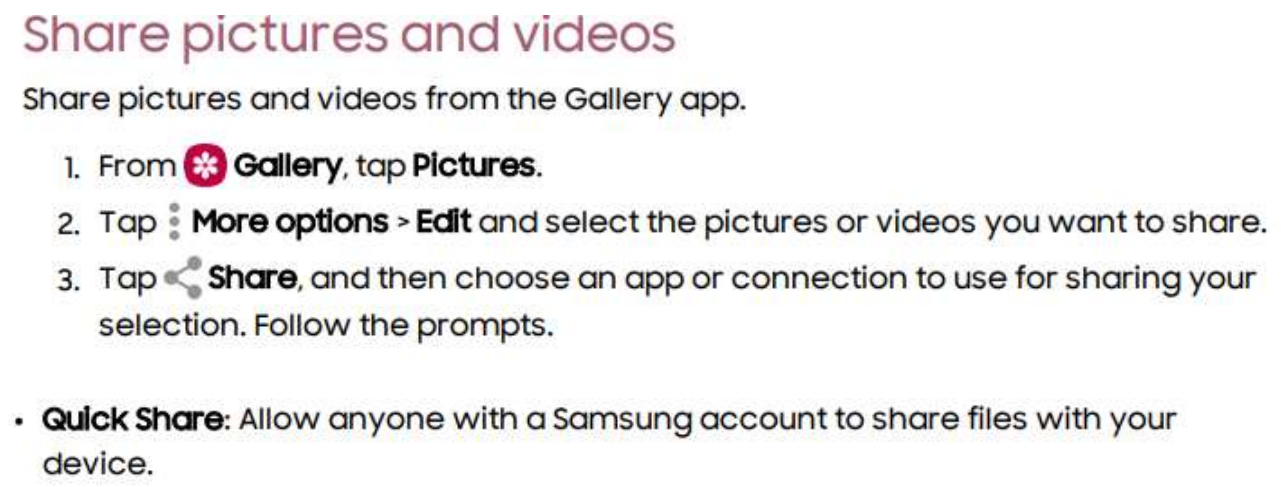
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE, aptX HD Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
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UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
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U-NII-7	Voice/Data	6535 - 6875 MHz
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NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes (market/region dependent) Radio: No USB: USB Type-C 2.0, OTG Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 49, 112.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

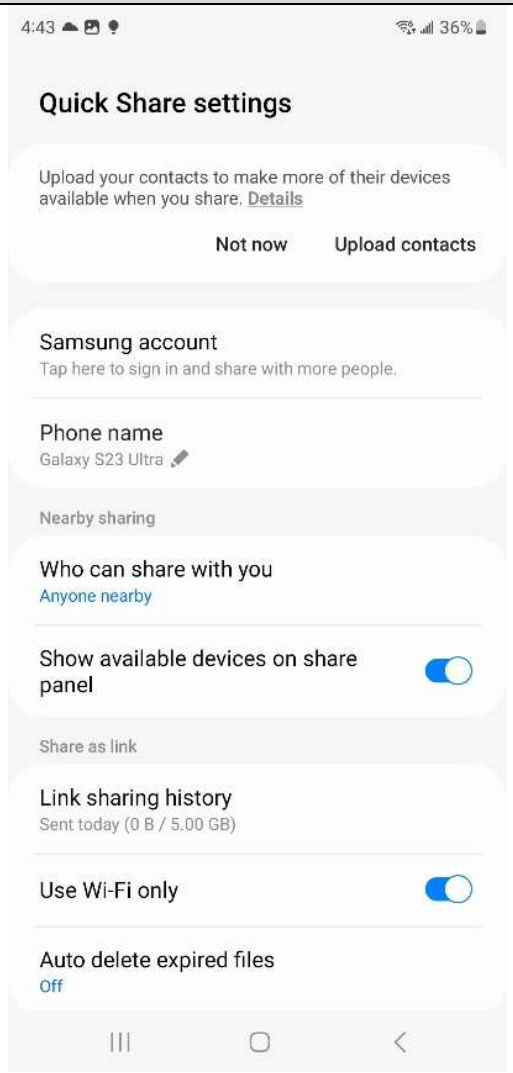
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

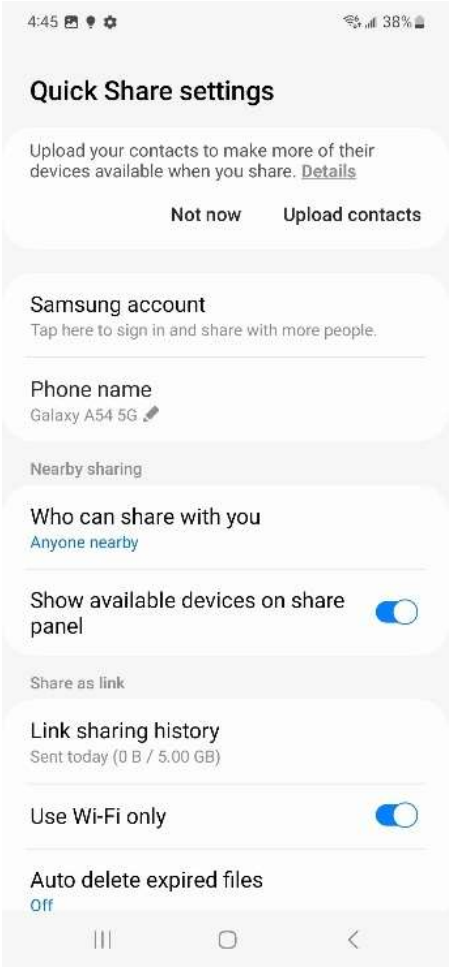
	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

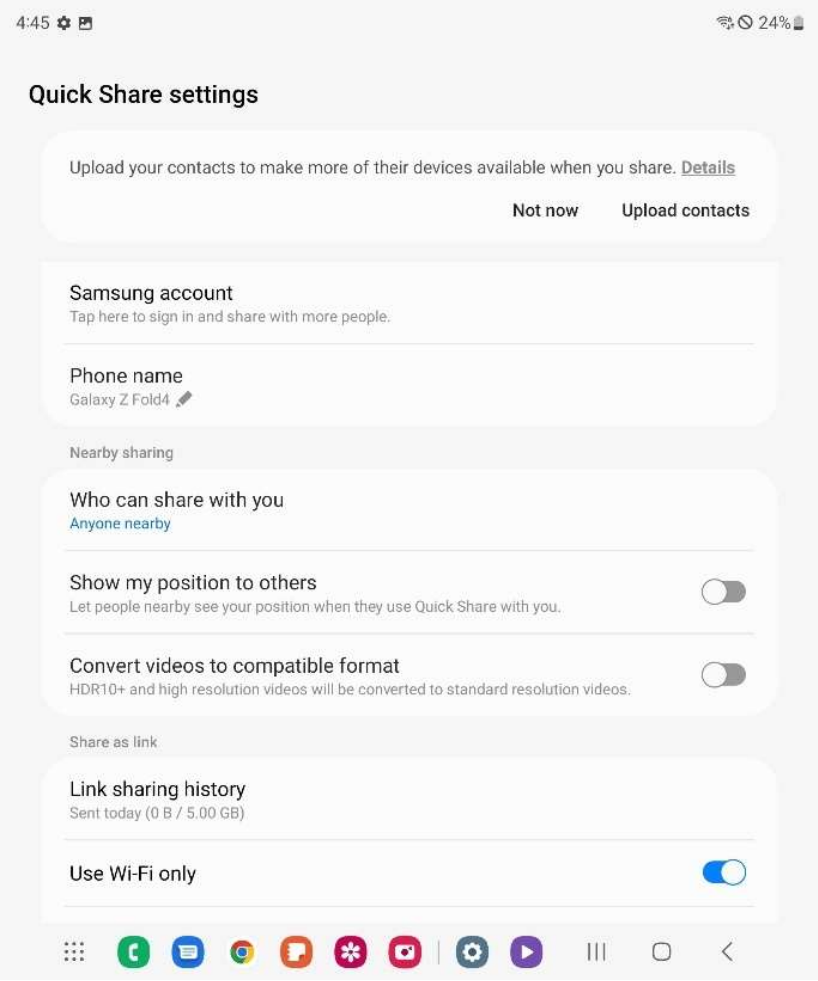
See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

For example, the following screenshots show exemplary Accused Samsung '590 Products using a Wi-Fi communication chip to receive video information by using Quick Share app:

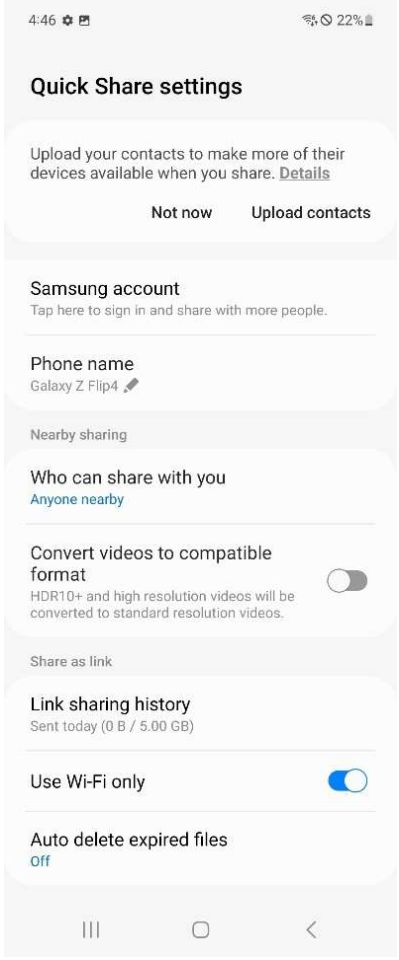
Samsung Galaxy 23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

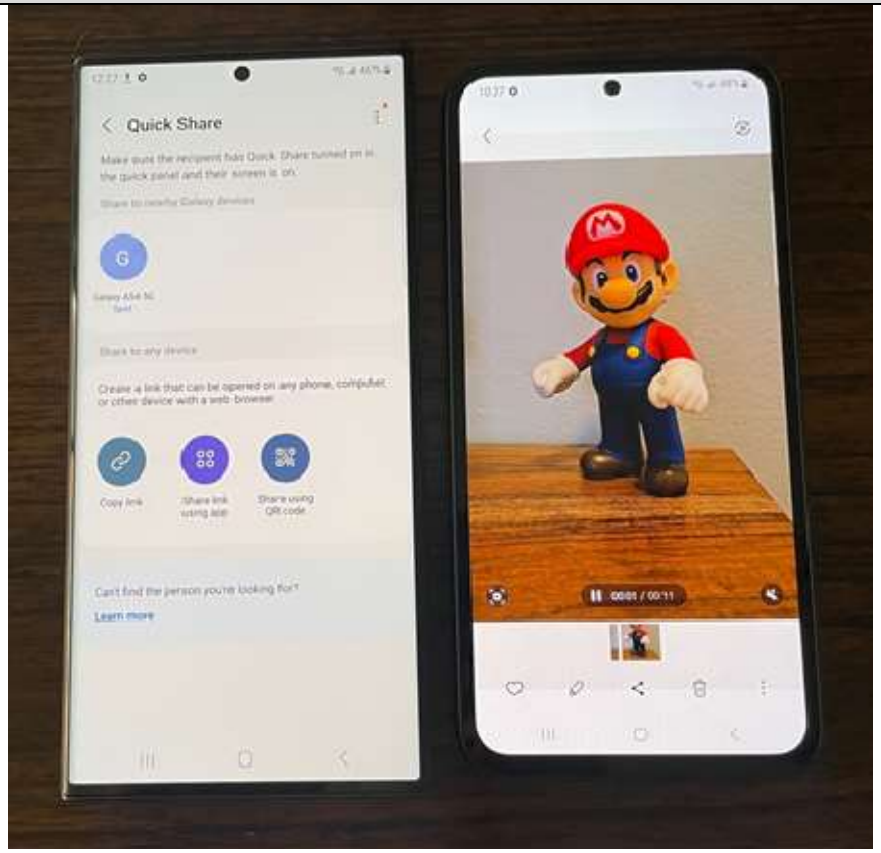
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

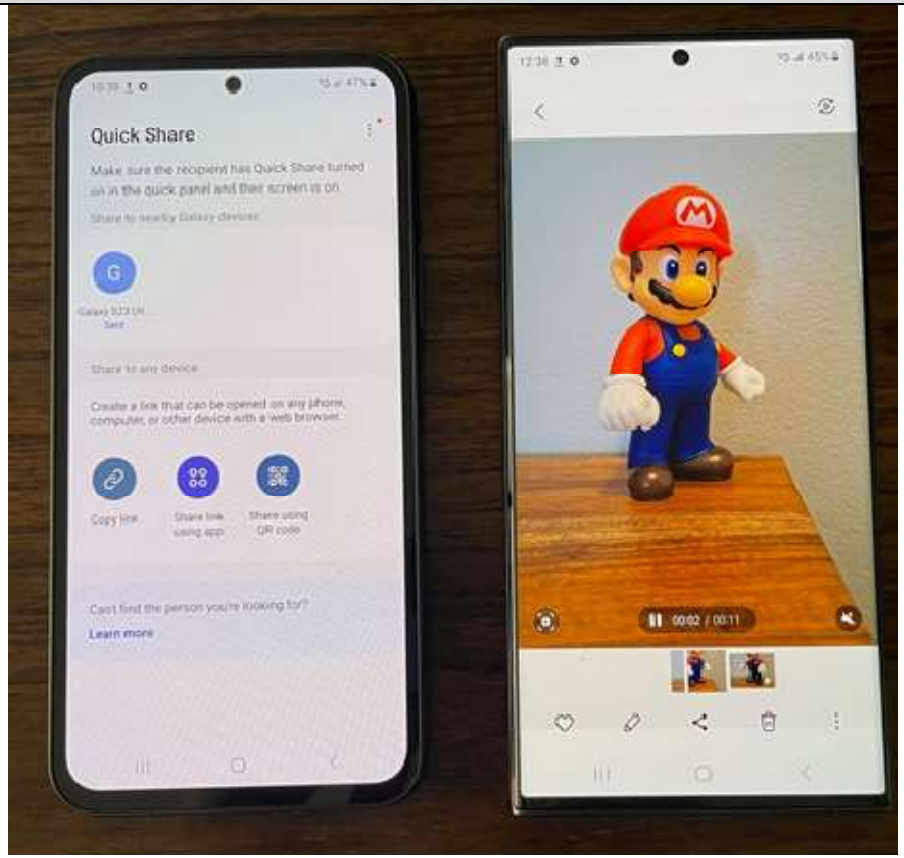
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



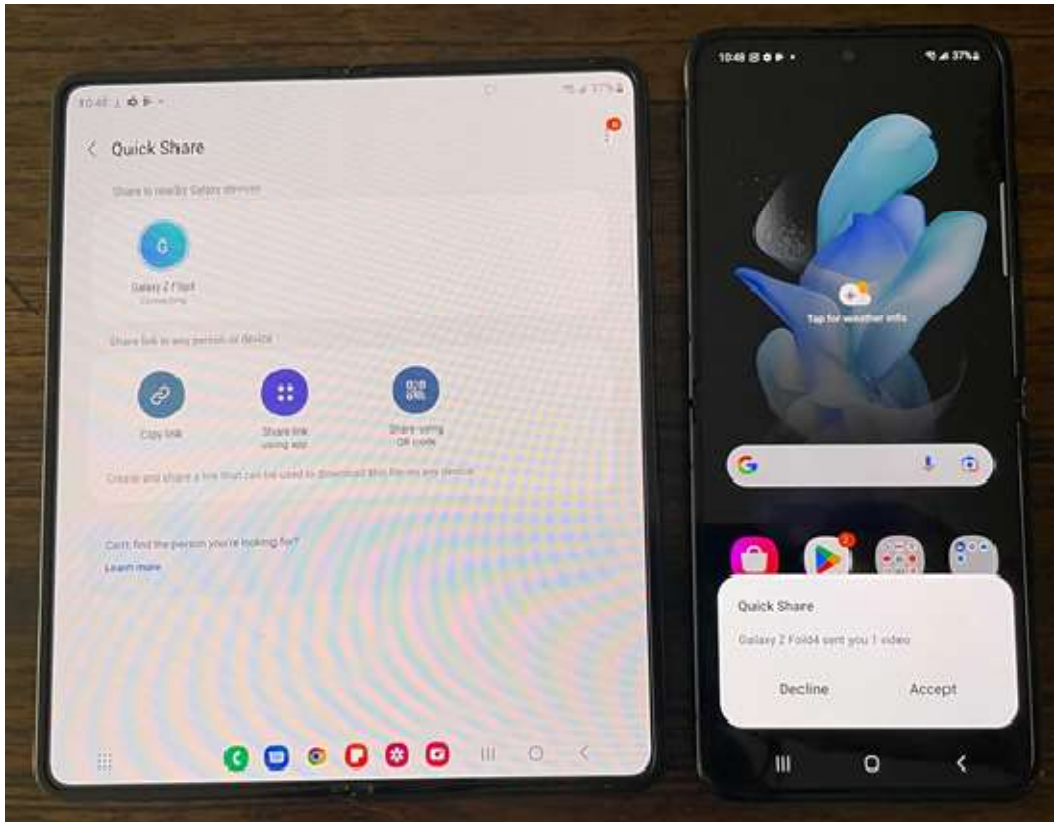
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

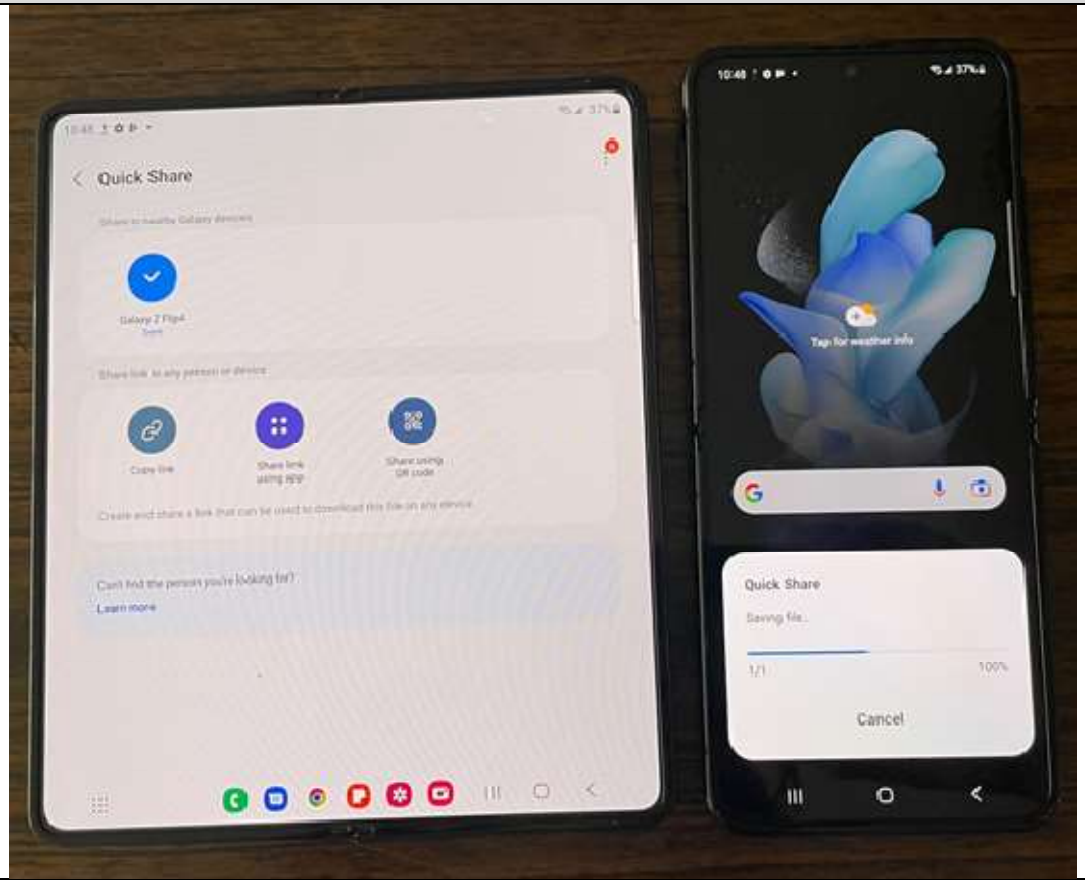
	

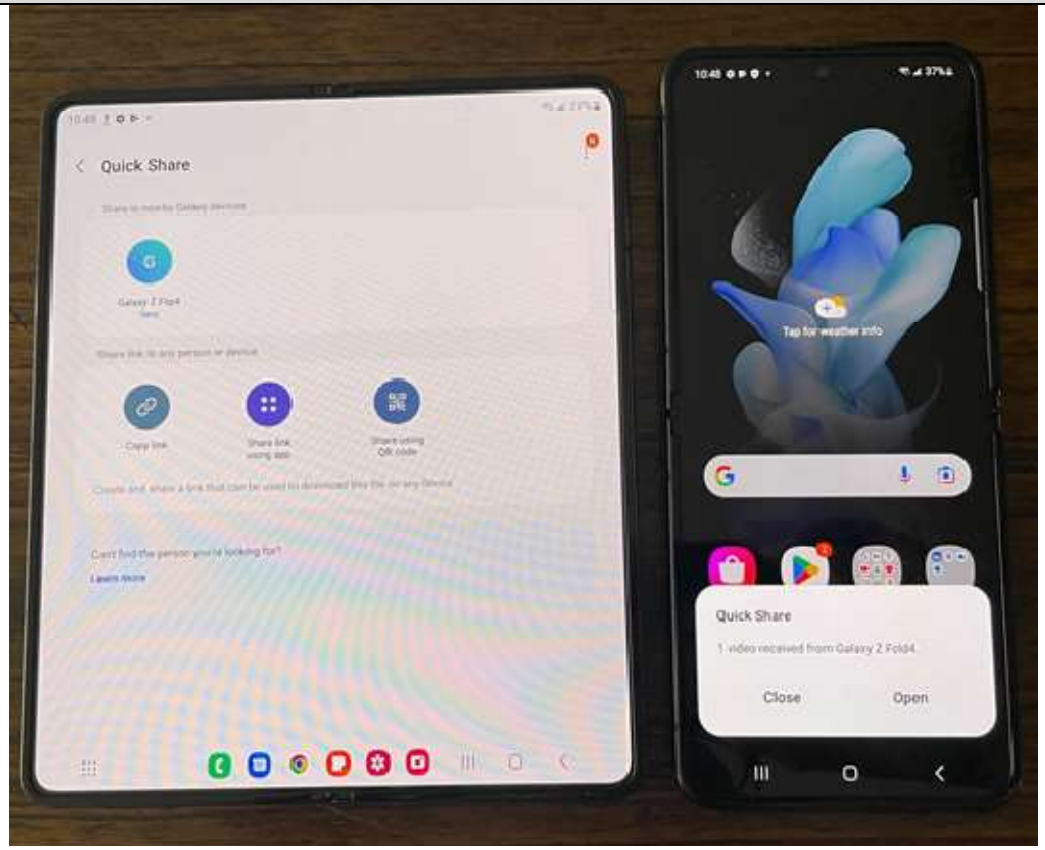

1 item
Galaxy Store
Play Store
Google
Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

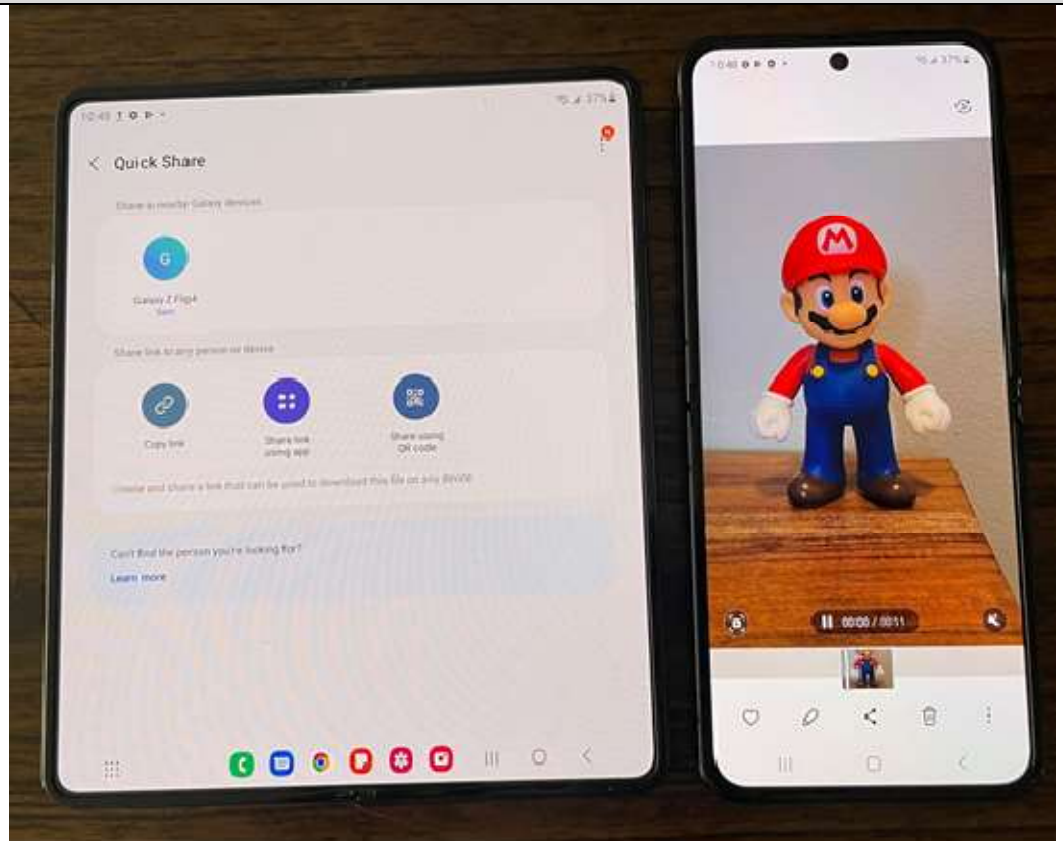
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

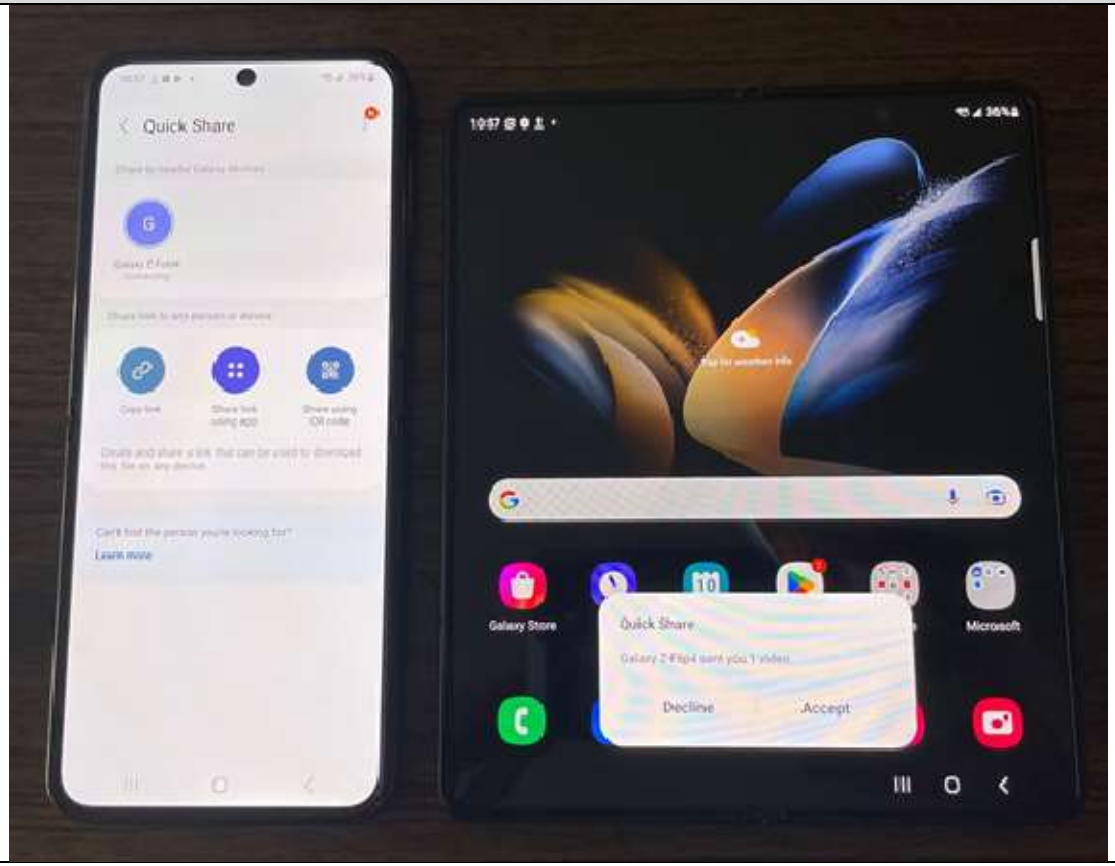
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

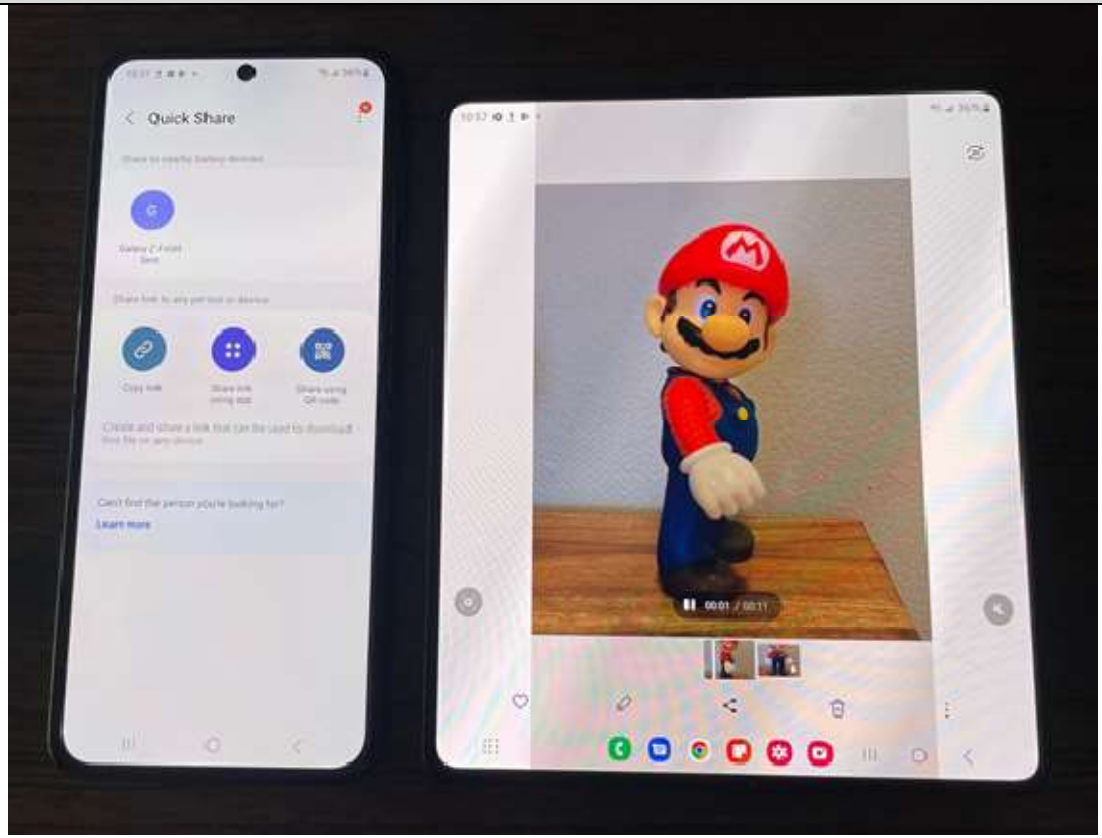
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Quick Share Galaxy Store Microsoft Quick Share Close Open

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Wi-Fi communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/. **Second Infringement Theory**:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip capable of receiving video information via Bluetooth communications using the first transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php. Bluetooth Use Bluetooth to exchange data or media files with other Bluetooth-enabled devices. Precautions for using Bluetooth • Samsung is not responsible for the loss, interception, or misuse of data sent or received through Bluetooth. • Always ensure that you share and receive data with devices that are trusted and properly secured. If there are obstacles between the devices, the operating distance may be reduced. • Some devices, especially those that are not tested or approved by the Bluetooth SIG, may be incompatible with your device. • Do not use the Bluetooth feature for illegal purposes (for example, pirating copies of files or illegally tapping communications for commercial purposes). Samsung is not responsible for the repercussion of illegal use of the Bluetooth feature.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Pairing with other Bluetooth devices 1 On the Settings screen, tap **Connections** → **Bluetooth** and tap the switch to turn it on. The detected devices will be listed. 2 Select a device to pair with. If the device you want to pair with is not on the list, set the device to enter Bluetooth pairing mode. Refer to the other device's user manuals. Your phone is visible to other devices while the Bluetooth settings screen is open. 3 Accept the Bluetooth connection request on your phone to confirm. The devices will be connected when the other device accepts the Bluetooth connection request. To unpair the devices, tap next to the device name to unpair and tap **Unpair**. **Sending and receiving data** Many apps support data transfer through Bluetooth. You can share data, such as contacts or media files, with other Bluetooth devices. The following actions are an example of sending an image to another device. 1 Open the **Gallery** app and select an image. 2 Tap → **Bluetooth** and select a device to receive the image. If the device you want to pair with is not in the list, turn on its visibility option. 3 Accept the Bluetooth connection request on the other device. Galaxy S23 Series User Guide at pg. 124-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

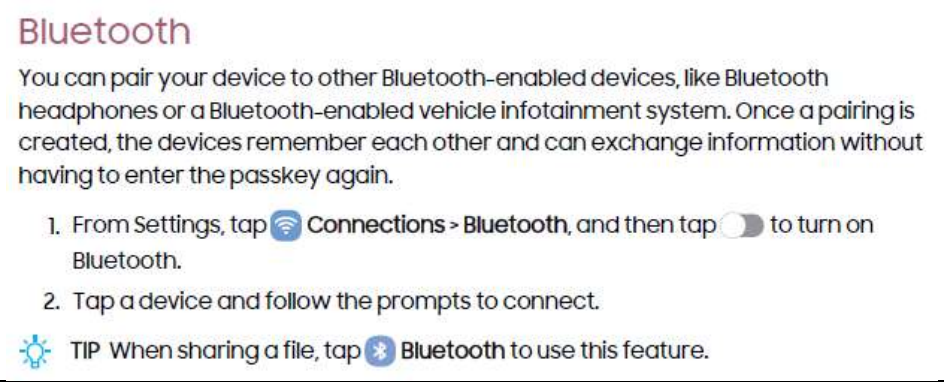
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power [dBm]	Avg Conducted Power [mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power [dBm]	Peak Conducted Power [mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. TIP When sharing a file, tap Bluetooth to use this feature.

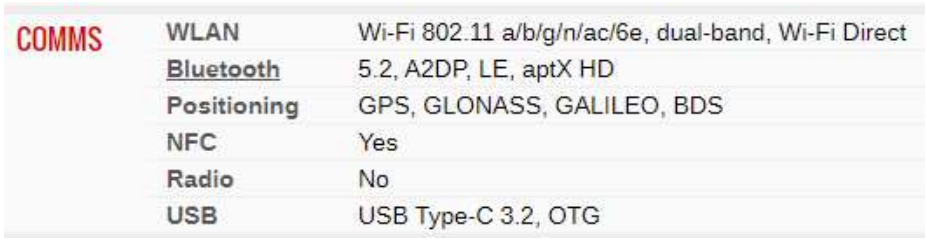
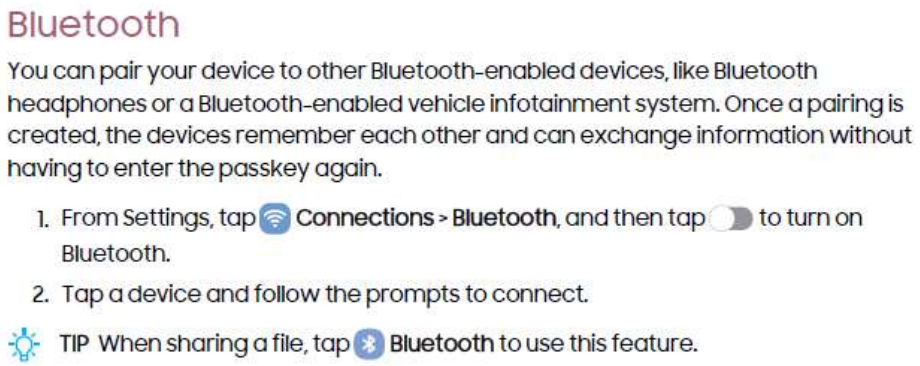
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-  11737.php

COMMS		
	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6e, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE, aptX HD
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 3.2, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. • To disconnect from a paired device, tap **Disconnect**. Tap **Connect** to reconnect. **TIP** When sharing a file, tap **Bluetooth** to use this feature. **Rename a paired device** You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Unpair from a Bluetooth device When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Phone name:** Change the name of your device for Bluetooth connections. • **Received files:** View a list of files received using Bluetooth. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy A54 User Guide at pg. 103-105.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>For example, the following screenshots show exemplary Accused Samsung '590 Products using a Bluetooth communication chip to transmit and/or receive video information by using Bluetooth file sharing:<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

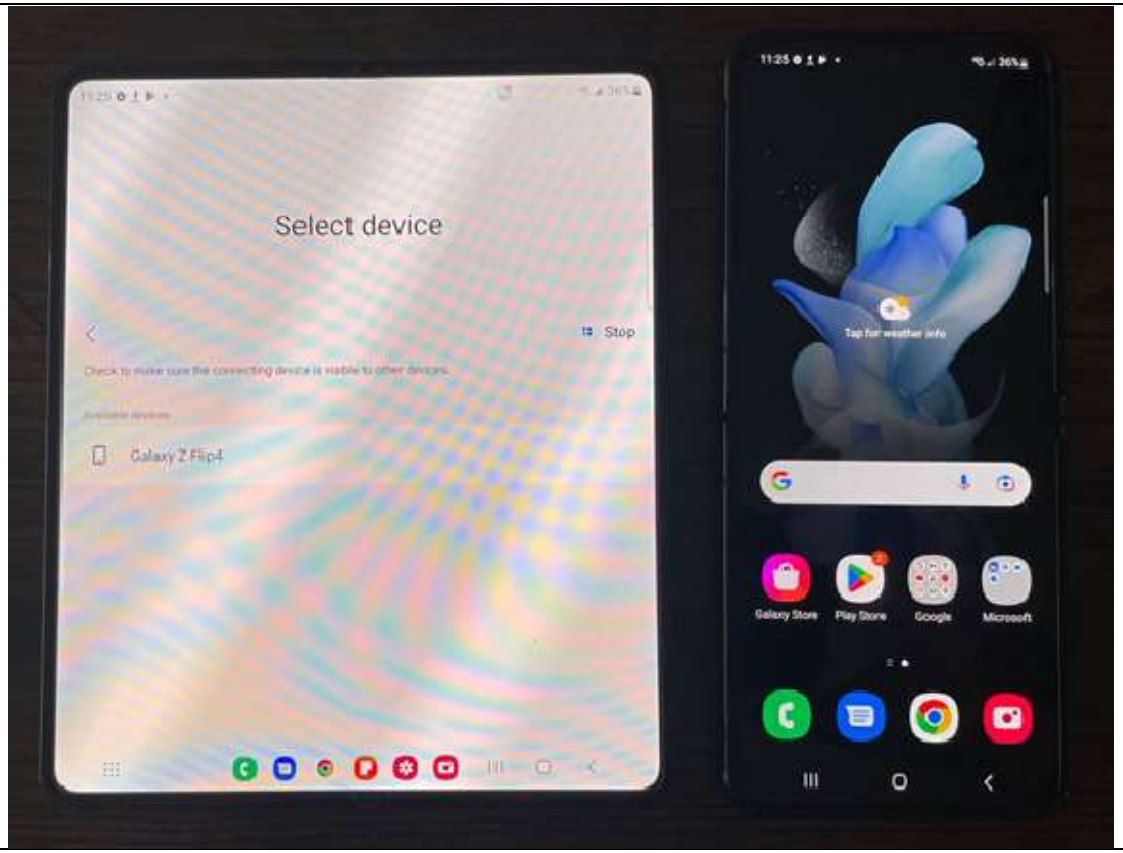


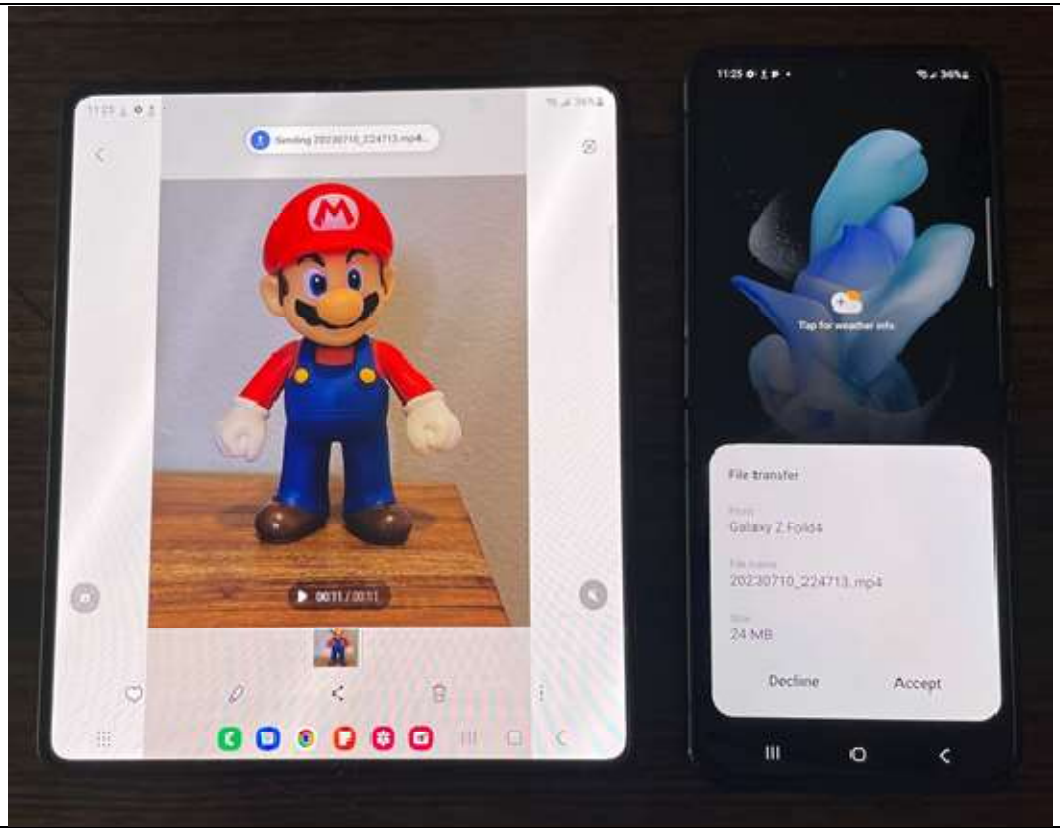
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft

		 Tap for weather info File transfer Galaxy Z Fold4 20230710_224713.mp4 24 MB Decline Accept

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

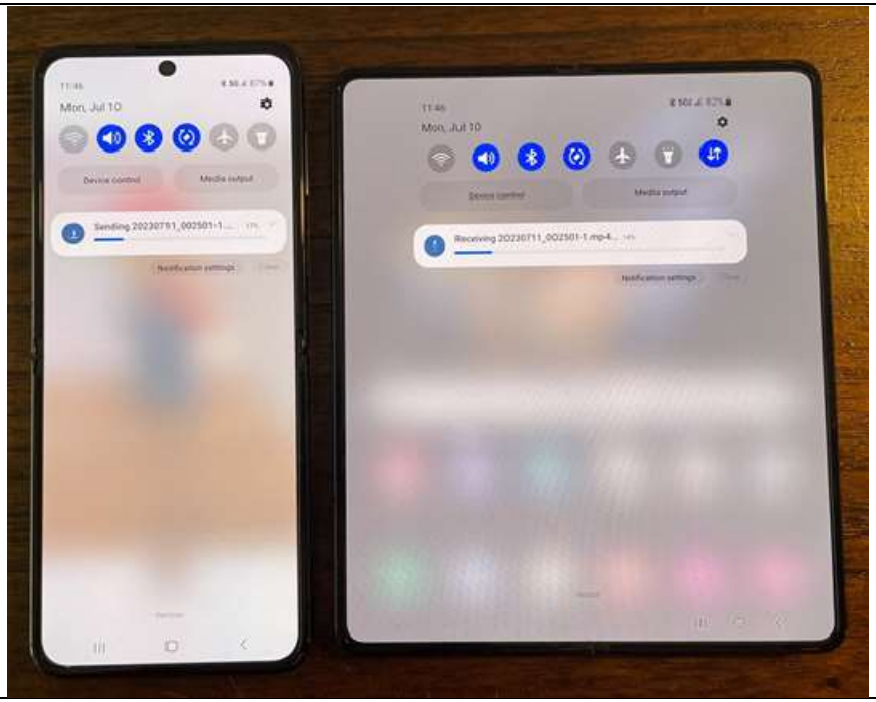
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

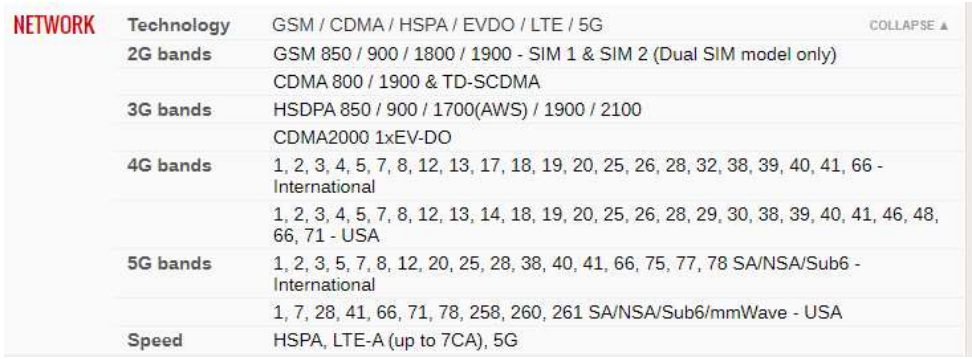
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 Galaxy Store Microsoft 23.2 MB Decline Accept	


Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Bluetooth communication chip and operate in a similar manner. **First and Second Infringement Theories:** Each of Accused Samsung '590 Products includes a cellular communication chip capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band. Specifically, the Accused Samsung '590 Products use a cellular communication chip configured to operate in one or more of 2G/3G/LTE/5G protocols to

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	connect to the external display apparatus (*e.g.*, connect to another smartphone via email/MMS/phone call/Internet) accessing to an internet or a home network (*e.g.*, connect to the internet via cellular data services), and receiving digital information (*e.g.*, receiving digital information via the Internet, email, and/or MMS by using cellular data services). **Galaxy S23 Ultra:** For example, the Galaxy S23 Ultra is configured for at least one or more of GSM, 3G, 4G LTE, and 5G cellular communications in order to connect to another device, access the Internet, and receive digital information by using cellular data services. For example, the Galaxy S23 Ultra comprises a cellular communication chip and processor and/or CPU that is capable of these functions (*e.g.*, via a multi media message (MMS) or email over cellular network).  NETWORK Technology: GSM / CDMA / HSPA / EVDO / LTE / 5G (COLLAPSE) 2G bands: GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only) CDMA 800 / 1900 & TD-SCDMA 3G bands: HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 CDMA2000 1xEV-DO 4G bands: 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA 5G bands: 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International 1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA Speed: HSPA, LTE-A (up to 7CA), 5G Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-20

LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

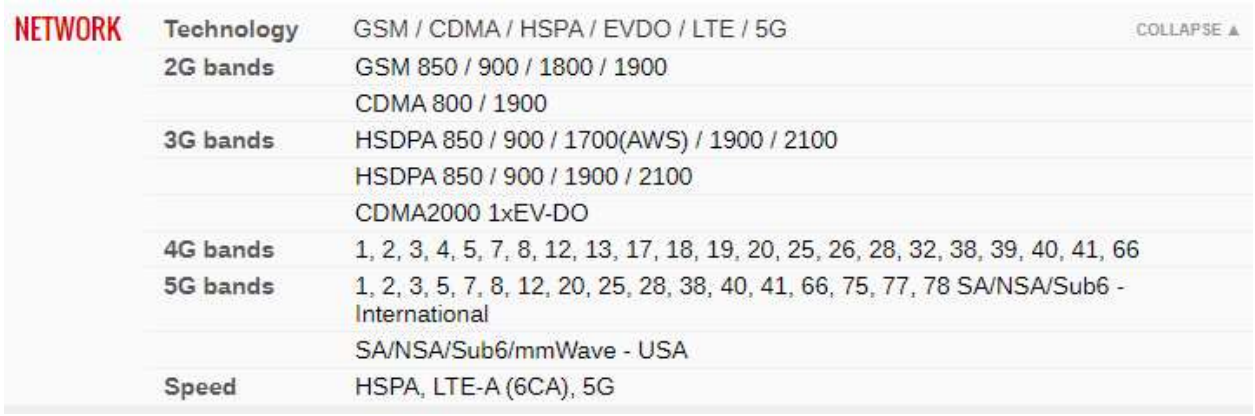
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

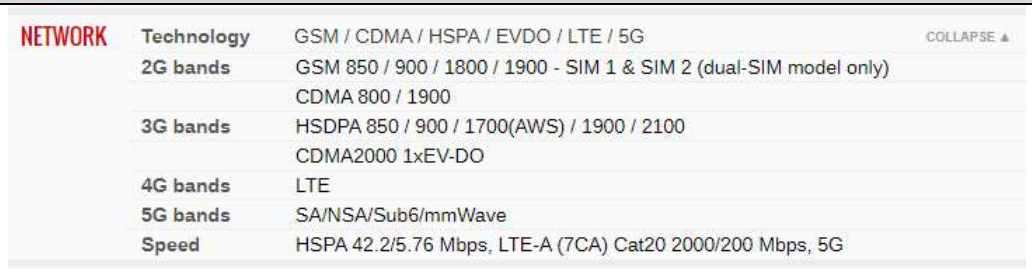
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

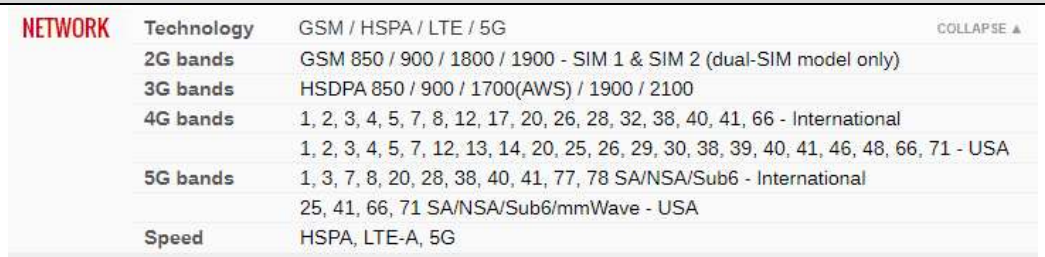
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **Cellular Frequency Bandwidth and Modulation/Demodulation Method:** ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **2G:**

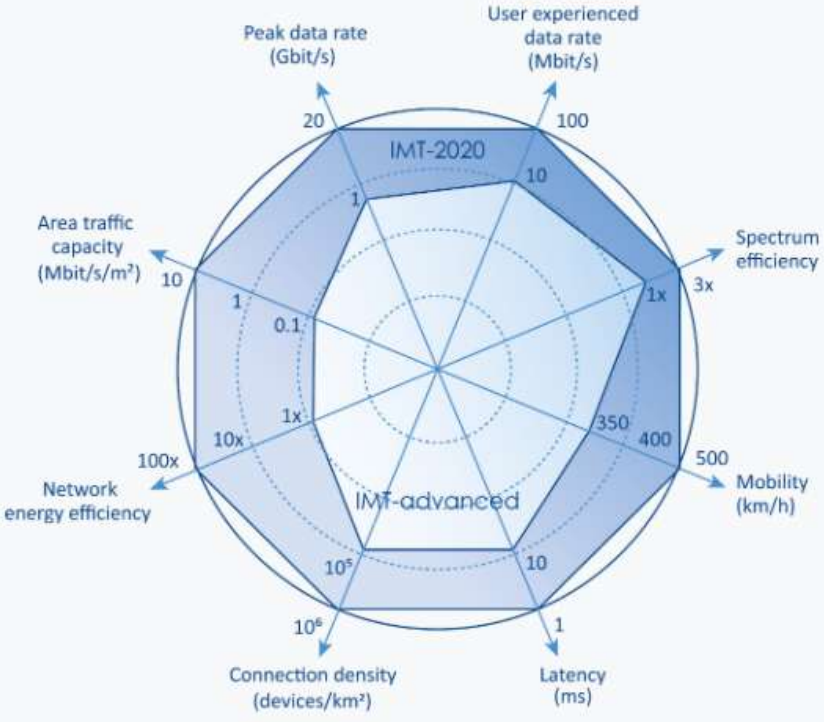
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Global System for Mobile communication (GSM) The technology behind the Global System for Mobile communication (GSM™) uses Gaussian Minimum Shift Keying (GMSK) modulation a variant of Phase Shift Keying (PSK) with Time Division Multiple Access (TDMA) signalling over Frequency Division Duplex (FDD) carriers. The physical layer is specified in 3GPP TS 45.001 and the logical channels in 3GPP TS 45.002. The channel coding is specified in 3GPP TS 45.003 and the modulation is specified in 3GPP TS 45.004. Although originally designed for operation in the 900 MHz band, it was soon adapted for 1800 MHz. The introduction of GSM into North America meant further adaptation to the 800 and 1900 MHz bands. Over the years, the versatility of GSM has resulted in the specifications being adapted to many more frequency bands to meet niche markets. A full list can be found in 3GPP TS 45.005. GSM has a channel spacing of 200kHz and was designed principally for voice telephony, but a range of bearer services was defined (a subset of those available for fixed line Integrated Services Digital Networks, ISDN), allowing circuit-switched data connections at up to 9600 bits/s. At the time of the original system design, this rate compared favourably to those available over fixed connections. However, with the passage of time, fixed connection data rates increased dramatically. The GSM channel structure and modulation technique did not permit faster rates, and thus the High Speed Circuit-Switched Data (HSCSD) service was introduced in the GSM Phase 2+. **Enhanced Data rates for Global Evolution (EDGE)** As its name suggests, EDGE (Enhanced Data rates for Global Evolution) is an enhancement of the GSM™ radio access technology to provide faster bit rates for data applications, both circuit- and packet-switched. As an enhancement of the existing GSM physical layer, EDGE is realized via modifications of the existing layer 1 3GPP specifications TS 45.000 rather than by separate, stand-alone specifications. The increased data rate is accomplished by a new modulation technique (8PSK as opposed to GSM/GPRS's GMSK, yielding a three-fold increase in bit rate for an identical symbol rate) coupled with new channel coding, resulting in improved spectral efficiency. This is important, because it allows EDGE to be introduced piecemeal into existing GSM networks without disrupting the frequency reuse plan of the existing deployment.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	By way of illustration, the General Packet Radio Service (GPRS) can offer a data rate of 115 (and a theoretical data rate of 171) kbit/s whereas EDGE on top of GPRS can increase this theoretical data rate to 384 kbit/s. This is comparable with the rate for early implementations of Wideband Code Division Multiple Access (W-CDMA) of the 3rd generation of UMTS and a reason why EDGE is considered to be the bridge between the 2nd and the 3rd generation of mobile communication systems. https://www.etsi.org/technologies/mobile/2g **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111): • **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h • **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h • **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	LONG TERM EVOLUTION (LTE)  Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example: • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM • LTE DL 4 Rx antenna ports https://www.etsi.org/technologies/mobile/4g **5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	So 5G should deliver significantly increased operational performance (e.g. increased spectral efficiency, higher data rates, low latency), as well as superior user experience (near to fixed network but offering full mobility and coverage). 5G needs to cater for massive deployment of Internet of Things, while still offering acceptable levels of energy consumption, equipment cost and network deployment and operation cost. It needs to support a wide variety of applications and services. Comparison of key capabilities of IMT-Advanced (4th generation) with IMT-2020 (5th generation) according to ITU-R M.2083: 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

The minimum requirements:

- for peak data rate: Downlink: 20 Gbit/s, Uplink: 10 Gbit/s
- for peak spectral efficiencies: Downlink: 30 bit/s/Hz, Uplink: 15 bit/s/Hz
- user plane latency (single user, small packets): 4 ms for eMBB, 1 ms for URLLC
- control plane latency (idle => active): 10-20ms

Other requirements:

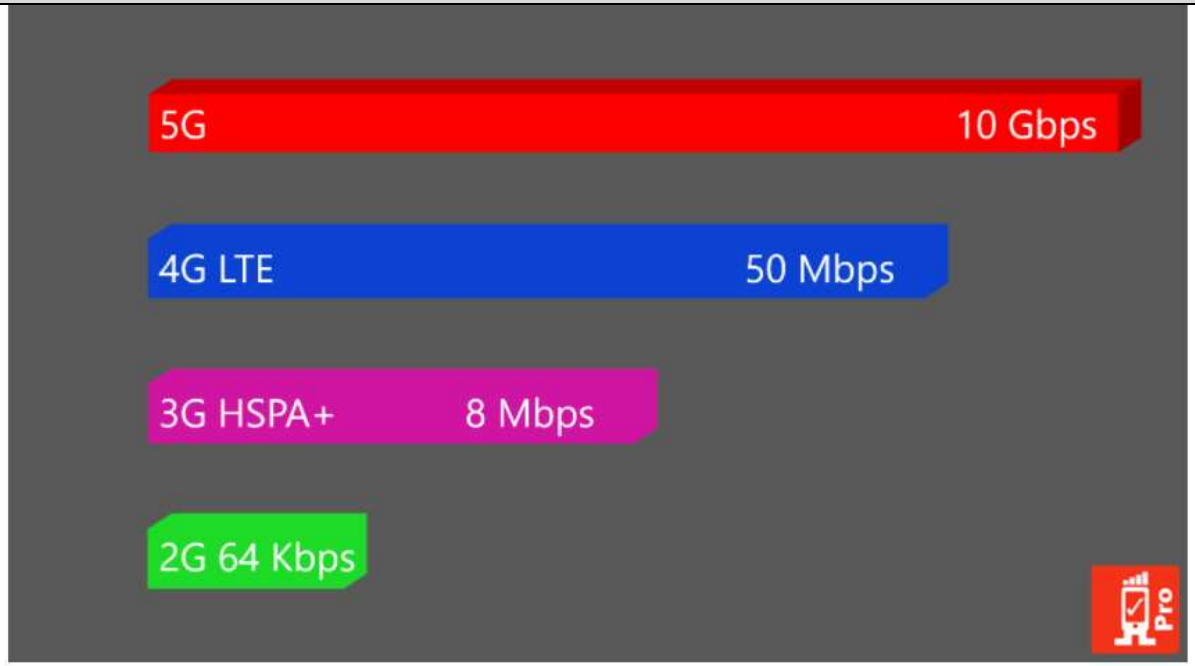
- maximum aggregated system bandwidth: at least 100 MHz, up to 1GHz in higher frequency bands (above 6GHz)
- mobility: up to 500km/h in rural eMBB

- Add support of NR DL 256QAM for frequency range 2 (FR2)

https://www.etsi.org/technologies/mobile/5g

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



https://rantcell.com/comparison-of-2g-3g-4g-5g.html

Further, AIDA64 reports confirm that the Accused Samsung '590 Products include one or more processors to connect to an external display apparatus, access the Internet, and receive digital information (*e.g.*, via MMS protocol over cellular network and/or via email or phone call):

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show exemplary Accused Samsung '590 Products using a cellular communication chip to transmit and receive digital video information via MMS and similar functionality also applies to transmitting and receiving digital video via e-mail:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) – WiFi off	Video Information Receiving Device (Samsung Galaxy A54 5G) – WiFi off



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G) – WiFi off	Video Information Receiving Device (Samsung Galaxy S23 Ultra) – WiFi off



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Video Information Transmitting Device (Samsung Galaxt ZFold 4) – WiFi off	Video Information Receiving Device (Samsung Galaxy ZFlip 4) – WiFi off

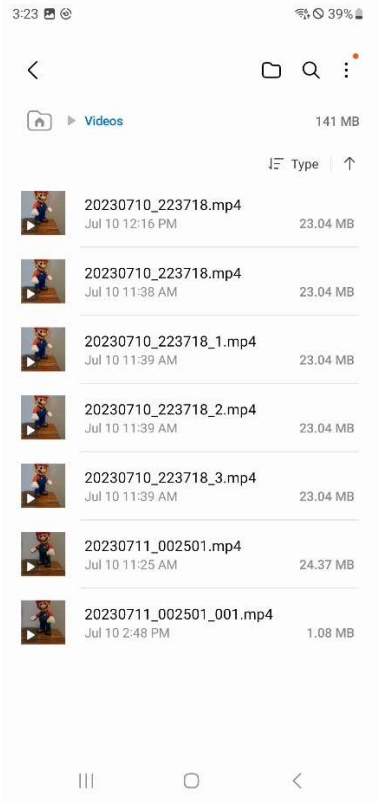


Video Information Transmitting Device (Samsung Galaxy ZFlip 4) – WiFi off	Video Information Receiving Device (Samsung Galaxt ZFold 4) – WiFi off

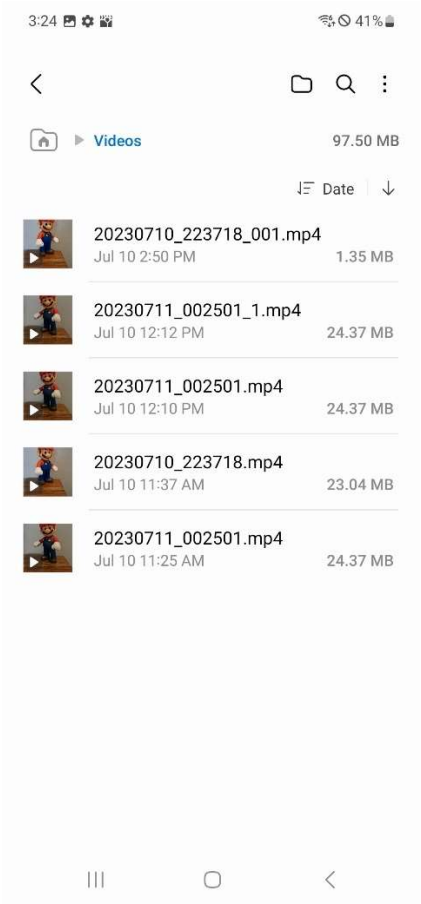
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a cellular chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/. **Doctrine of Equivalents:** To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>that the Accused Samsung '590 Products do not have a second radio communication circuit, each of these products include software, hardware, or a combination of the two that perform the equivalent functions of connecting by radio to the external display apparatus, accessing to an internet or a home network, and receiving digital information. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, they use an integrated Bluetooth/Wi-Fi chipset and/or cellular communication chipset to perform these functions by using wireless transmissions. The performance of this function achieves substantially the same result, for example, connecting to an external display apparatus, accessing to an internet or a home network, and receiving digital information.</td></tr>
<tr><td>[10.d] compressing the video information received by the first radio communication circuit using a first compression scheme;</td><td>Each of the Accused Samsung '590 Products performs a method of compressing the video information received by the first radio communication circuit using the first compression scheme.
First Infringement Theory:
For example, each of the Accused Samsung '590 Products includes a compression circuit compressing the video information received by the Wi-Fi communication chip via at least the MPEG-4 compression scheme.
For example, the following screenshots show exemplary Accused Samsung '590 Products using a compression circuit compressing the video information received by the Wi-Fi communication chip via at least the MPEG-4 compression scheme:
<table><tr><td>Video Information Transmitting Device (Samsung Galaxy A54 5G)</td><td>Video Information Receiving Device (Samsung Galaxy S23 Ultra)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension

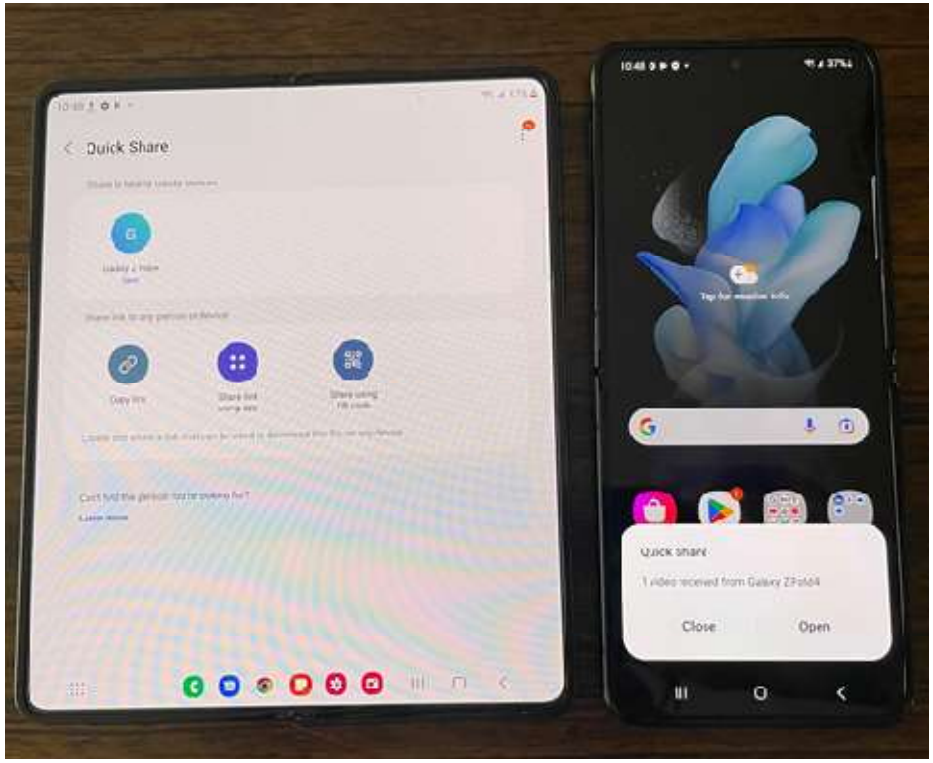
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(Samsung Galaxy S23 Ultra)  Video Information Transmitting Device (Samsung Galaxy S23 Ultra) | Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Video information using a ".mp4" file extension (Samsung Galaxy A54 5G) 

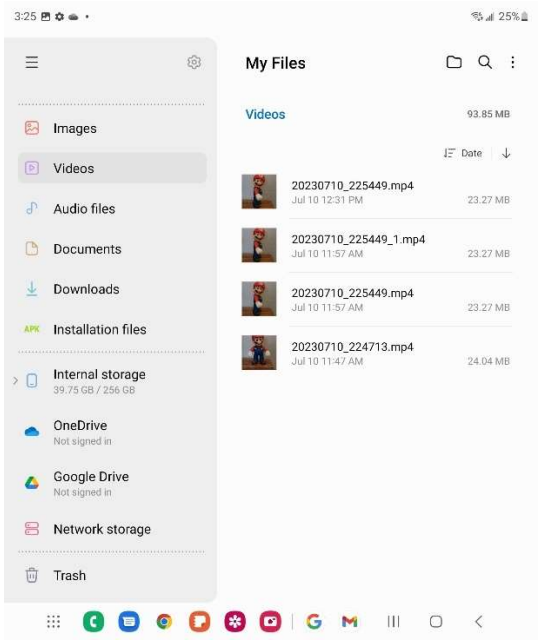
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)



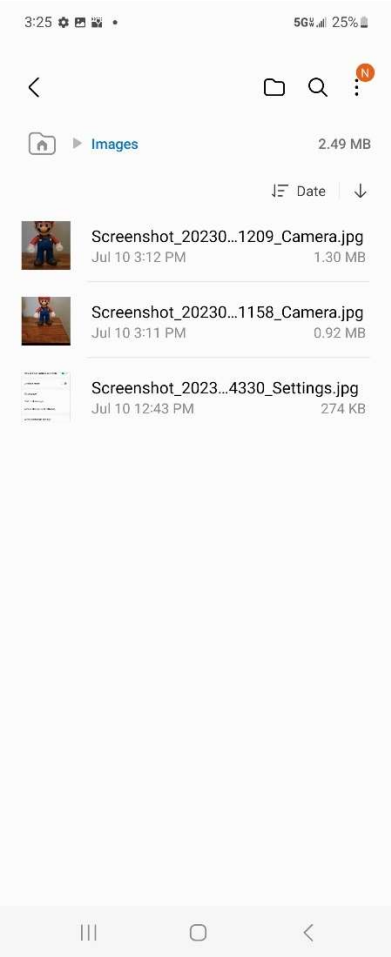
Video information using a ".mp4" file extension (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:**

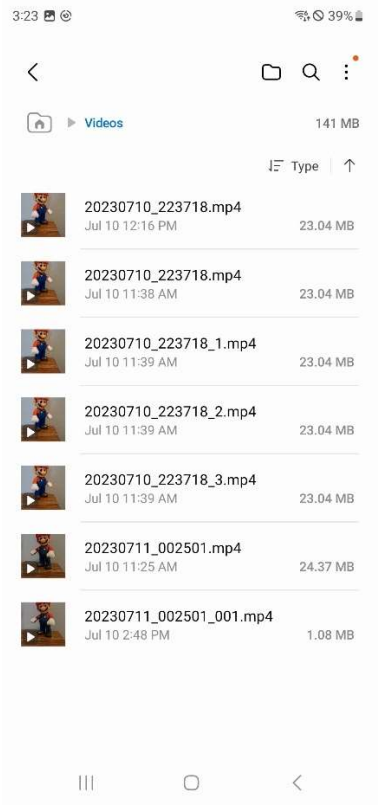
<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>For example, each of the Accused Samsung '590 Products includes a compression circuit compressing the video information received by the Bluetooth communication chip via at least the MPEG-4 compression scheme.

For example, the following screenshots show exemplary Accused Samsung '590 Products using a compression circuit compressing the video information received by the Bluetooth communication chip via at least the MPEG-4 compression scheme:

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy A54 5G)</td><td>Video Information Receiving Device (Samsung Galaxy S23 Ultra)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy S23 Ultra)

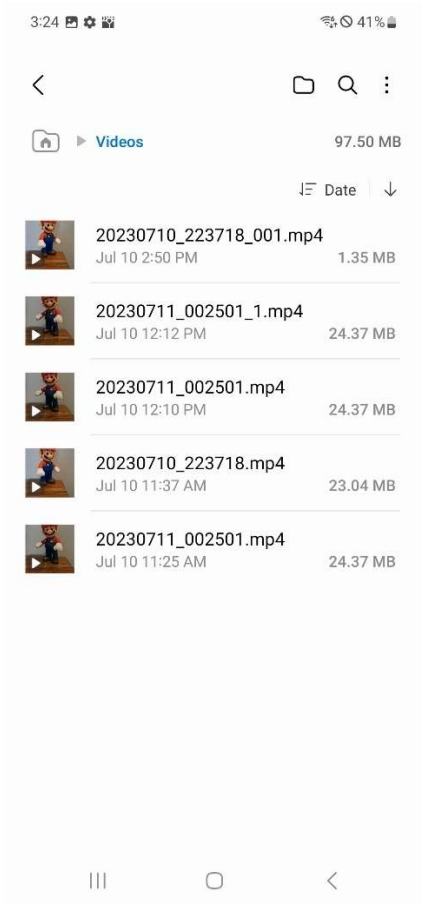
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy A54 5G)

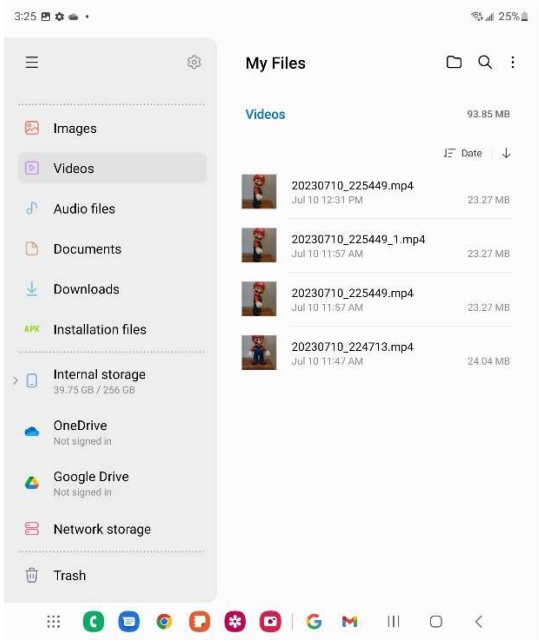
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

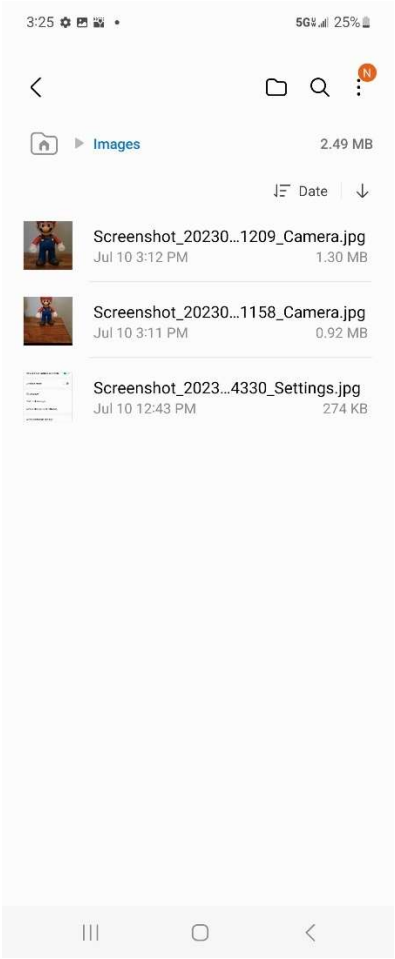
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

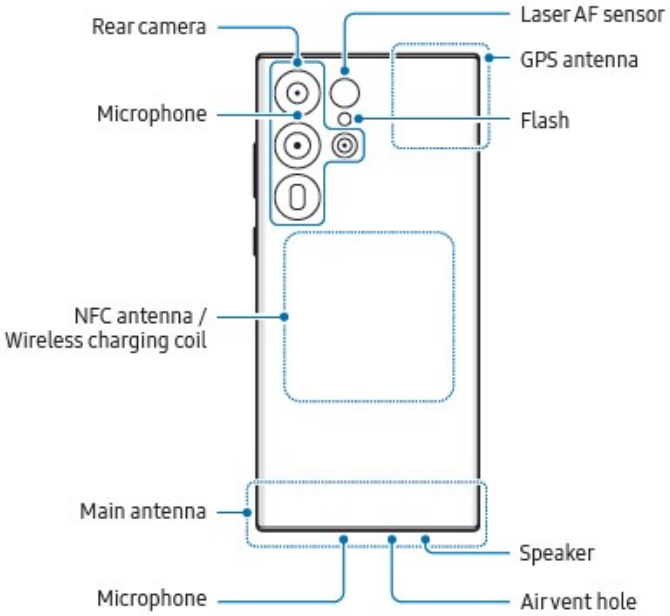


Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Video information using a ".mp4" file extension (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include similar compressions circuit. *See* https://www.samsung.com/us/support/answer/ANS00089063/; *see also* https://www.samsung.com/us/support/answer/ANS00079026/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[10.e] transmitting, via a third radio communication circuit, information using a third transmission frequency band;	Each of the Accused Samsung '590 Products performs a method of transmitting, via a third radio communication circuit, information and using a third transmission frequency band. For example, each of the Accused Samsung '590 Products includes a NFC communication chip capable of transmitting information (*e.g.*, Samsung Pay and/or Samsung Wallet) and using a third transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Series User Guide at pg. 6 (Galaxy S23 Ultra device layout). **NFC and contactless payments** You can use your phone to read near field communications tags (NFC) that contain information about products. You can also use this feature to make payments and buy tickets for transportation or events after downloading the required apps. The device contains a built-in NFC antenna. Handle the device carefully to avoid damaging the NFC antenna.

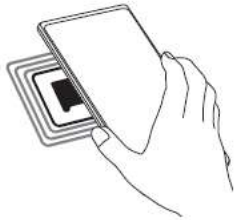
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Reading information from NFC tags

Use the NFC feature to read product information from NFC tags.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

2 Place the NFC antenna area on the back of your device near an NFC tag.
The information from the tag appears.



Ensure that the device's screen is turned on and unlocked. Otherwise, the device will not read NFC tags or receive data.

Making payments with the NFC feature

Before you can use the NFC feature to make payments, you must register for a mobile payment service. To register or get more information about services, contact your service provider.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

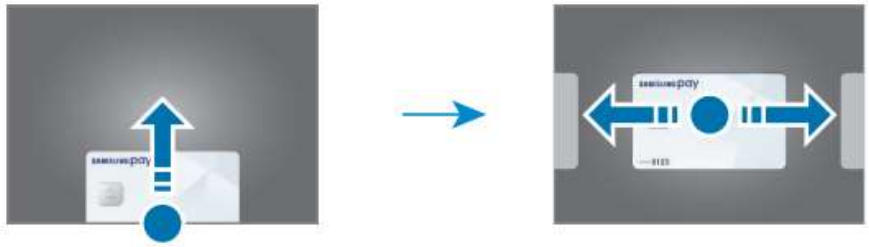
2 Touch the NFC antenna area on the back of your device to the NFC card reader.

To set the default payment app, open the Settings screen and tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment**, and then select an app.

- The payment services list may not include all available payment apps.
- If you update the payment app or install a new one, the payment services that you used before may not work properly. If that is the case, on the Settings screen, tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment** or **Others**, and then select another app instead of the updated or newly installed app. Or, deselect the selected app.

Galaxy S23 Series User Guide at pgs. 125-126.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Setting up Samsung Pay When running this app for the first time or restarting it after performing a data reset, follow the on-screen instructions to complete the initial setup. 1 Open the **Samsung Pay** app. 2 Sign in to your Samsung account and read and agree to the terms and conditions. 3 Register your fingerprint and a PIN to use when making payments. This PIN will be used to verify various actions in Samsung Pay, such as making payments and unlocking the app. **Registering cards** Open the **Samsung Pay** app and follow the on-screen instructions to complete your card registration.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	## Making payments 1 Drag a card image at the bottom of the screen upwards. Alternatively, open the **Samsung Pay** app. Then, on the cards list, swipe to the left or right and select a card to use.  2 Scan your fingerprint or enter the payment PIN you set. 3 Touch the back of your device to the card reader. When the card reader recognizes the card information, the payment will be processed. • Payments may not be processed depending on your network connection. • The verification method for payments may vary depending on the card reader. ### Cancelling payments You can cancel payments by visiting the place where you made them. On the cards list, swipe to the left or right to select the card you used. Follow the on-screen instructions to complete payment cancellation. Galaxy S23 Series User Guide at pgs. 94-95.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

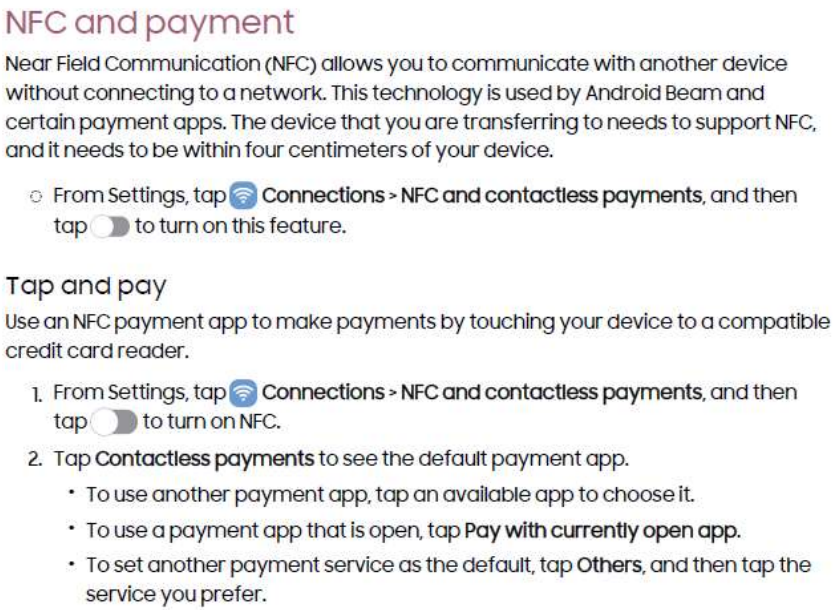
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.



NFC and payment

Near Field Communication (NFC) allows you to communicate with another device without connecting to a network. This technology is used by Android Beam and certain payment apps. The device that you are transferring to needs to support NFC, and it needs to be within four centimeters of your device.

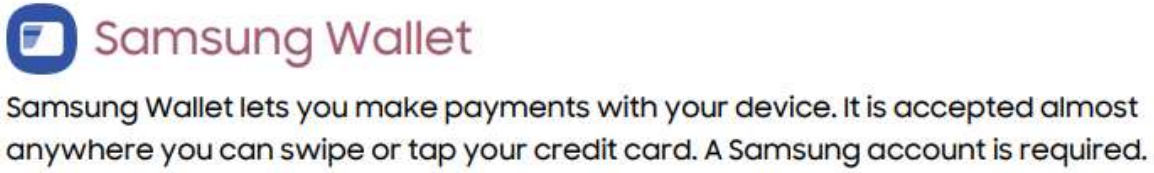
- From Settings, tap Connections > NFC and contactless payments, and then tap to turn on this feature.

Tap and pay

Use an NFC payment app to make payments by touching your device to a compatible credit card reader.

1. From Settings, tap Connections > NFC and contactless payments, and then tap to turn on NFC.
2. Tap Contactless payments to see the default payment app.
   - To use another payment app, tap an available app to choose it.
   - To use a payment app that is open, tap Pay with currently open app.
   - To set another payment service as the default, tap Others, and then tap the service you prefer.

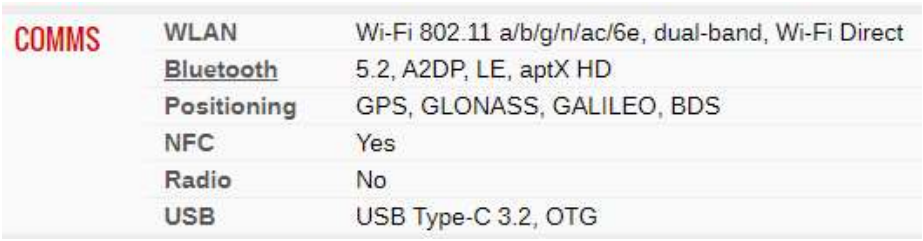
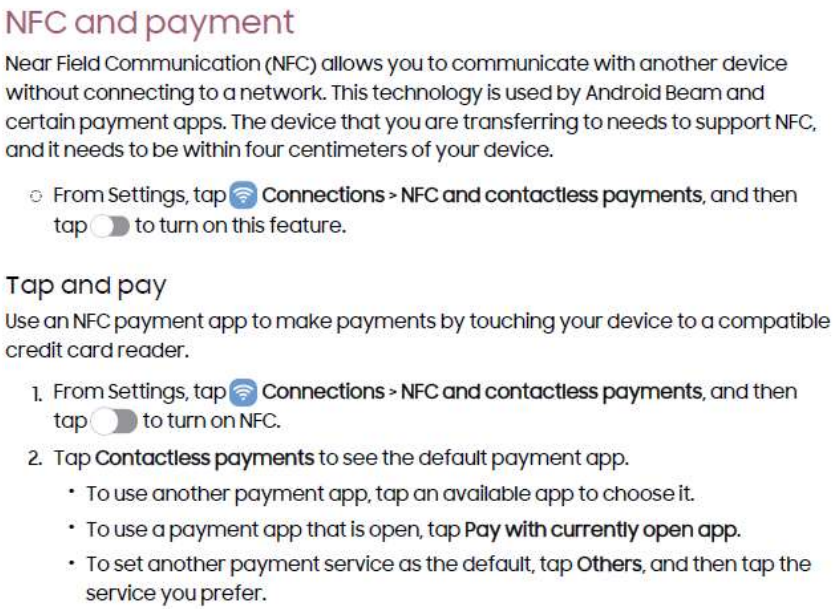
Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

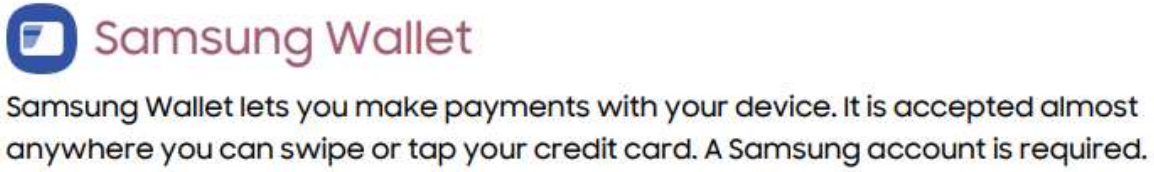
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

NFC and payment

Near Field Communication (NFC) allows you to communicate with another device without connecting to a network. This technology is used by Android Beam and certain payment apps. The device that you are transferring to needs to support NFC, and it needs to be within four centimeters of your device.

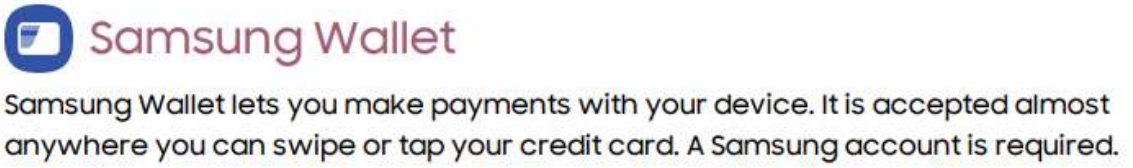
- From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on this feature.

Tap and pay

Use an NFC payment app to make payments by touching your device to a compatible credit card reader.

1. From Settings, tap **Connections** > **NFC and contactless payments**, and then tap to turn on NFC.
2. Tap **Contactless payments** to see the default payment app.
   - To use another payment app, tap an available app to choose it.
   - To use a payment app that is open, tap **Pay with currently open app**.
   - To set another payment service as the default, tap **Others**, and then tap the service you prefer.

Galaxy A54 User Guide at pg. 105.

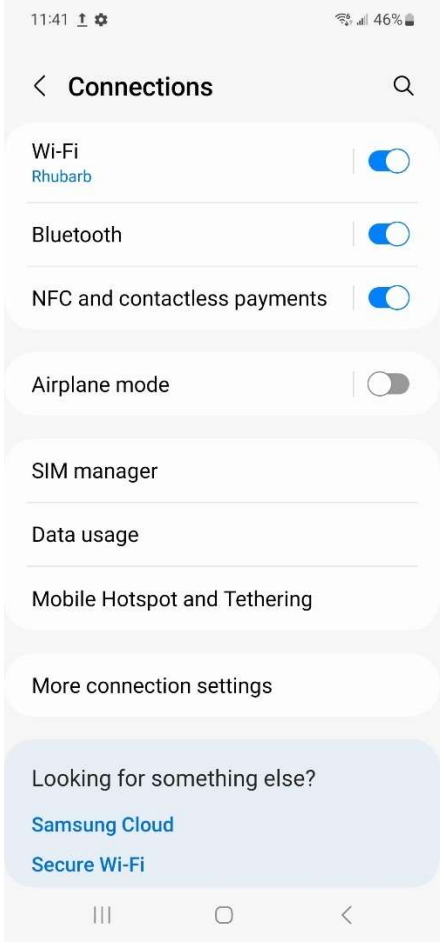
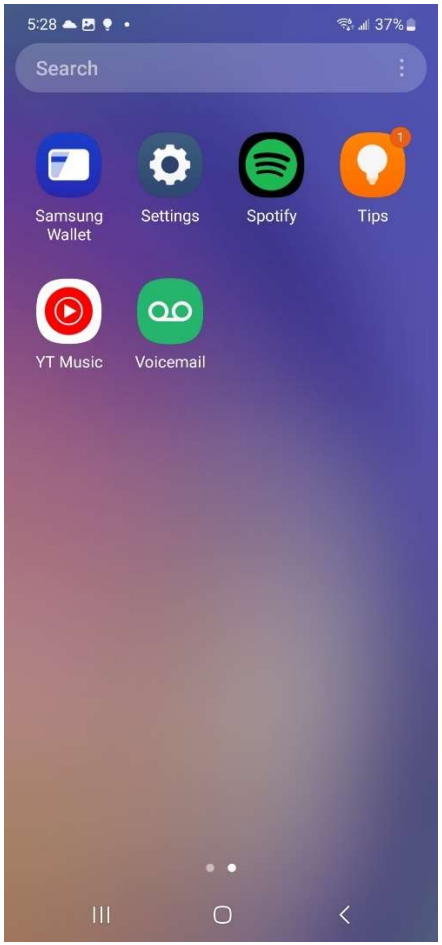
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 57.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

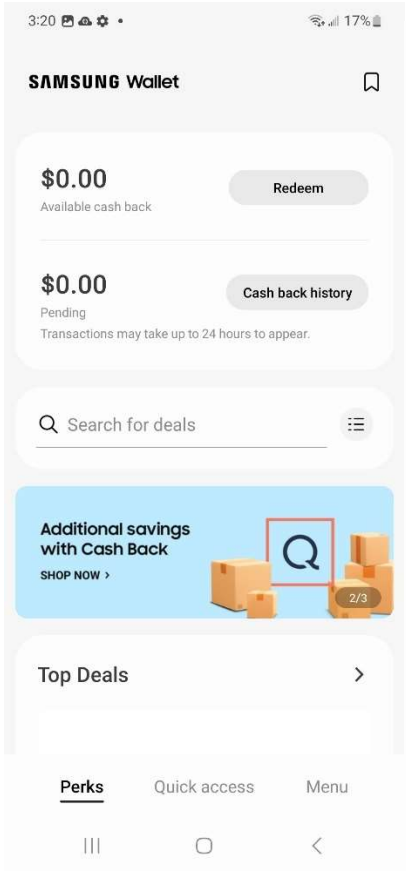
Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

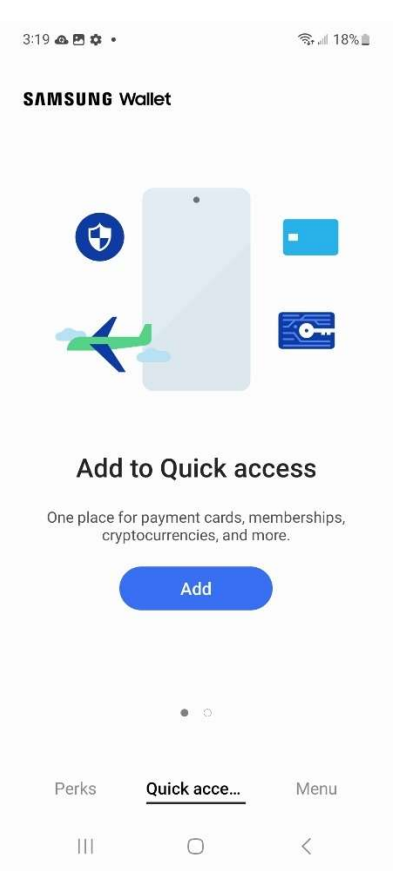
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf For example, the following screenshots show exemplary Accused Samsung '590 Products using a NFC communication chip to transmit information by using Samsung Pay and/or Samsung Wallet applications: **Samsung Galaxy A54 5G:**

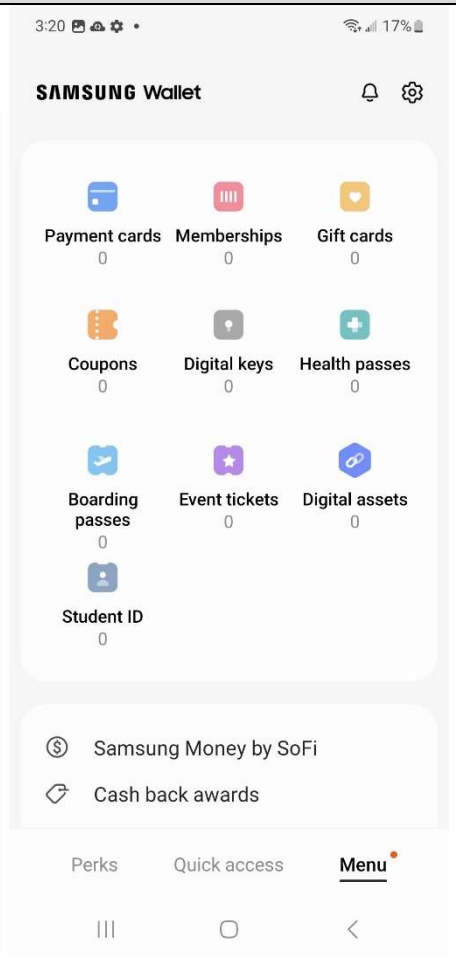
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

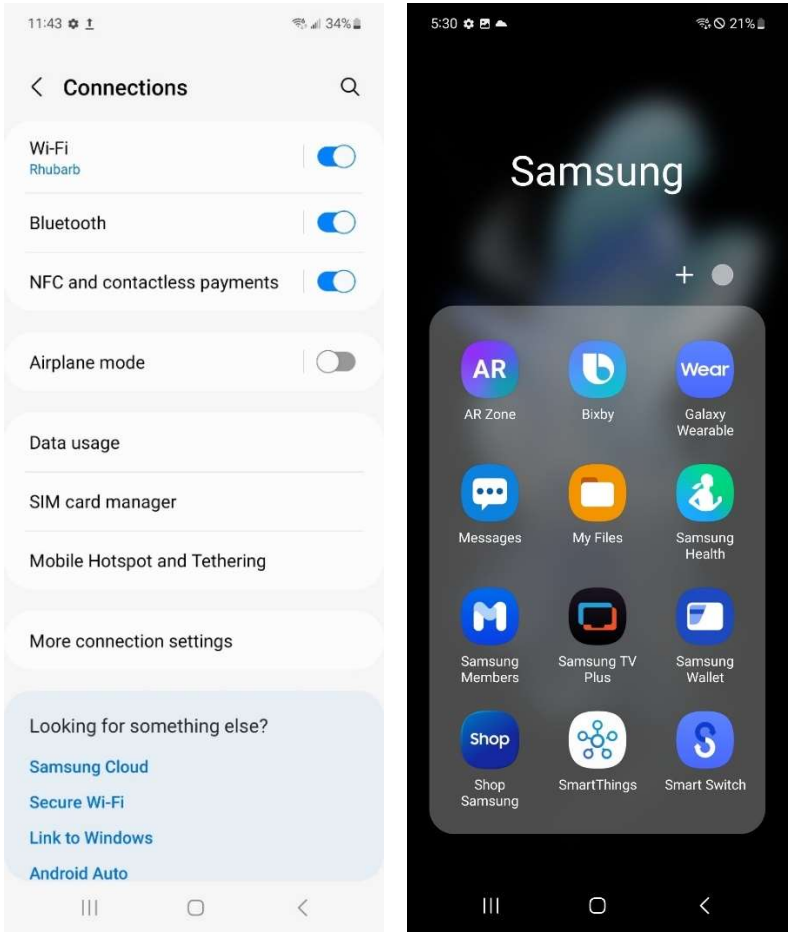
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

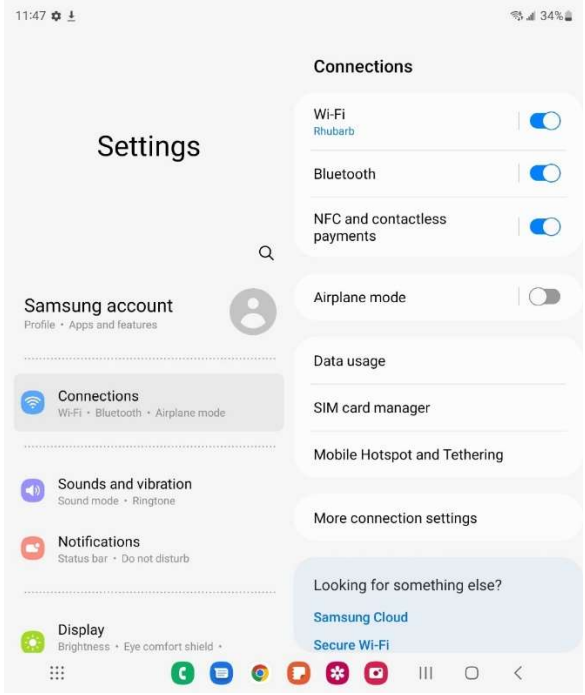


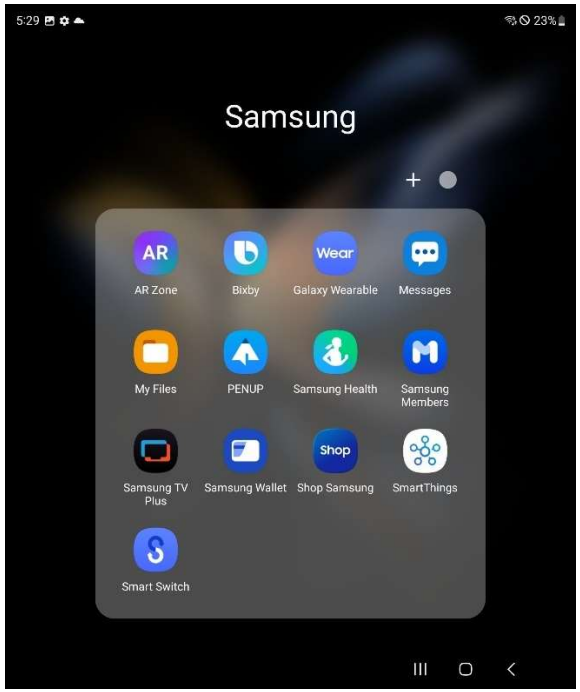




U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy ZFlip 4:  **Samsung Galaxy ZFold 4:**

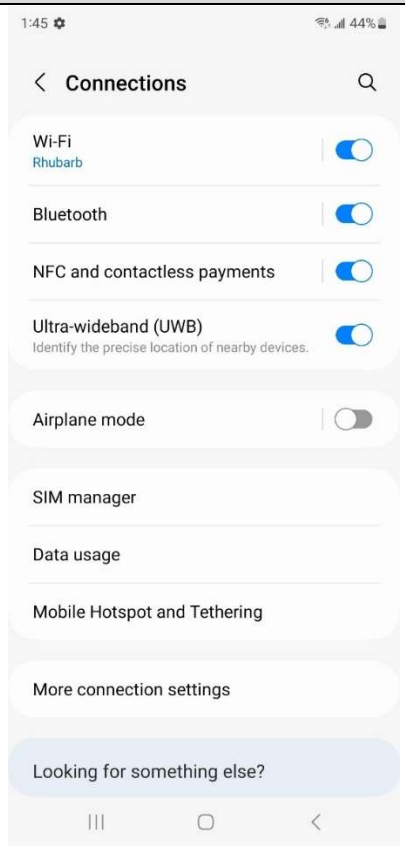
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

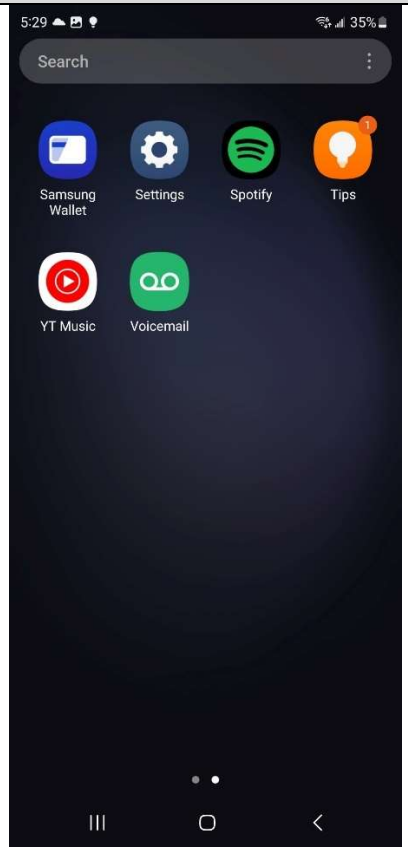




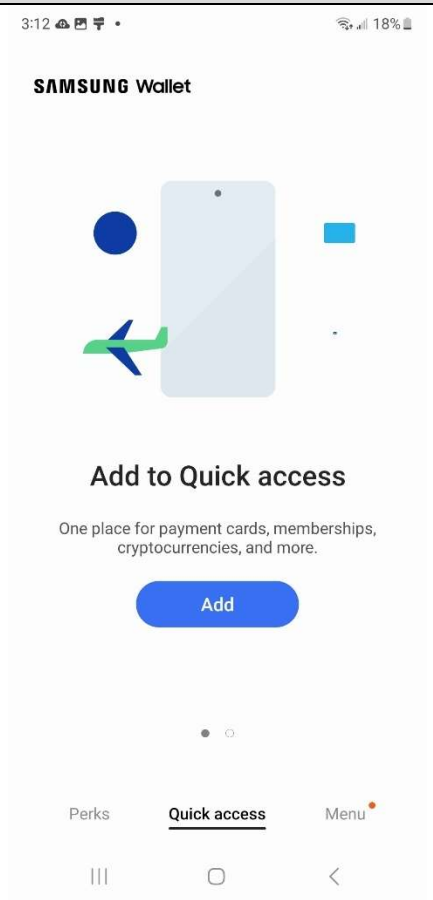
Samsung Galaxy S23 Ultra:

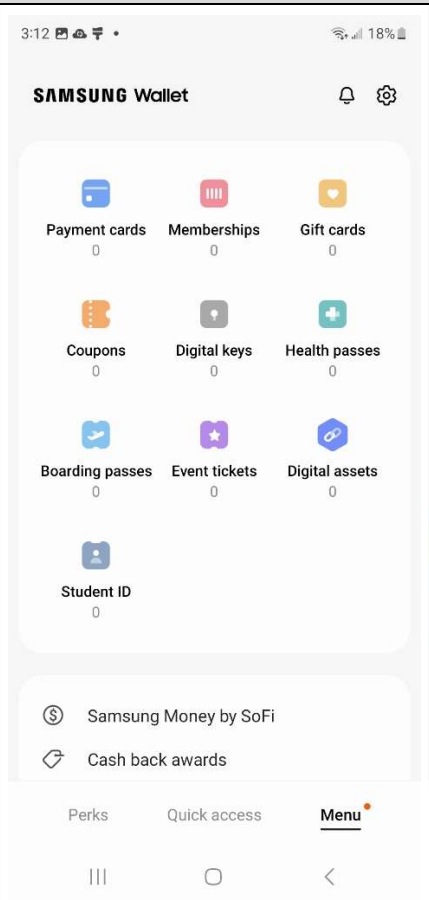
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

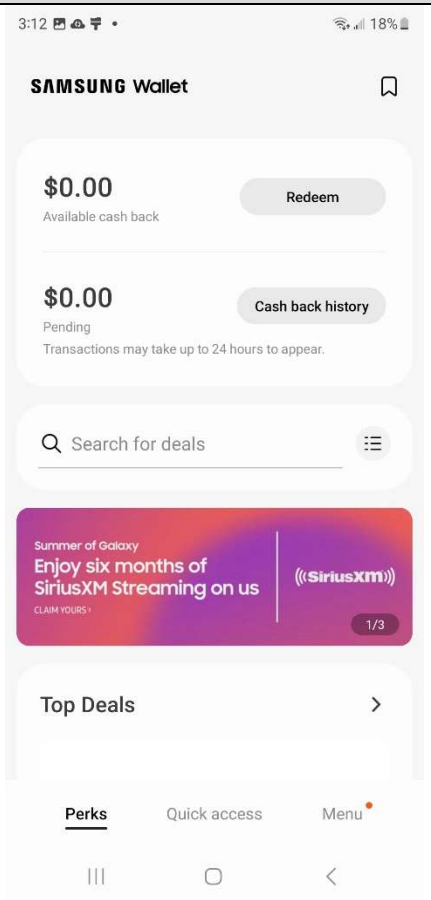




U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement







See also Appendix 8 showing that the remaining Accused Samsung '590 Products include a NFC communication chip and operate in a similar manner. *See* https://www.samsung.com/us/samsung-pay/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[10.f] displaying, via a display circuit, information received by the first radio communication circuit or the second radio communication circuit,	*See supra* at claim [5.f] showing that each of the Accused Samsung '590 Products includes a display circuit for displaying information received by Bluetooth, WiFi, and/or cellular communication circuit by selecting such information from the Camera or Gallery applications for playback.
[10.g] controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits, wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user such that when an indication from the user indicates to use the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for receiving the video information,	Each of the Accused Samsung '590 Products performs a method of controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits, wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user such that when an indication from the user indicates to use the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for receiving the video information. For example, each of the Accused Samsung '590 Products includes a chipset that includes one or more processors (*e.g.*, CPU) that executed the operating system source code to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits for various functions and/or applications (*e.g.*, Quickshare, Bluetooth file share, email, MMS, Samsung Wallet).

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/

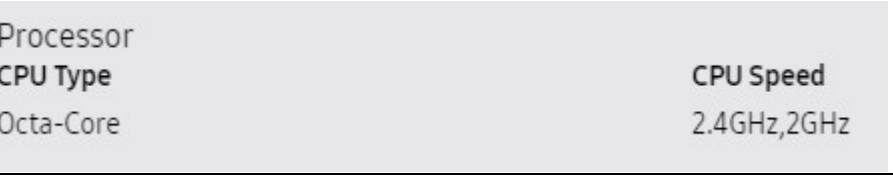
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

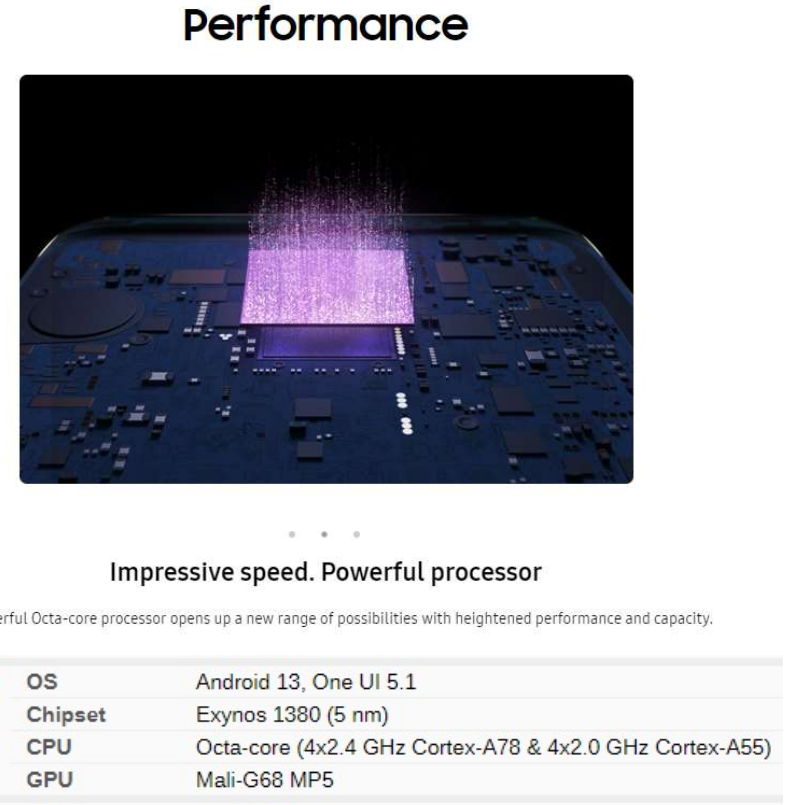


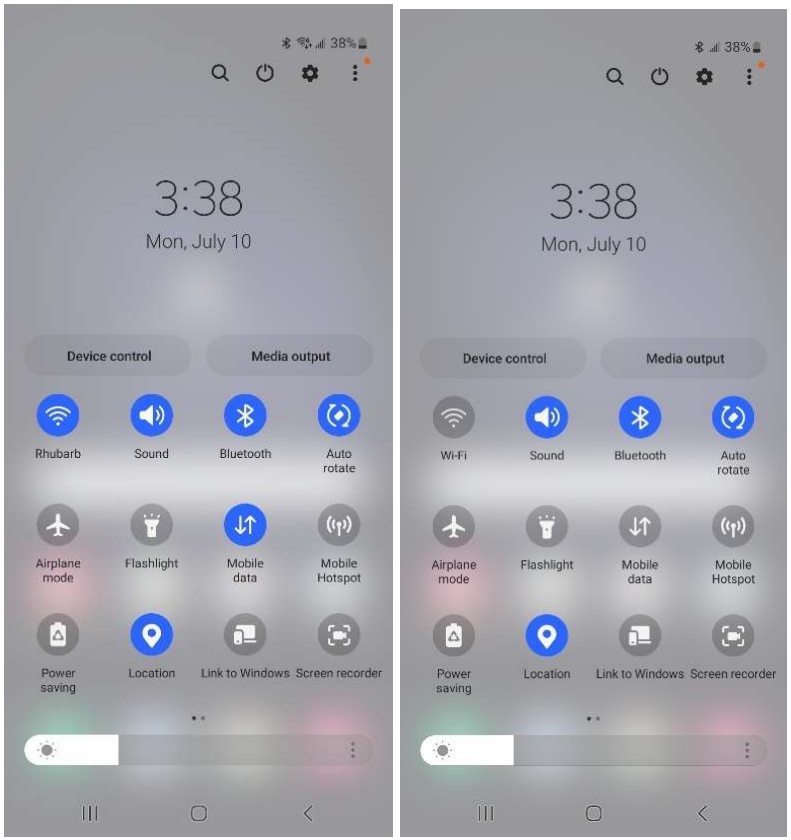
Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

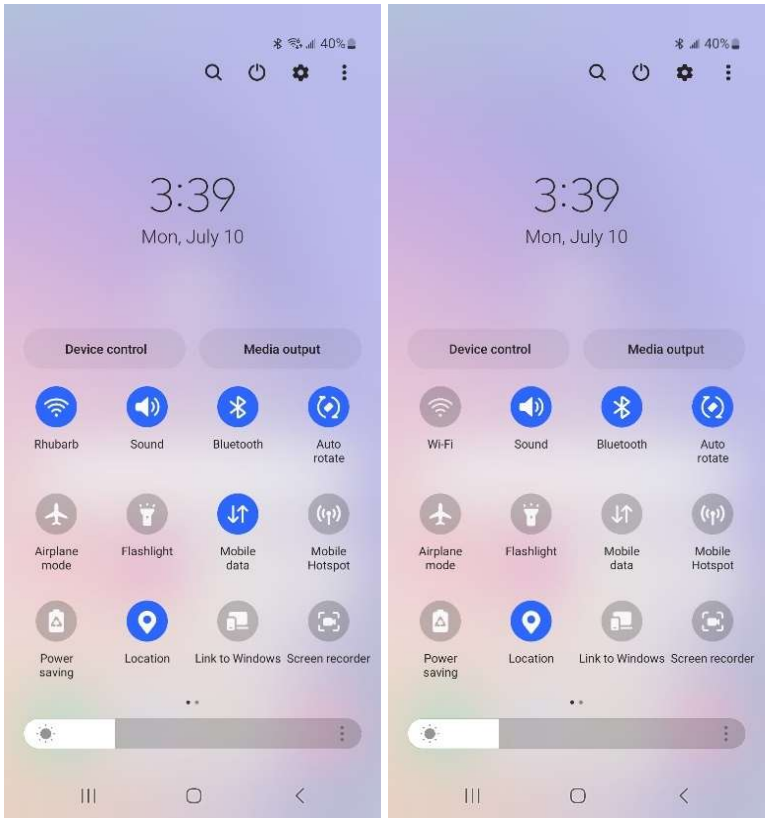


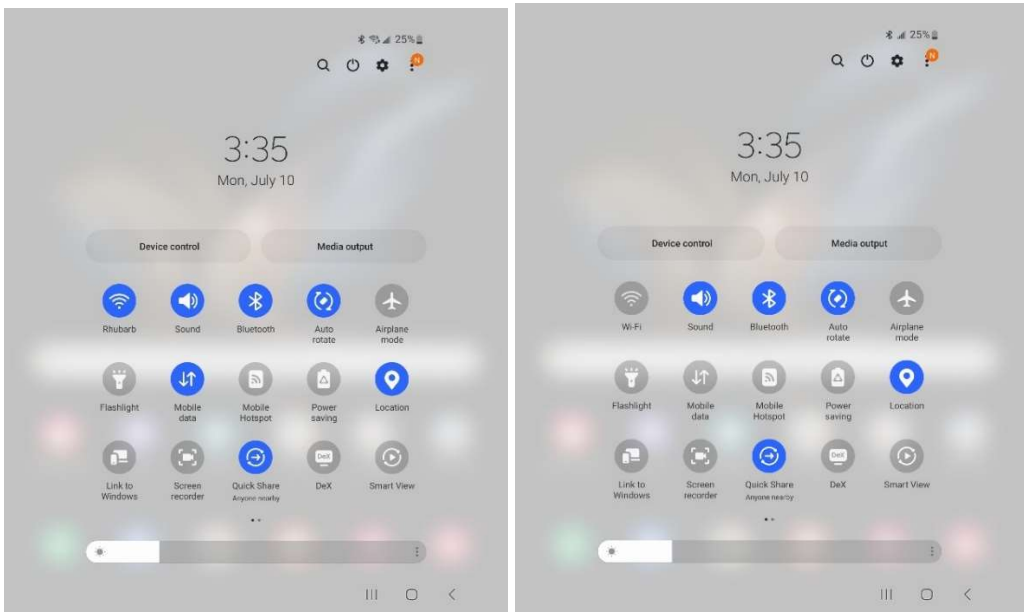
Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

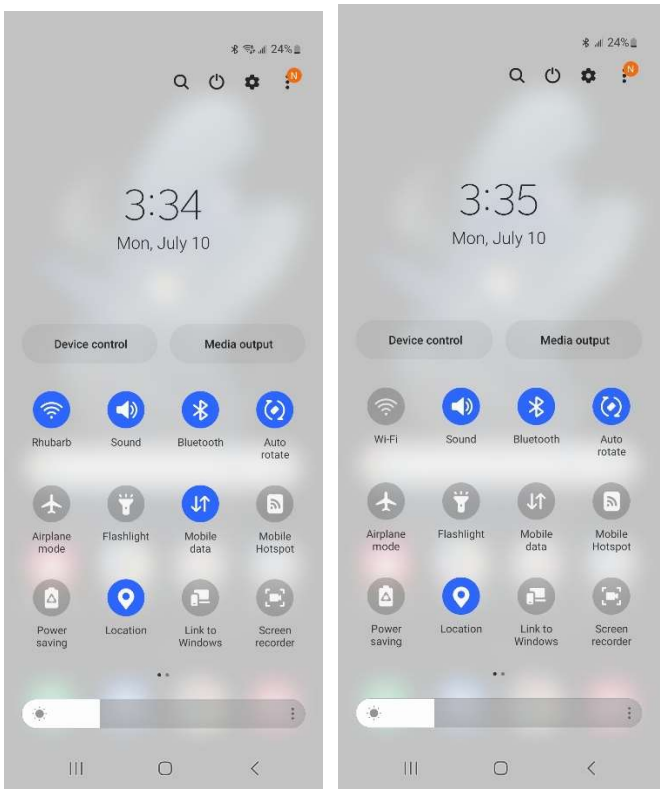
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php. 

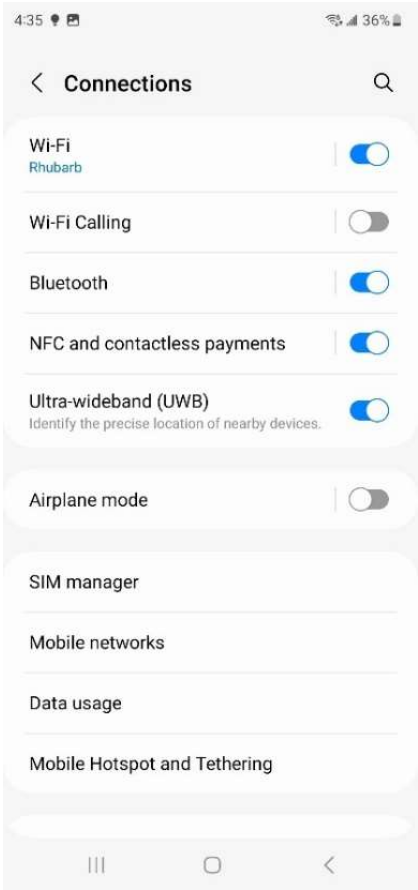
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php. For example, the following screenshots show exemplary Accused Samsung '590 Products using a controller (*e.g.*, application processor or CPU) to control assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication chips by turning them on/off through the quick control menu:

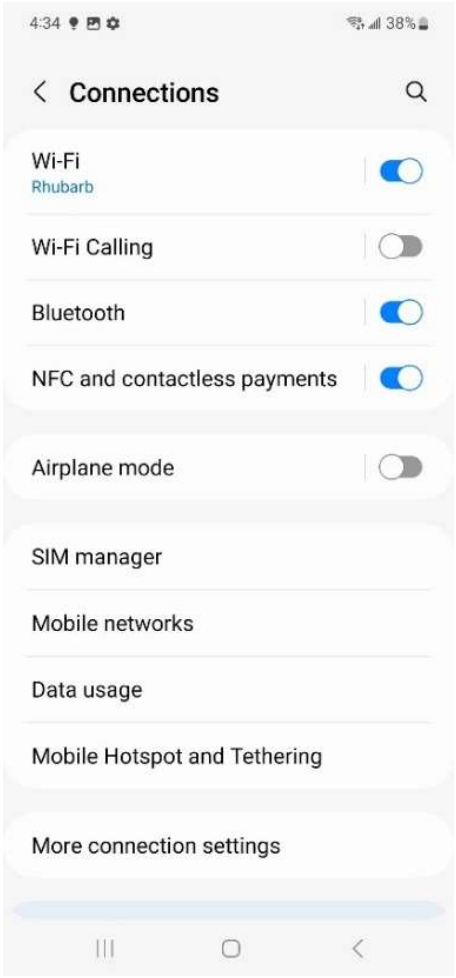
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

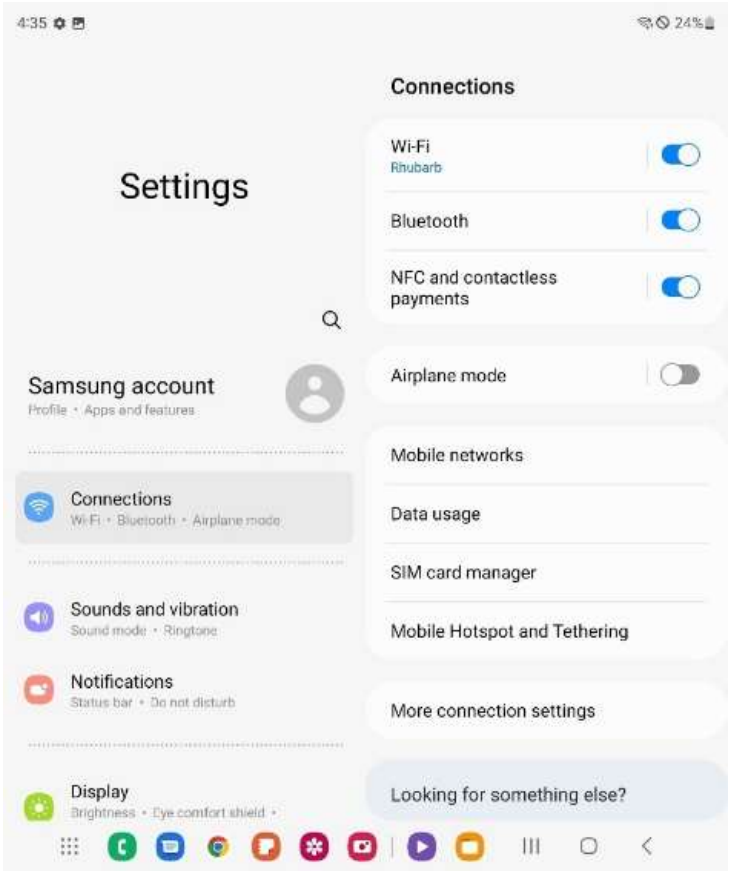
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

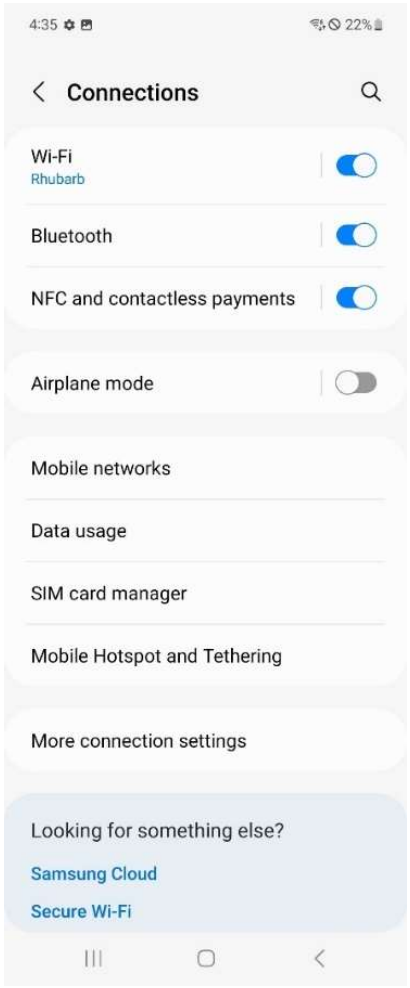
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)  As an additional example of controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	"Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options. User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

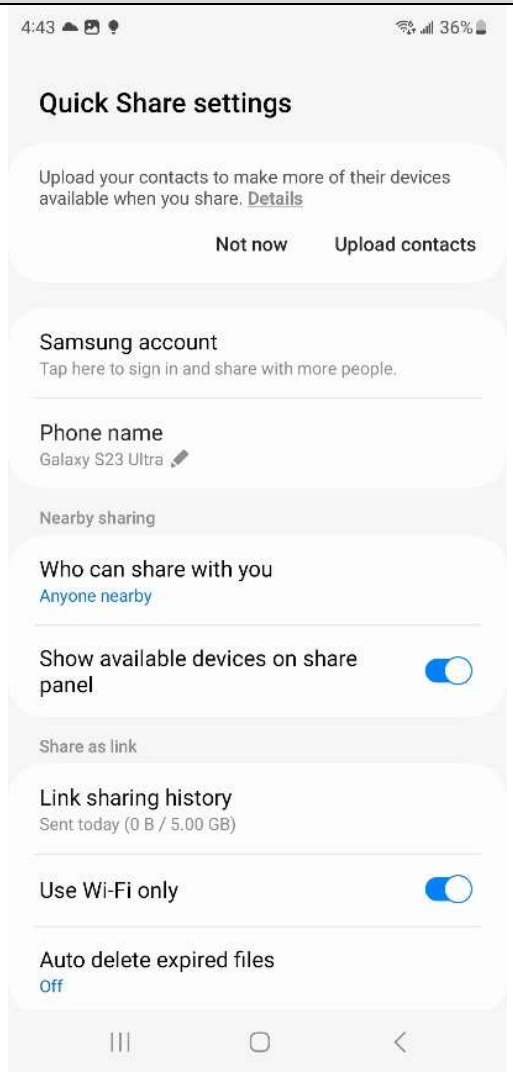
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4) 

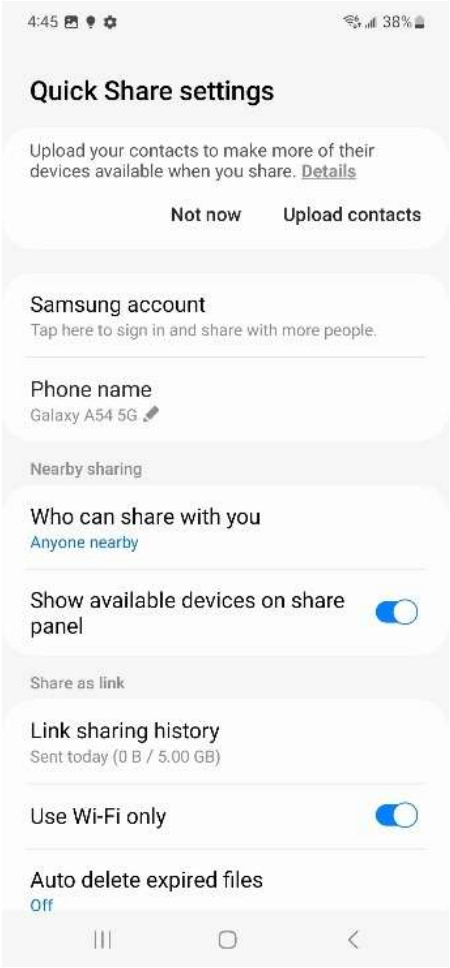
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of the controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products receive instructions from the user to use "Quick Share," "Samsung Pay," "Bluetooth File Share," and/or access the internet which will be accepted by the operating system executing on the one or more CPUs and based on such execution the controller will control the assignment of the connection by sending the instructions to one of the WiFi, NFC, Bluetooth, and cellular circuits, respectively. Further, each of the Accused Samsung '590 Products controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user such that when an indication from the user indicates to use the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for receiving the video information or transmitting the information by radio. **First Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Wi-Fi and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to recieve video information using the Wi-Fi communication circuit, the controller assigns a connection to the Wi-Fi communication circuit for receiving the video by using Wi-Fi, for example, "Quick Share." For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share "Wi-Fi only" and then receiving data through the Quick Share application. Also, "an indication" from a user to control assignment to the cellular communication chip is turning the cellular or Wi-Fi connection on/off from the quick menu. As an additional example, "an indication" from a user to control assignment to the Wi-Fi communication chip is "Accepting" a Quick Share request to receive video from another device.

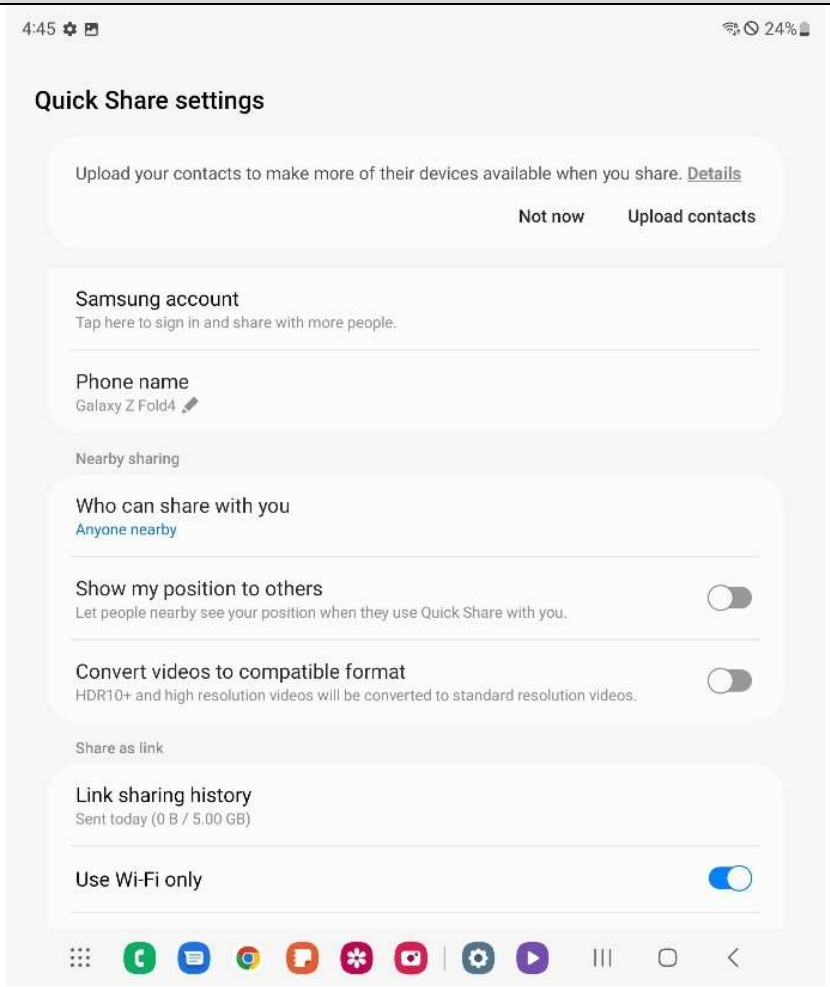
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

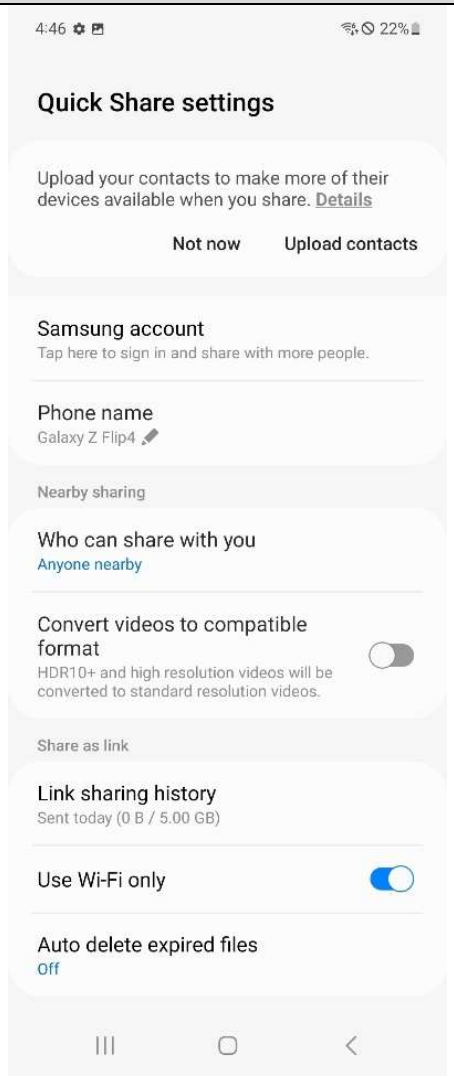
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show exemplary Accused Samsung '590 Products turning selecting Quick Share "Wi-Fi only" and then receiving data through the Quick Share application: **Samsung Galaxy 23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

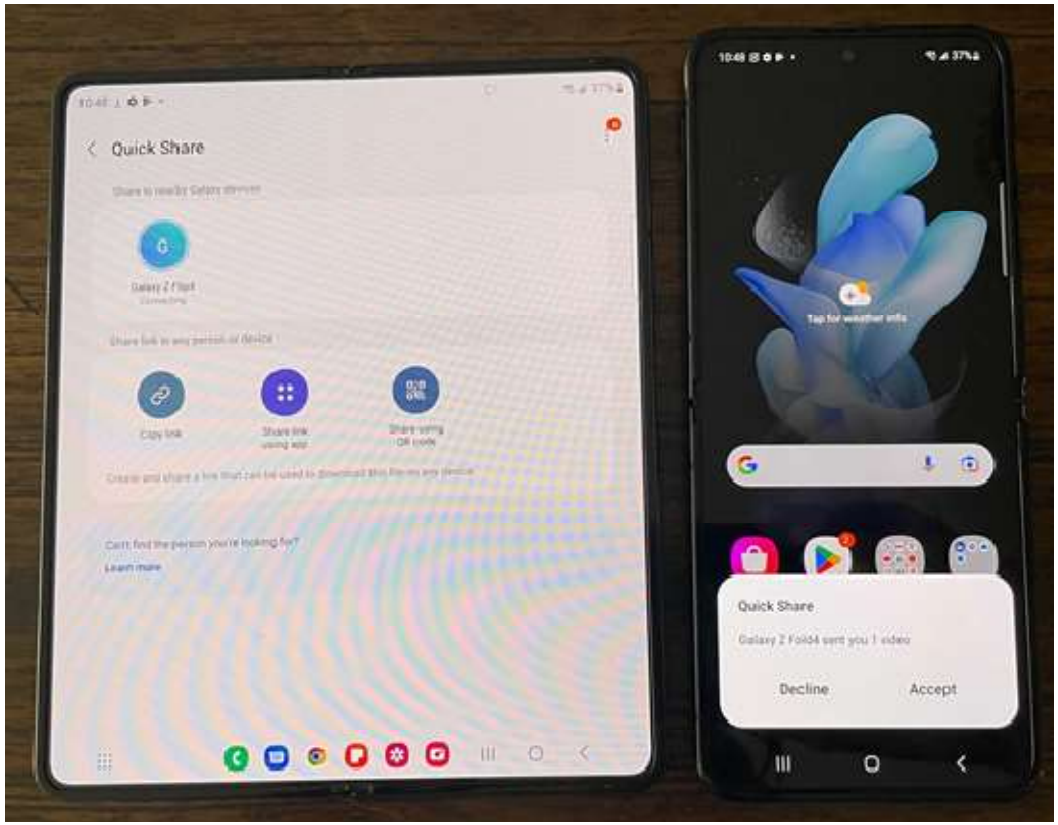
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

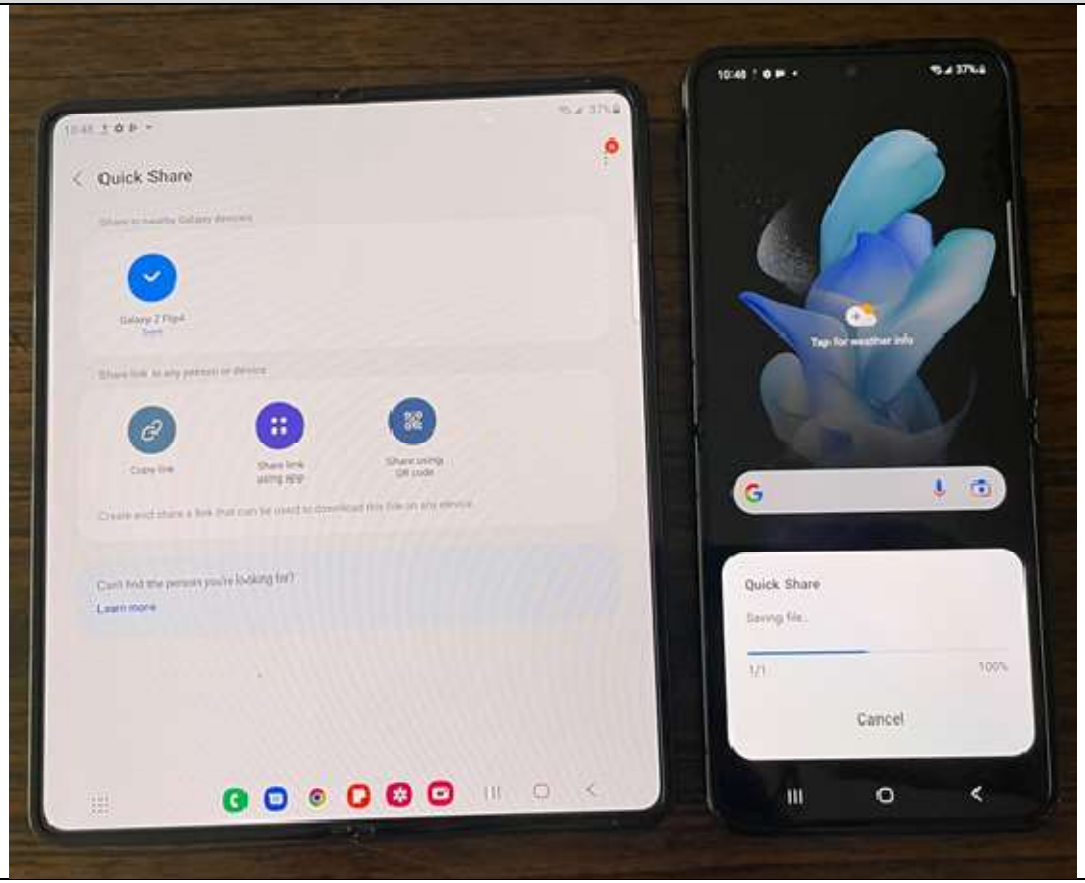
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
	Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)	


1 item
Galaxy Store
Play Store
Google
Microsoft

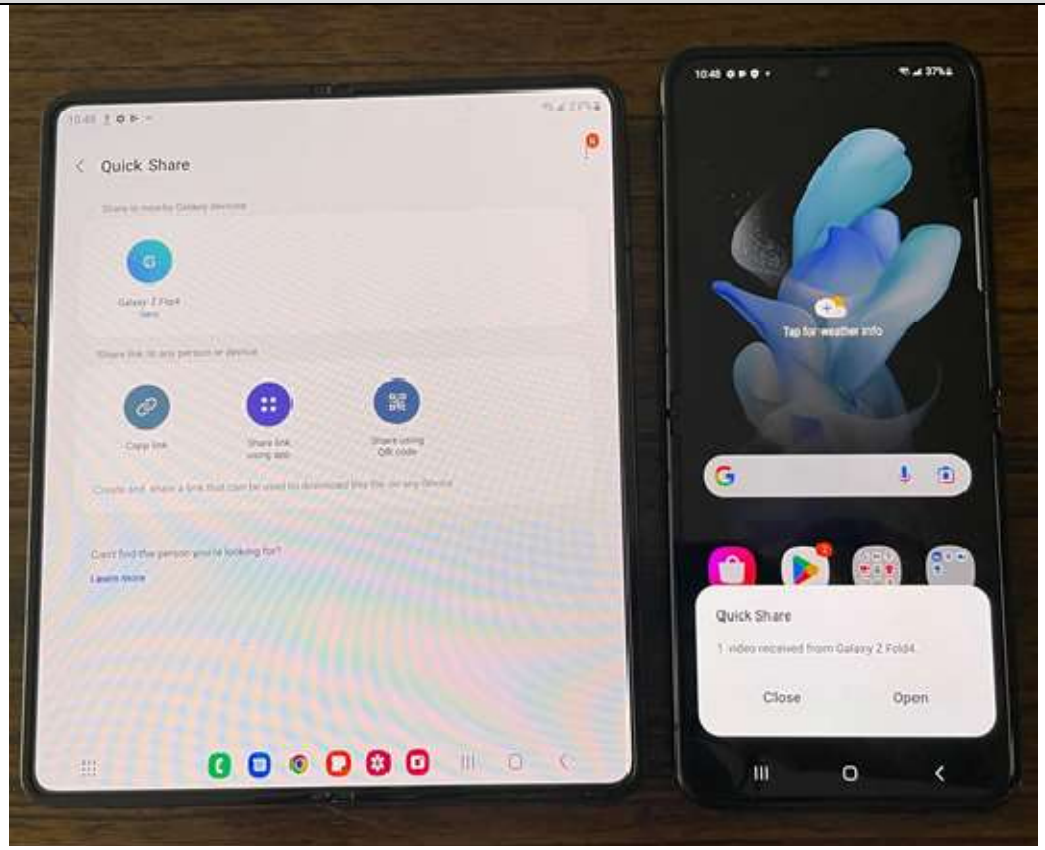
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



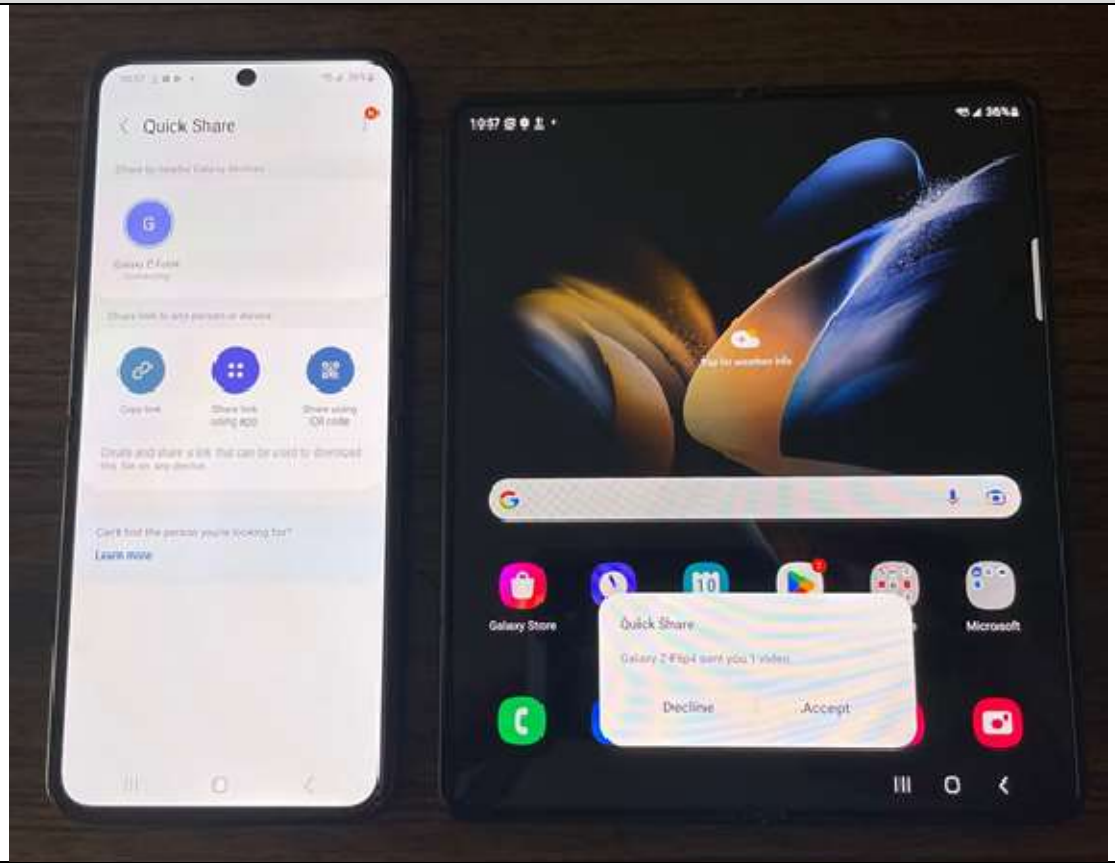
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

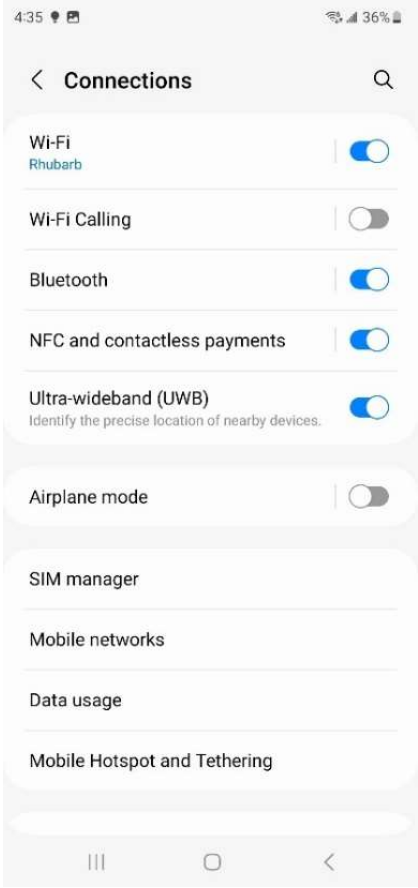
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

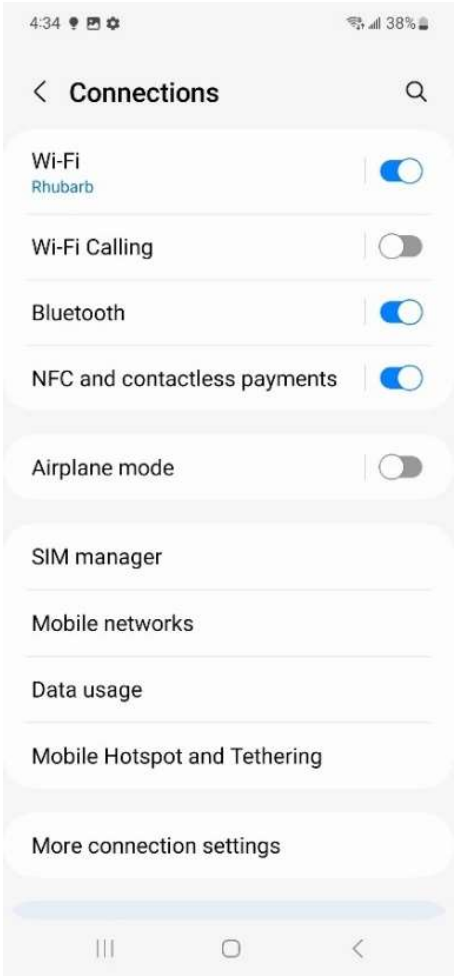
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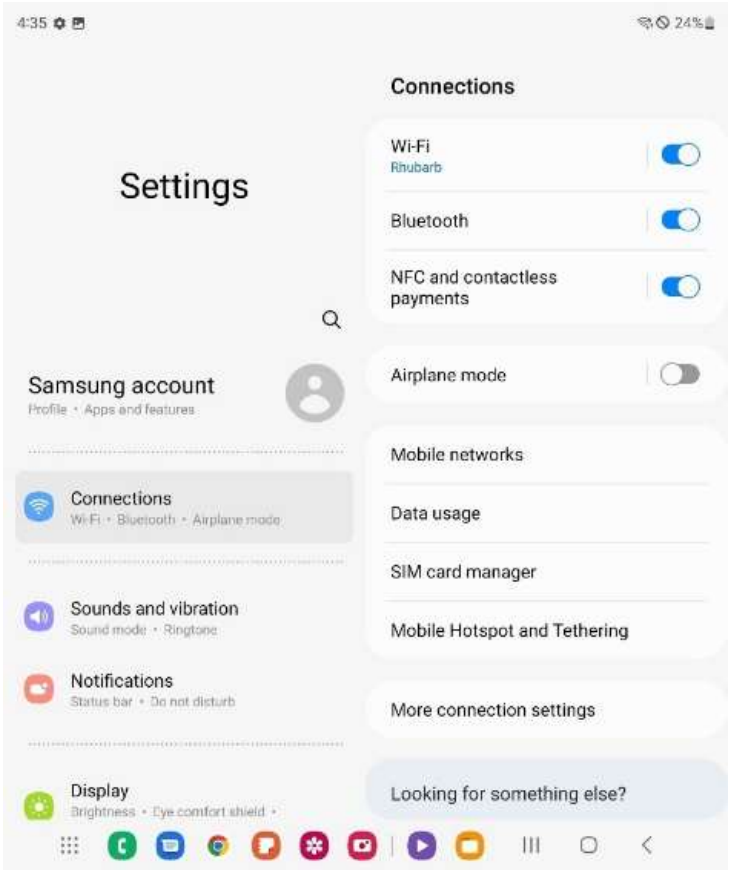
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

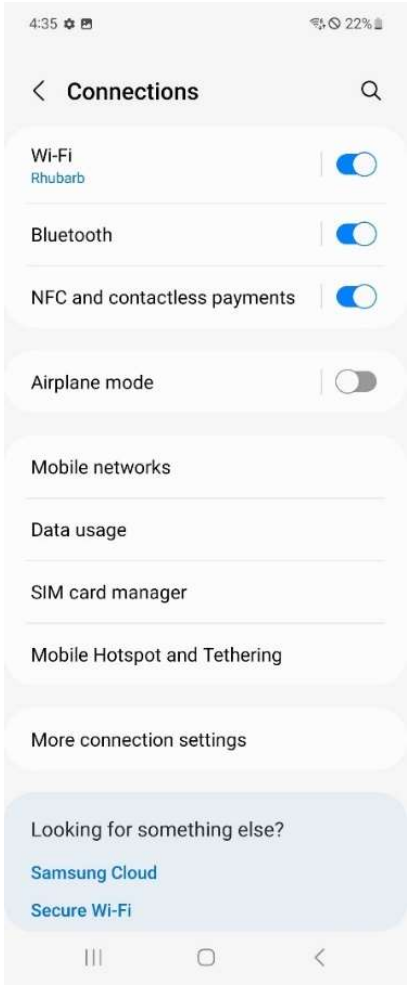
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 For example, the following screenshots show exemplary Accused Samsung '590 Products turning Wi-Fi on/off and cellular on/off: User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

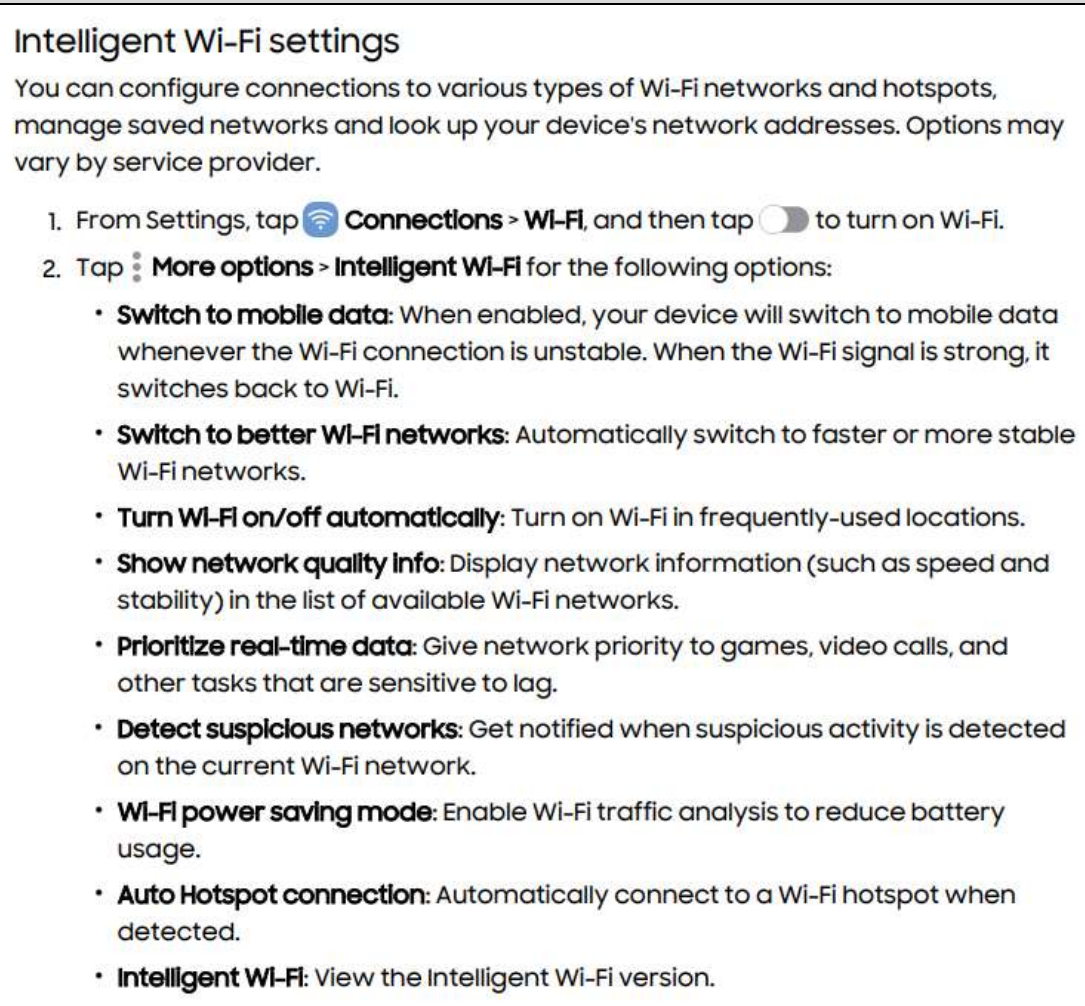
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

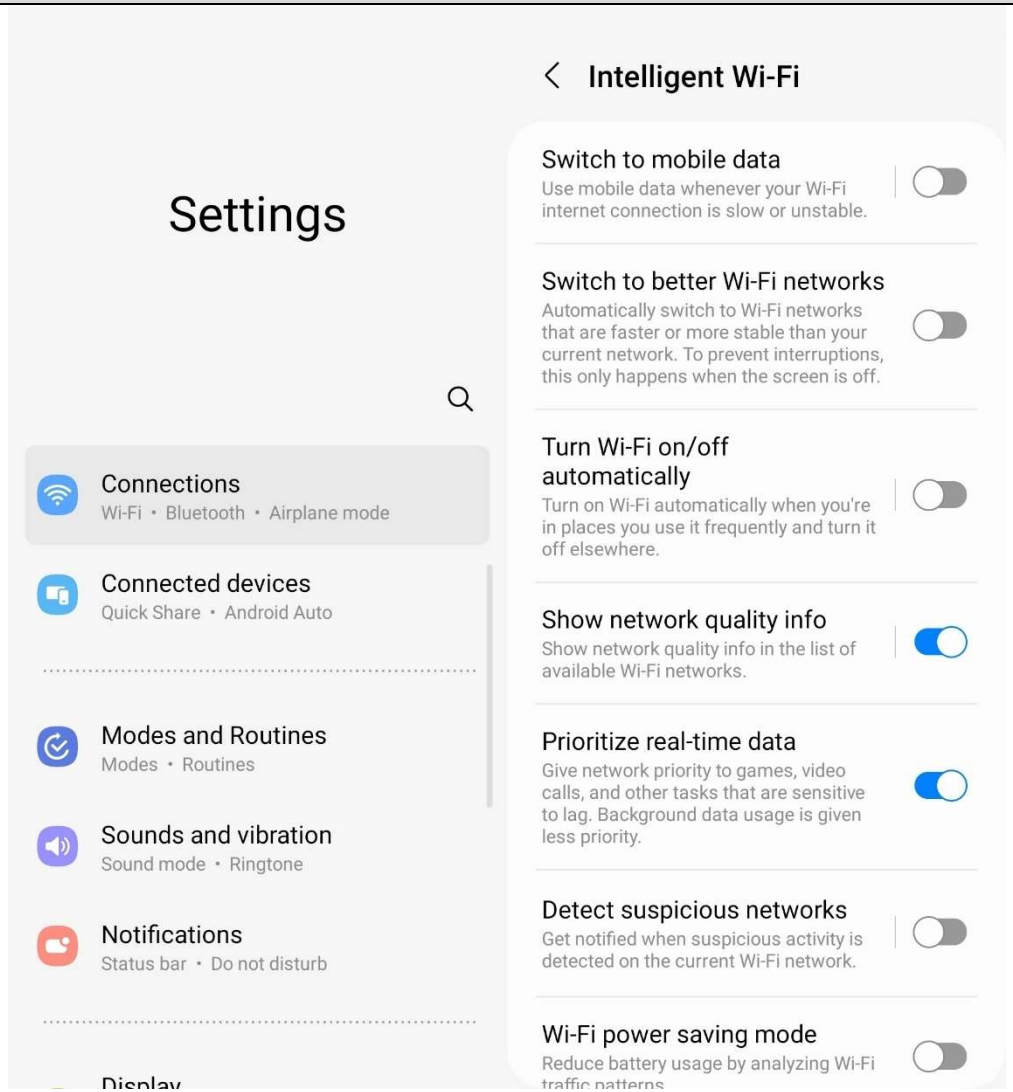
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of "an indication" from a user to control assignment, the user can turn Wi-Fi on and turn cellular connection off to indicate that the user wants to use Wi-Fi for communications. As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Wi-Fi off to indicate that the user wants to use cellular connection for communications. Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Switch to mobile data," so the user is indicating to assign a connection to the cellular communication chip when the Wi-Fi connection is unstable. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 User Guide at pg. 122.

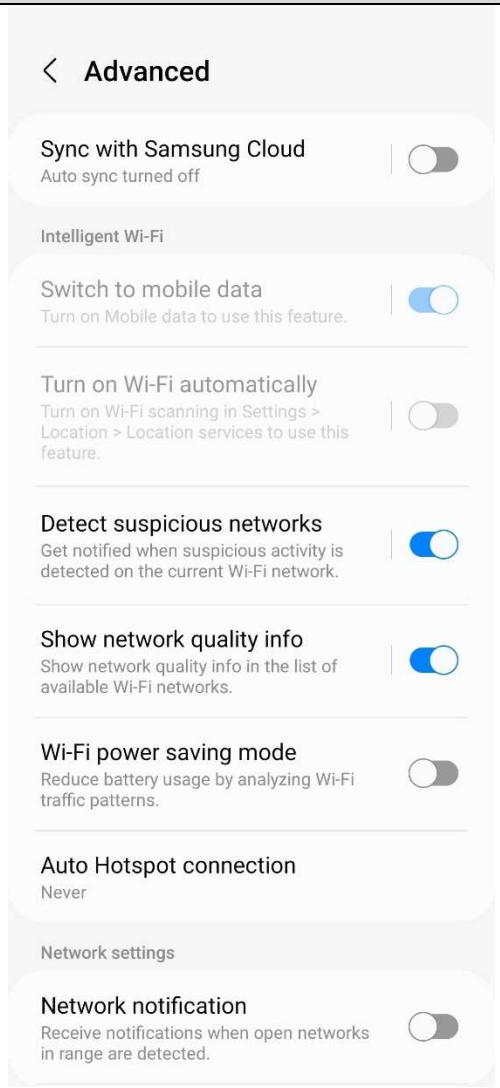
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. • **Prioritize real-time data**: Give network priority to games, video calls, and other tasks that are sensitive to lag. • **Detect suspicious networks**: Get notified when suspicious activity is detected on the current Wi-Fi network. • **Wi-Fi power saving mode**: Enable Wi-Fi traffic analysis to reduce battery usage. • **Auto Hotspot connection**: Automatically connect to a Wi-Fi hotspot when detected. • **Intelligent Wi-Fi**: View the Intelligent Wi-Fi version. Galaxy Z Flip4 User Guide at pg. 122.

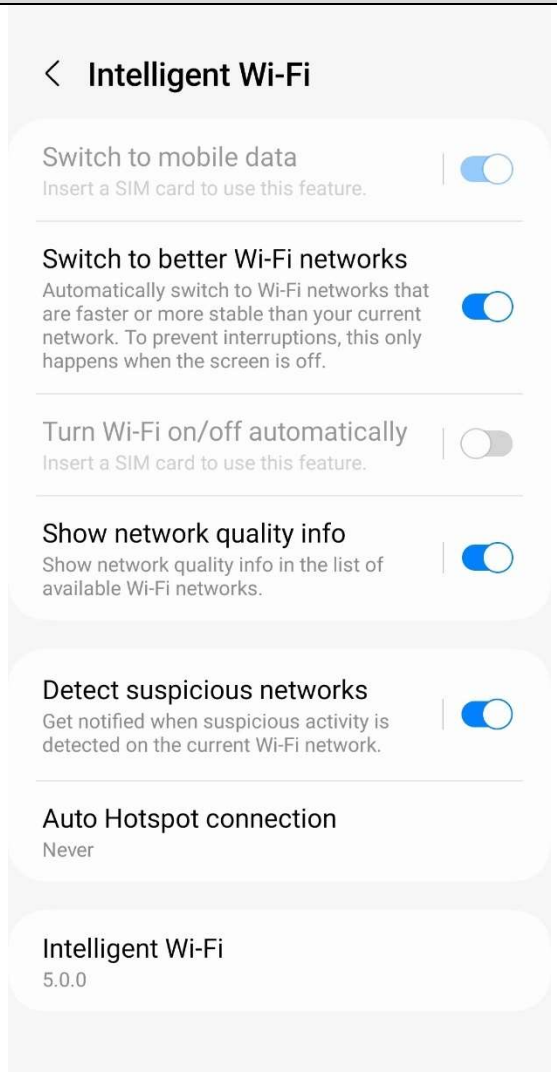
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. Galaxy A54 G User Guide at pg. 101.

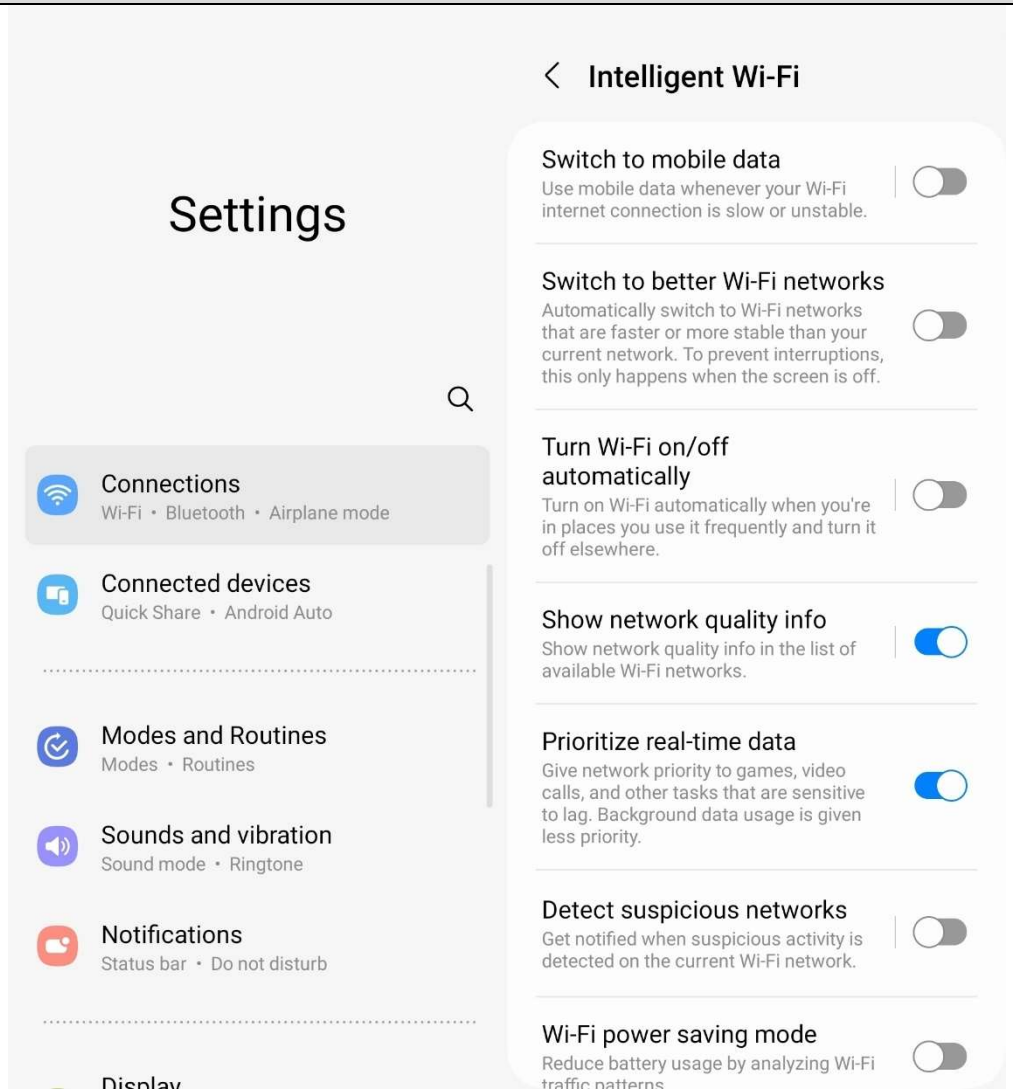
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



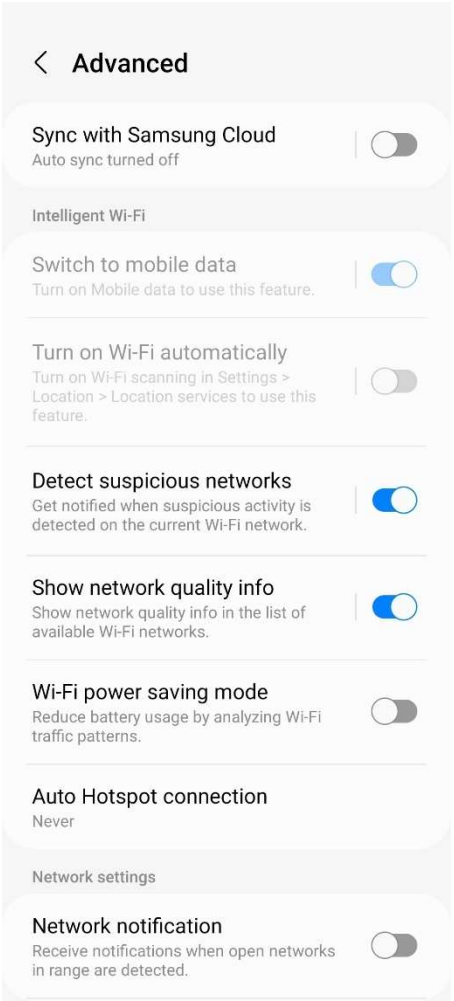
Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

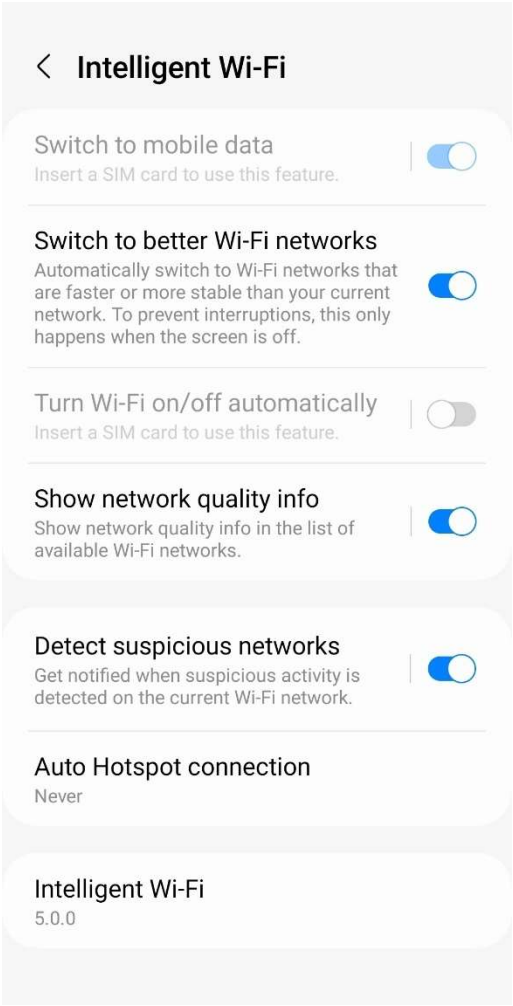
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Turn Wi-Fi on/off automatically," so the user is indicating to switch on Wi-Fi in frequently used areas. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

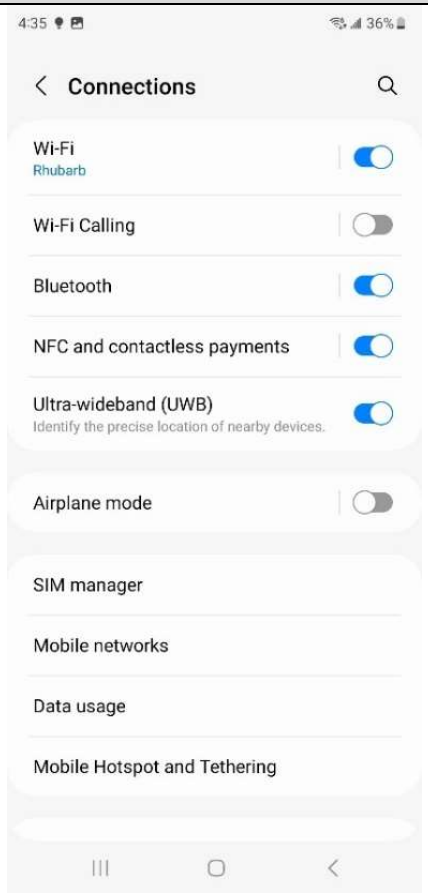


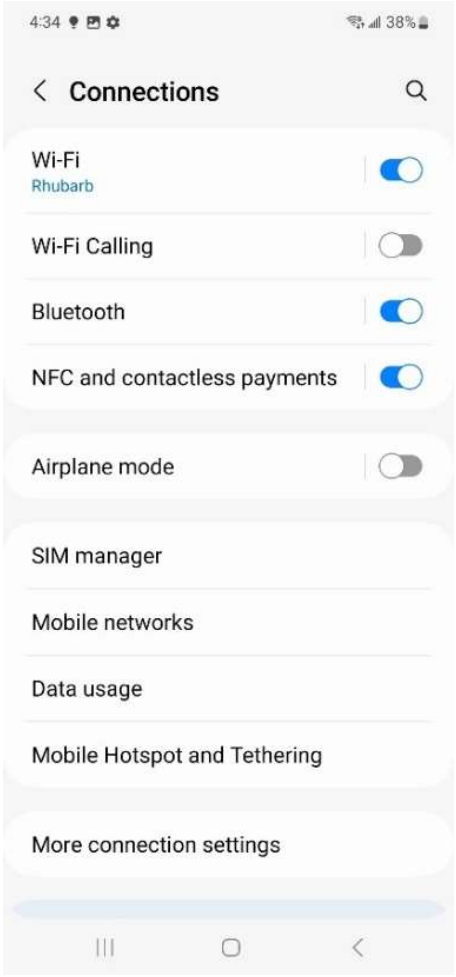
Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

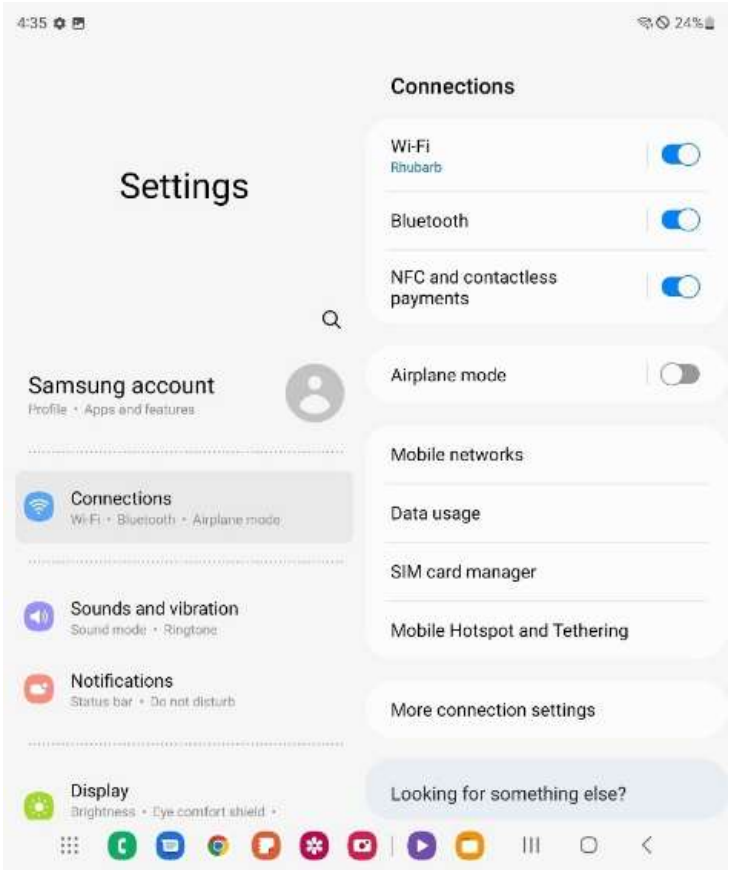
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

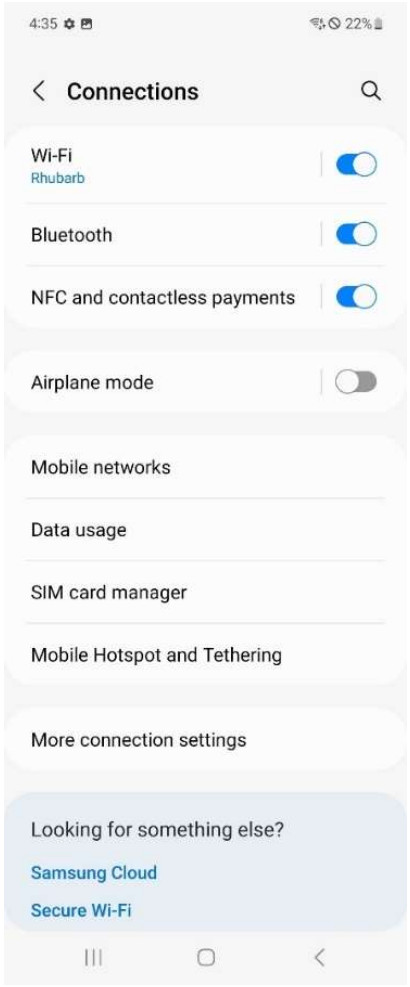
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Second Infringement Theory: For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Bluetooth and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to receive video information using the Bluetooth communication circuit, the controller assigns a connection to the Bluetooth communication circuit for receiving the video by using Bluetooth. For example, "an indication" from a user to control assignment to the Bluetooth communication chip is turning Bluetooth on/off, and "an indication" from a user to control assignment to the cellular communication chip is turning the cellular connection on/off from the quick menu. As an additional example, "an indication" from a user is to "Accept" reception of video via Bluetooth. For example, the following screenshots show exemplary Accused Samsung '590 Products turning Bluetooth on/off and cellular on/off: User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>As an additional example of "an indication" from a user to control assignment, the user can turn Bluetooth on and turn cellular connection off to indicate that the user wants to use Bluetooth for communications.

As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Bluetooth off to indicate that the user wants to use cellular connection for communications.

Further, the user can provide an indication to transmit video information using the Bluetooth communication circuit by selecting "Bluetooth" share, and the controller then assigns a connection to the Bluetooth communication circuit for transmitting the video.

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

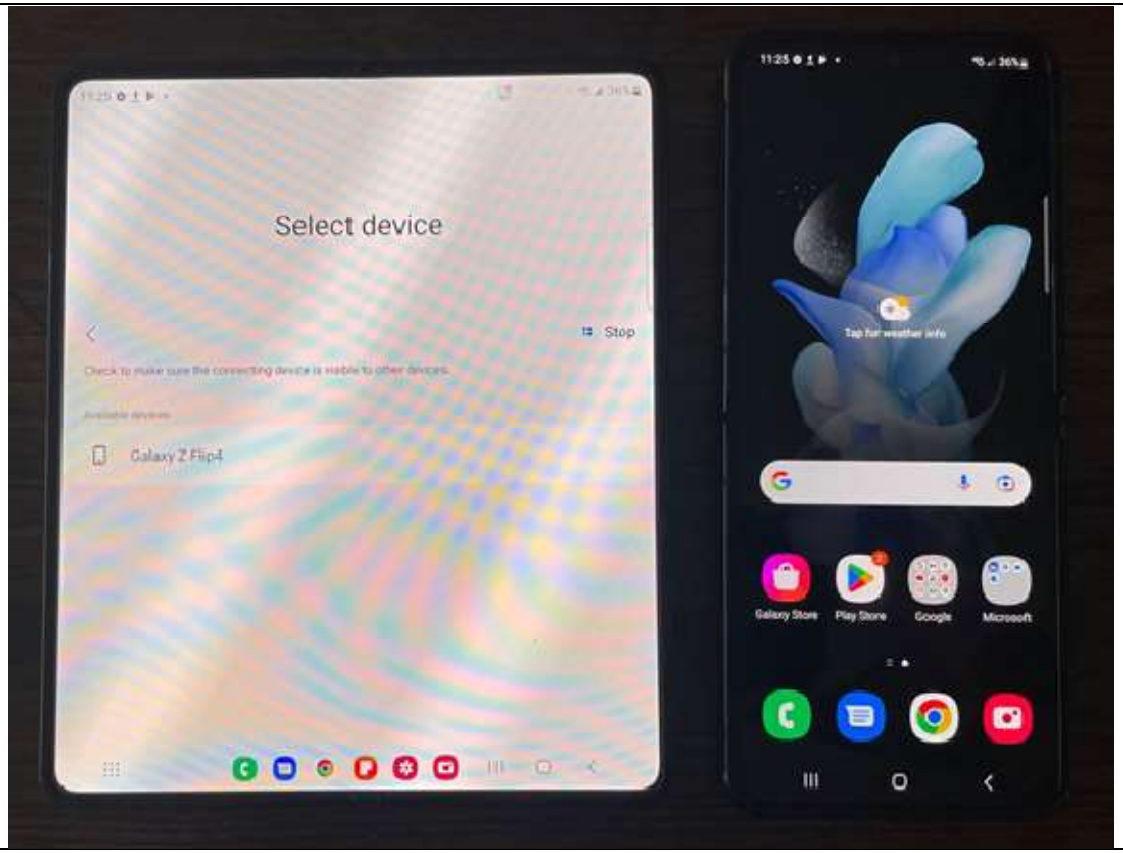
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

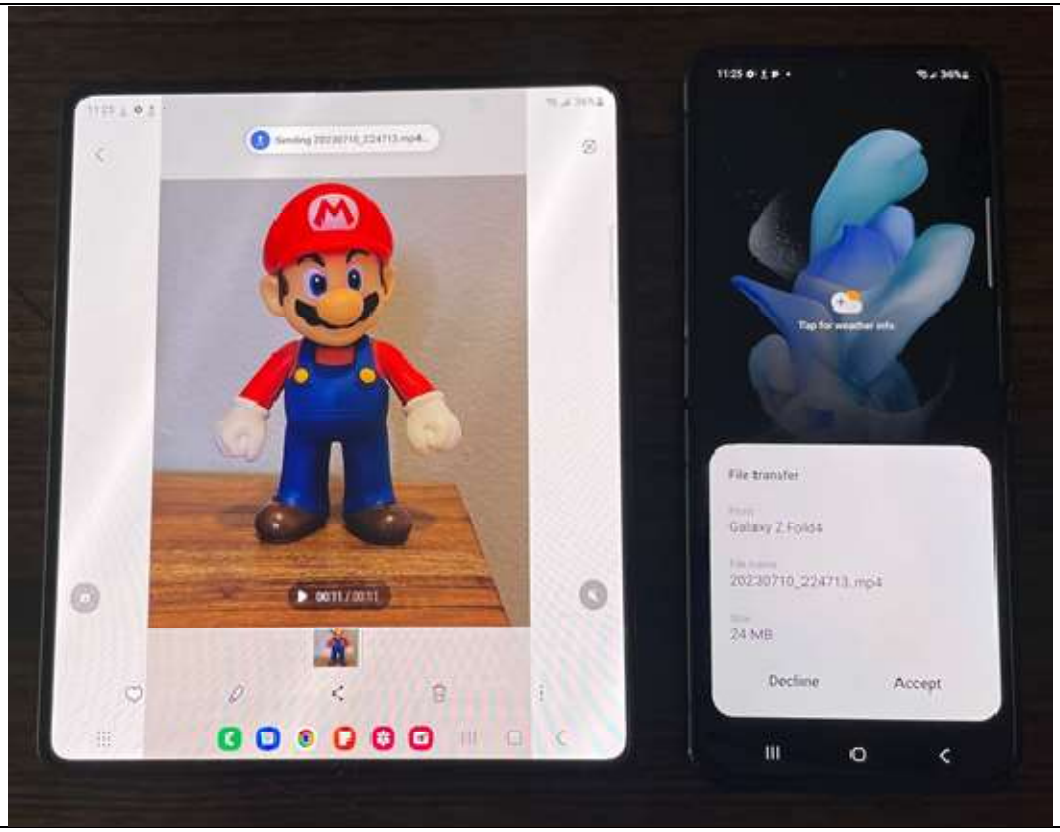
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft

		 Tap for weather info File transfer Galaxy Z Fold4 20230710_224713.mp4 24 MB Decline Accept

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

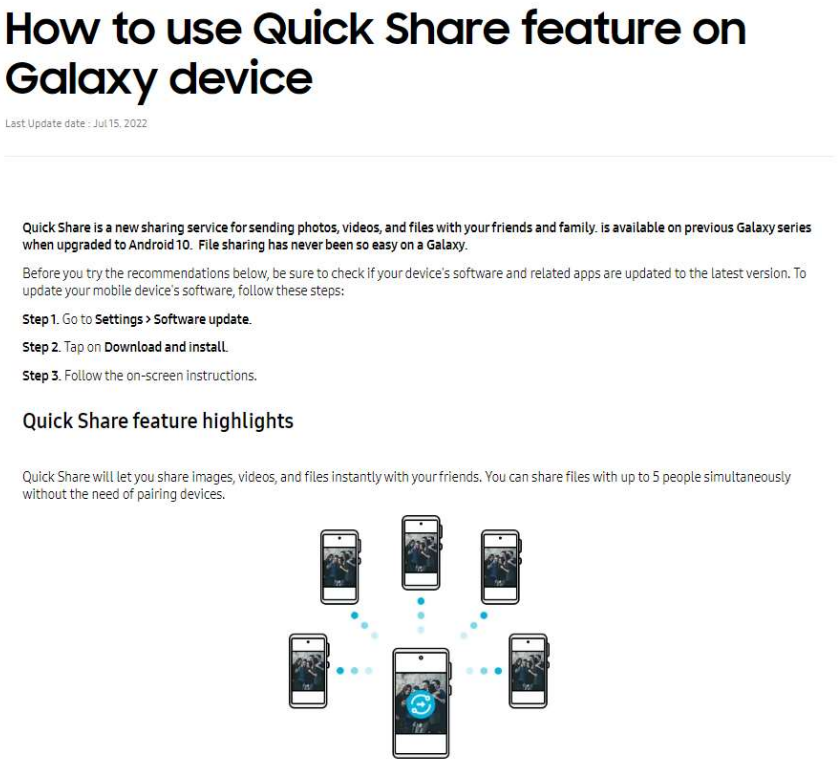


Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls assignment of connection in response to a user selecting options via the touch interface (display) in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.
[10.h] wherein the receiving and connecting is controlled so that the first radio communication circuit is configured to receive video	Each of the Accused Samsung '590 Products performs a method wherein the receiving and connecting is controlled so that the first radio communication circuit receives video information and the second radio communication circuit connects to the internet or the home network simultaneously.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
information and the second radio communication circuit is configured to connect to the internet or the home network simultaneously;	**First Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control receiving of video information via the Wi-Fi communication chip (e.g., Quick Share) and the cellular communication chip connects to the Internet or home network simultaneously.  How to use Quick Share feature on Galaxy device Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1.** Go to **Settings > Software update**. **Step 2.** Tap on **Download and install**. **Step 3.** Follow the on-screen instructions. Quick Share feature highlights Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	1.7 Simultaneous Transmission Capabilities According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

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Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network

Galaxy S23 Ultra User Guide, pg. 30

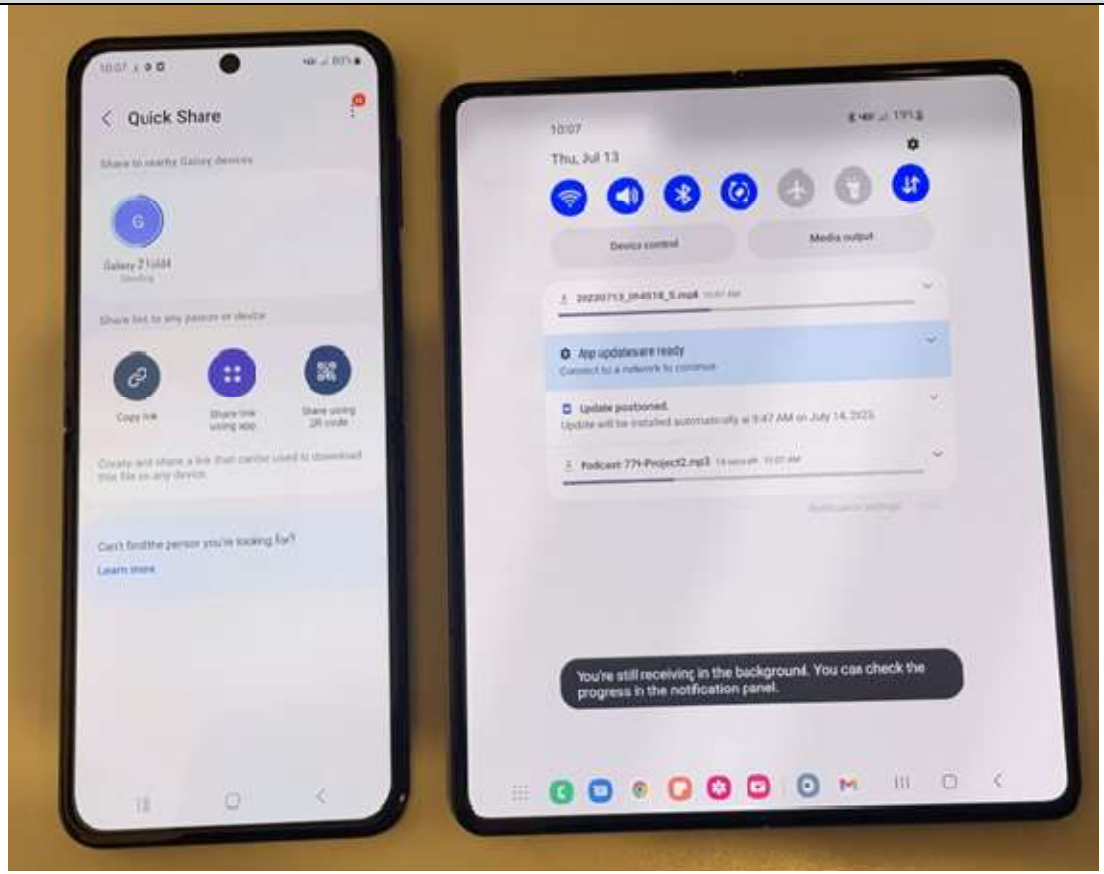
In addition, the Wi-Fi communication chip is used to receive video information via "Quick Share" while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content as Wi-Fi is switched off and/or Wi-Fi router is off (similar functionality also applies to receiving e-mail or MMS or streaming video or doing a video call over a cellular network while transmitting a file through Quick Share):

Transmitting Device (Samsung Galaxy S23 Ultra) Receiving Device (Samsung A54 5G):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy A54 5G) Receiving Device (Samsung Galaxy S23 Ultra):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy ZFold 4) Receiving Device (ZFlip 4):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy ZFlip 4) Receiving Device (ZFold 4):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Quick Share and at the same time downloading a podcast file via a cellular connection. **Second Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control receiving of video

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	information via the Bluetooth communication chip and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:** **1.7 Simultaneous Transmission Capabilities** According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

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Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

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60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

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12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

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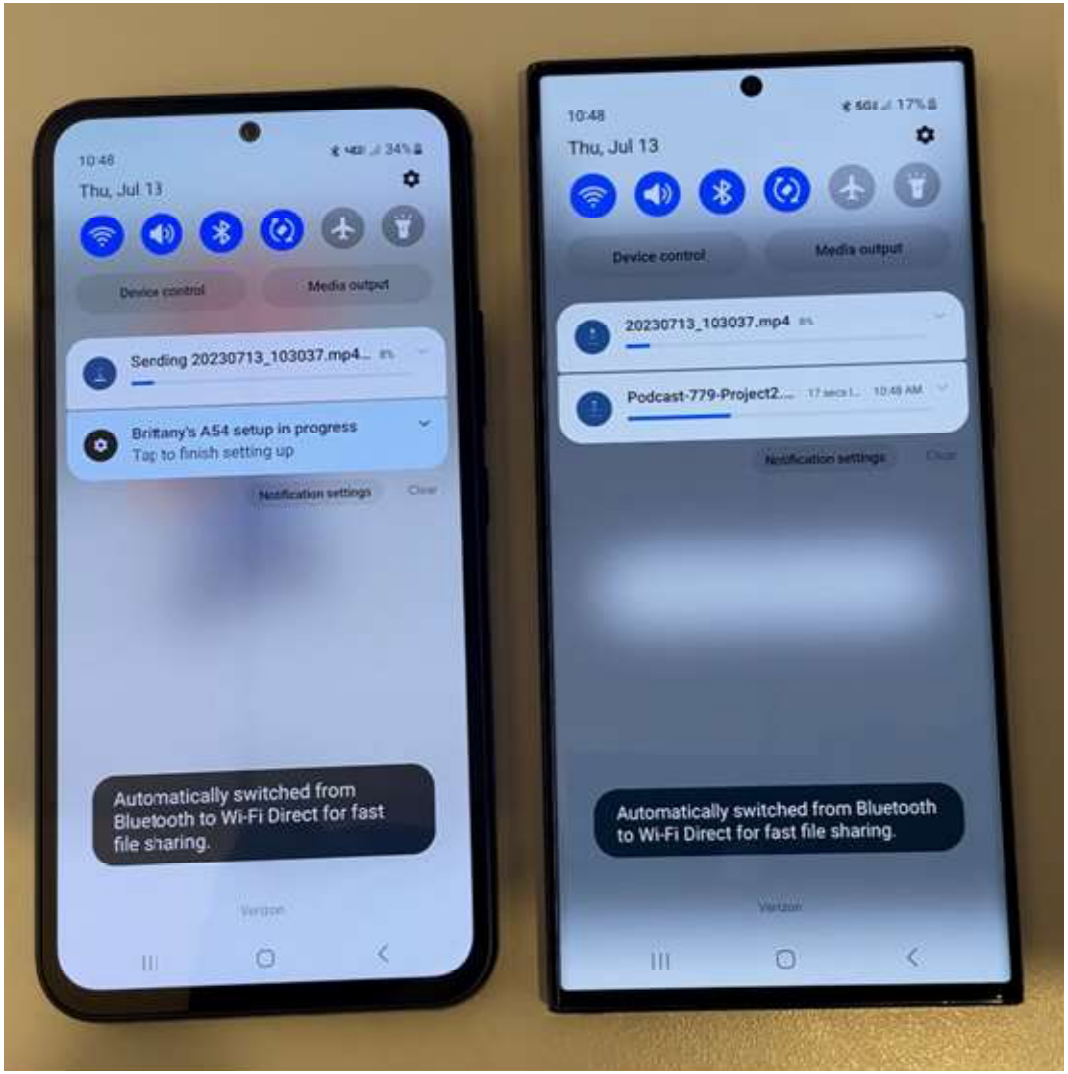
Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network
	Wi-Fi connected
	Bluetooth feature turned on

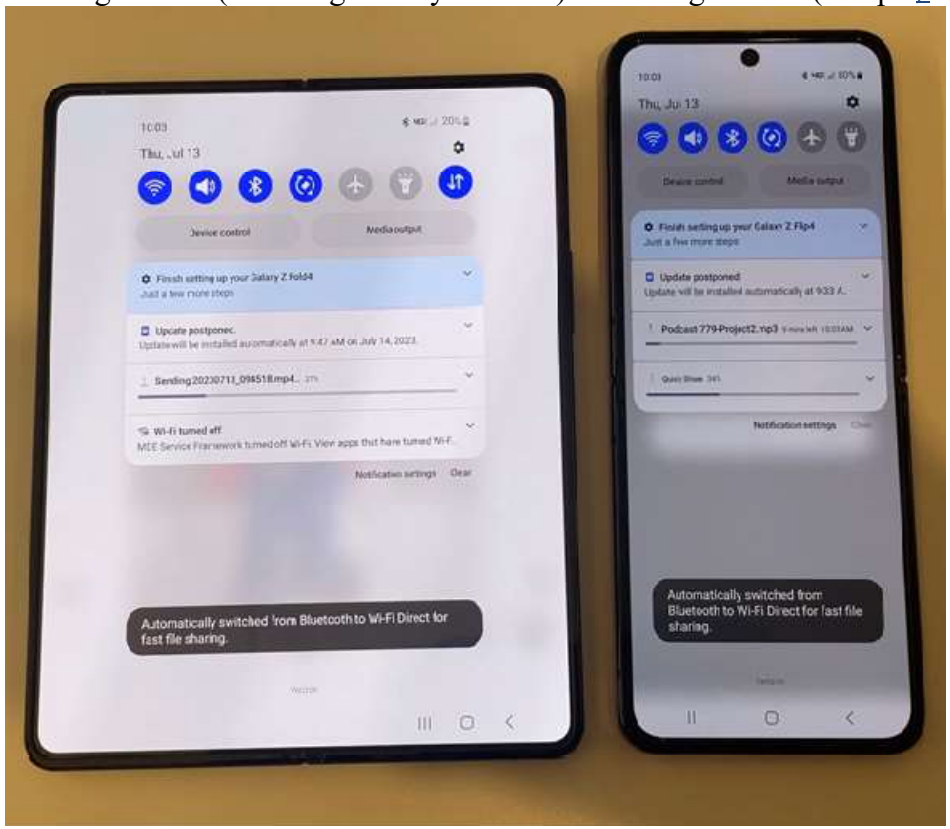
Galaxy S23 Ultra User Guide, pg. 30.

In addition, the Bluetooth communication chip is used to receive video information via Bluetooth file share while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content as Wi-Fi is switched off and/or Wi-Fi router is off (similar functionality also applies to receiving e-mail or MMS or streaming video or doing a video call over a cellular network while transmitting a Bluetooth file):

Transmitting Device (Samsung Galaxy S23 Ultra) Receiving Device (Samsung A54 5G):

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	 As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy A54 5G) Receiving Device (Samsung Galaxy S23 Ultra):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Transmitting Device (Samsung Galaxy ZFold 4) Receiving Device (ZFlip 4):  As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection. Transmitting Device (Samsung Galaxy ZFlip 4) Receiving Device (ZFold 4):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As seen above, the receiving device is downloading an ".mp4" file through Bluetooth and at the same time downloading a podcast file via a cellular connection. *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls simultaneous communication by WiFi or Bluetooth and cellular circuits in a similar manner when implementing Samsung QuickShare/Bluetooth File Share and connecting to the Internet. *See*

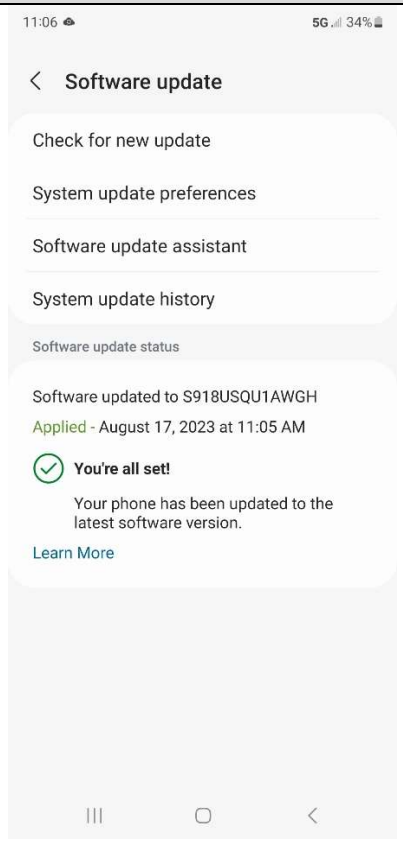
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/. **Doctrine of Equivalents** To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling each of the first and second radio communication circuit so that the first radio communication circuit receives video information and the second radio communication circuit connects to the internet or the home network simultaneously. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, the Accused Samsung '590 Products include an application processor/CPU which executes the operating system and source code for various applications to control Bluetooth, Wi-Fi, and cellular functionalities occurring simultaneous. The performance of this function achieves substantially the same result, for example, simultaneous transmission of video information with connection to the internet or home network.
[10.i] receiving via the second or third radio communication circuits a signal from the internet indicating that an update for an operating system is available; [10.j] executing the update process; and [10.k] storing an updated operating system after	Each of the Accused Samsung '590 Products performs a method of receiving via the second or third radio communication circuits a signal from the internet indicating that an update for an operating system is available, executing the update process, and storing an updated operating system after execution of the update process. For example, the operating system can be updated by connecting to the Internet via at least cellular communication circuits. **Galaxy S23 Ultra:**

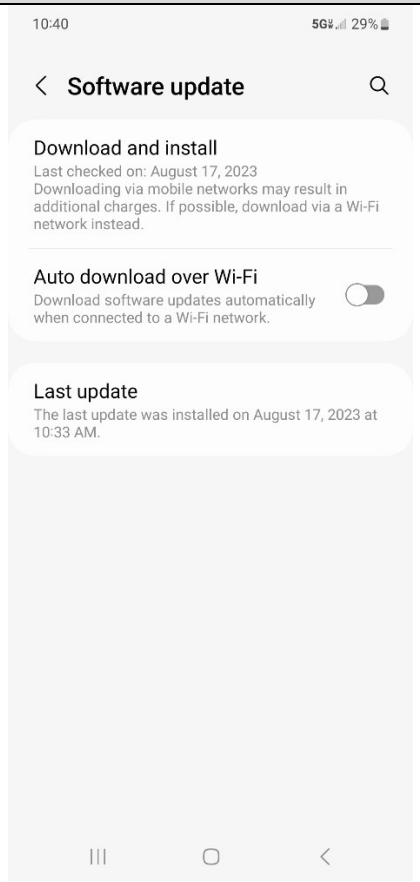
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
execution of the update process.	 Galaxy S23 Series User Guide at pg. 163. **Galaxy Z Flip4:**

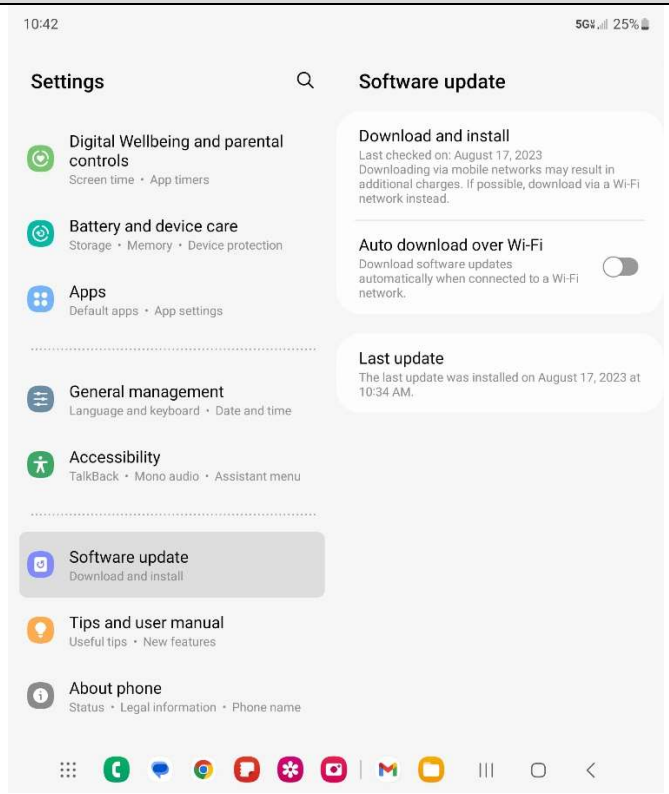
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy Z Fold4:**

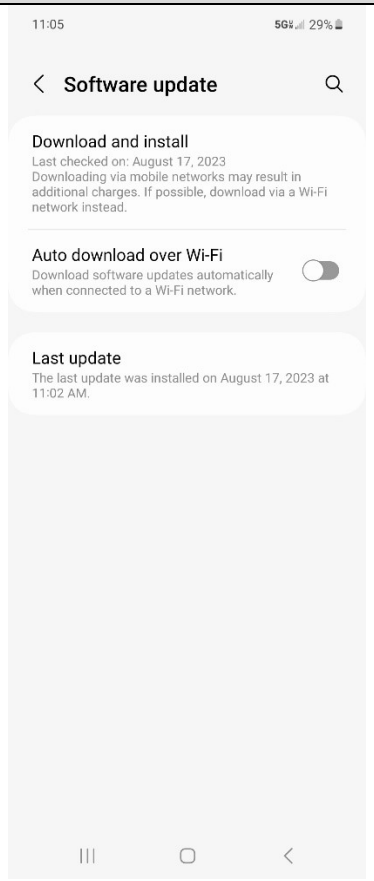
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy A54 5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Auto download over Wi-Fi**: Automatically download software updates when the device is connected to a Wi-Fi network. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy A54 User Guide at pg. 146. For example, the following screenshots show exemplary Accused Samsung '590 Products using the second radio communication circuits ("Download and install" option) to receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available: Galaxy S23 Ultra:

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	 Samsung Galaxy A54G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy ZFold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy Z Flip 4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for receiving a signal from the Internet and updating the operating system in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00077582/.
[11] The video processing apparatus of claim 1, further	The Accused Samsung '590 Products include a fourth radio communication circuit capable of transmitting information and using a fourth transmission frequency band that is different from the

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
comprising a fourth radio communication circuit capable of transmitting information and using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits.	first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits. **First Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip capable of transmitting information and using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

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Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power	
				[dBm]	[mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

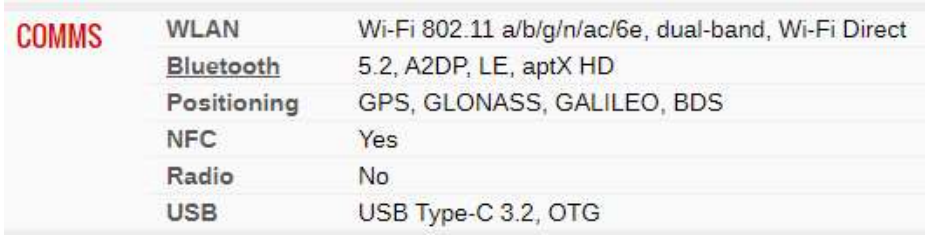
Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

and fading.

Two modulation modes are defined. A mandatory mode, called Basic Rate, uses a shaped, binary FM modulation to minimize transceiver complexity. An optional mode, called Enhanced Data Rate, uses PSK modulation and has two variants: π/4-DQPSK and 8DPSK. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate, 2 Mb/s for Enhanced Data Rate using π/4-DQPSK and 3 Mb/s for Enhanced Data Rate using 8DPSK.

Bluetooth

2 FREQUENCY BANDS AND CHANNEL ARRANGEMENT

The Bluetooth system operates in the 2.4 GHz ISM band. This frequency band is 2400 - 2483.5 MHz.

Regulatory Range	RF Channels
2.400-2.4835 GHz	f=2402+k MHz, k=0,…,78

Table 2.1: Operating frequency bands

RF channels are spaced 1 MHz and are ordered in channel number k as shown in Table 2.1.

Bluetooth devices are classified into three power classes based on their highest output power capabilities.

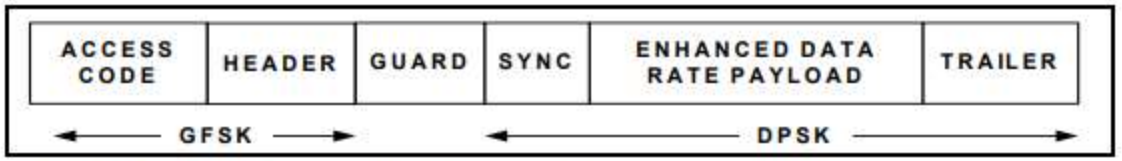
Power Class	Maximum Output Power (Pmax)	Nominal Output Power	Minimum Output Power[1]	Power Control
1	100 mW (20 dBm)	N/A	1 mW (0 dBm)	Pmin<+4 dBm to Pmax Optional: Pmin[2] to Pmax
2	2.5 mW (4 dBm)	1 mW (0 dBm)	0.25 mW (-6 dBm)	Optional: Pmin[2] to Pmax
3	1 mW (0 dBm)	N/A	N/A	Optional: Pmin[2] to Pmax

Table 3.1: Power classes

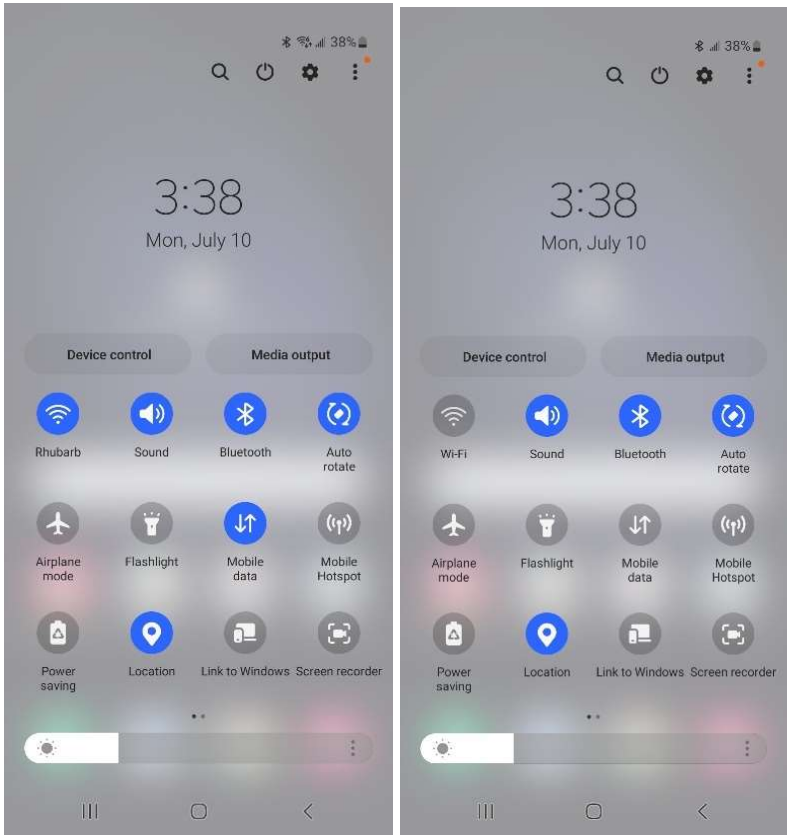
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3.1 BASIC RATE **3.1.1 Modulation Characteristics** The Modulation is GFSK (Gaussian Frequency Shift Keying) with a bandwidth-bit period product BT=0.5. The Modulation index shall be between 0.28 and 0.35. A binary one shall be represented by a positive frequency deviation, and a binary zero shall be represented by a negative frequency deviation. The symbol timing shall be less than ±20 ppm.

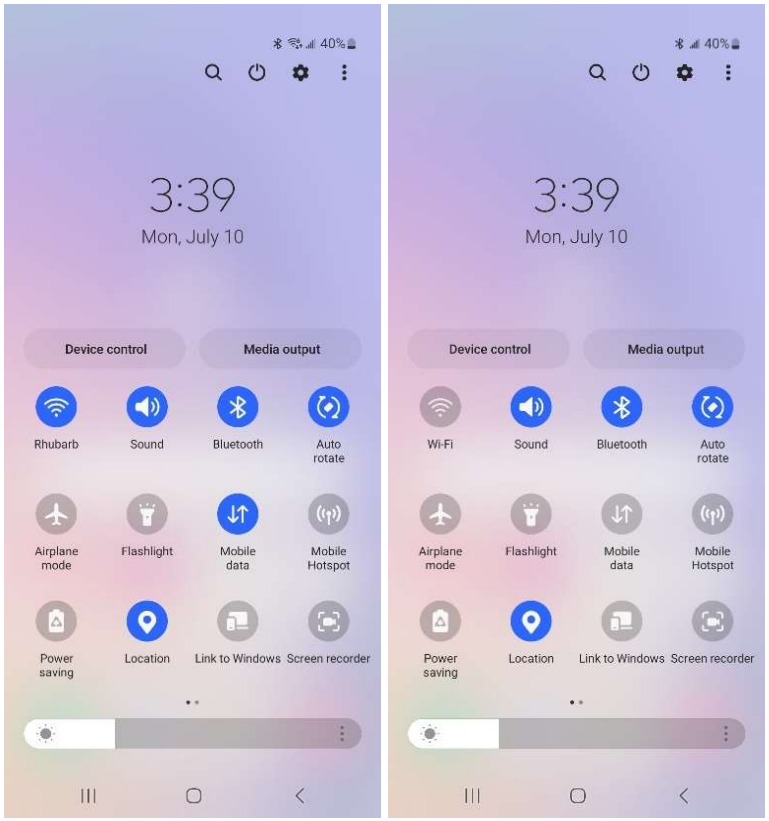
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3.2.1 Modulation Characteristics During access code and packet header transmission the Basic Rate GFSK modulation mode shall be used. During the transmission of the synchronization sequence, payload, and trailer sequence a PSK type of modulation with a data rate of 2 Mb/s or optionally 3 Mb/s shall be used. The following subsections specify the PSK modulation for this transmission. ***3.2.1.1 Modulation Method Overview*** The PSK modulation format defined for the 2 Mb/s transmission shall be π/4 rotated differential encoded quaternary phase shift keying (π/4-DQPSK). The PSK modulation format defined for the 3 Mb/s transmission shall be differential encoded 8-ary phase shift keying (8DPSK). The modulation shall employ square-root raised cosine pulse shaping to generate the equivalent lowpass information-bearing signal v(t). The output of the transmitter shall be a bandpass signal that can be represented as $$S(t) = Re\left[v(t)e^{j2\pi F_c t}\right] \quad \text{(EQ 1)}$$ with F_c denoting the carrier frequency. ***3.2.1.2 Differential Phase Encoding*** For the M-ary modulation, the binary data stream $\{b_n\}$, n=1,2,3, ...N, shall be mapped onto a corresponding sequence {Sk}, k=1,2, ...N/$\log_2$(M) of complex valued signal points. M=4 applies for 2 Mb/s and M=8 applies for 3 Mb/s. Gray coding shall be applied as shown in Table 3.4 and Table 3.5. In the event that the length of the binary data stream N is not an integer multiple of log2(M), the last symbol of the sequence $\{S_k\}$ shall be formed by appending data zeros to the appropriate length. The signal points S_k shall be defined by: $$S_k = S_{k-1}e^{j\varphi_k} \qquad k = 1, 2, ..N/\log_2(M) \quad \text{(EQ 2)}$$ $$S_0 = e^{j\phi} \qquad \text{with } \phi \in [0, 2\pi) \quad \text{(EQ 3)}$$ Receiver:

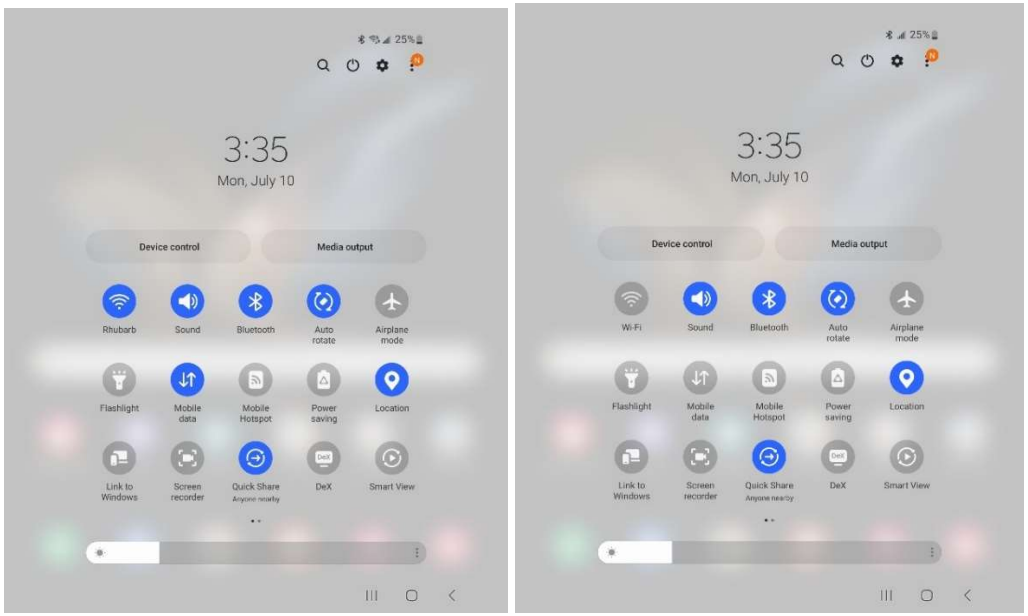
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	4.2.1 Actual Sensitivity Level The actual sensitivity level shall be defined as the input level for which a raw bit error rate (BER) of 0.01% is met. The requirement for a Bluetooth π/4-DQPSK and 8DPSK Enhanced Data Rate receiver shall be an actual sensitivity level of –70 dBm or better. The receiver shall achieve the –70 dBm sensitivity level with any Bluetooth transmitter compliant to the Enhanced Data Rate transmitter specification as defined in Section 3.2. **4.2.6 Reference Signal Definition** A 2 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = π/4-DQPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB A 3 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = 8DPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 1, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/

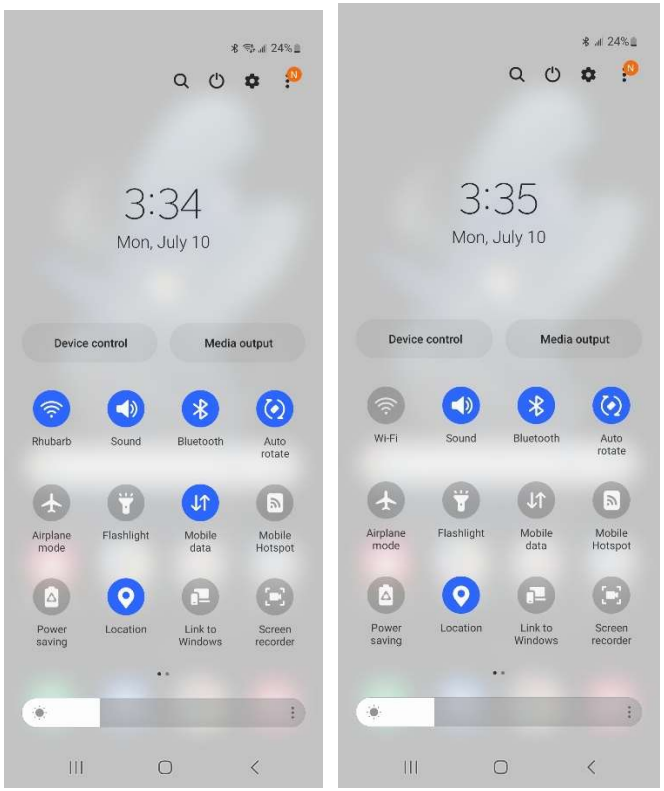
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Data is transmitted over the air in packets. Two modes are defined: a mandatory mode called Basic Rate and an optional mode called Enhanced Data Rate. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate. Enhanced Data Rate has a primary modulation mode that provides a gross air data rate of 2 Mb/s, and a secondary modulation mode that provides a gross air data rate of 3 Mb/s. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 354, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ The general Enhanced Data Rate packet format is shown in Figure 1.3. Each packet consists of 6 entities: the access code, the header, the guard period, the synchronization sequence, the Enhanced Data Rate payload and the trailer. The access code and header use the same modulation mode as for Basic Rate packets while the synchronization sequence, the Enhanced Data Rate payload and the trailer use the Enhanced Data Rate modulation mode. The guard time allows for the transition between the modulation modes.  *Figure 1.3: Standard Enhanced Data Rate packet format* *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 355, https://www.bluetooth.com/specifications/specs/core-specification-5-0/

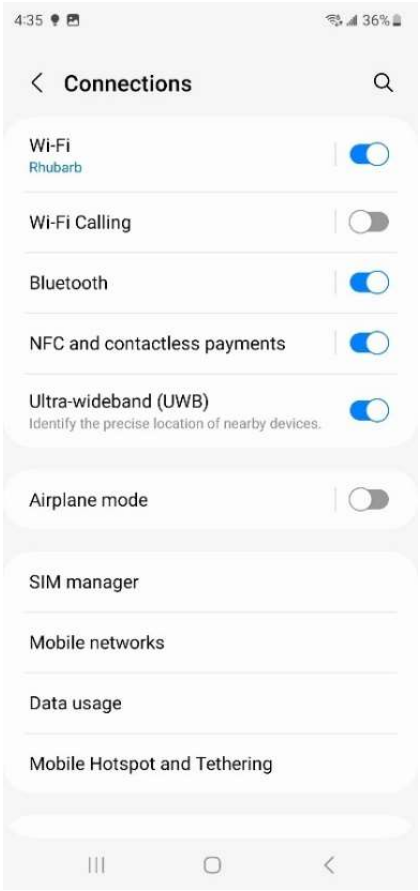
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	6.5 PACKET TYPES The packets used on the piconet are related to the logical transports on which they are used. Four logical transports with distinct packet types are defined (see Section 4): • SCO logical transport • eSCO logical transport • ACL logical transport • CSB logical transport. To indicate the different packets on a logical transport, the 4-bit TYPE code is used. The packet types are divided into four segments. The first segment is reserved for control packets. All control packets occupy a single time slot. The second segment is reserved for packets occupying a single time slot. The third segment is reserved for packets occupying three time slots. The fourth segment is reserved for packets occupying five time slots. The slot occupancy is reflected in the segmentation and can directly be derived from the type code. Table 6.2 summarizes the packets defined for the SCO, eSCO, ACL, and CSB logical transport types; a dash means the value is reserved for future use. All packet types with a payload shall use GFSK modulation unless specified otherwise in the following sections. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 410, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ For example, the following screenshots show that in an exemplary Accused Samsung '590 Product that includes a Bluetooth chip, the controller is controlling assignment of connection to the Bluetooth chip:

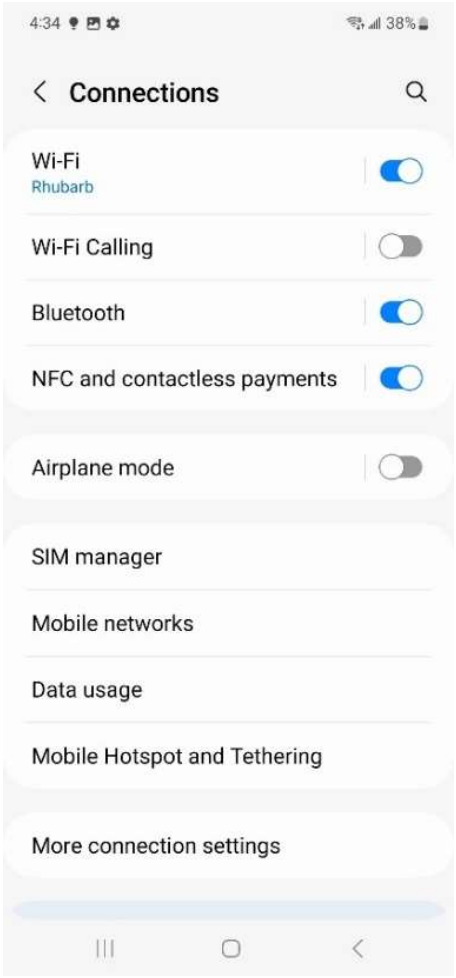
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)
	
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

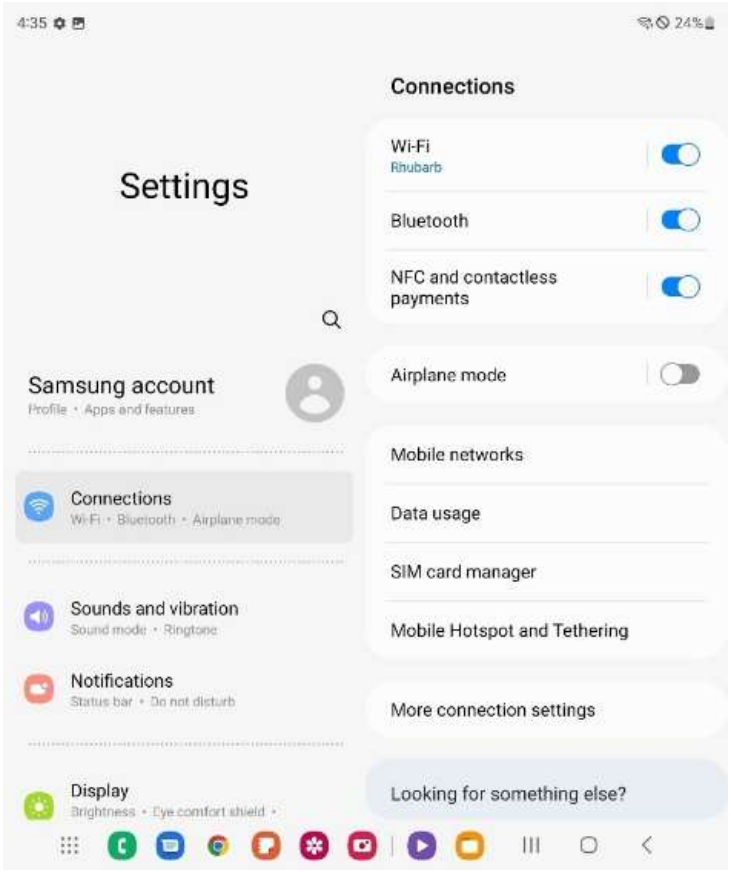
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

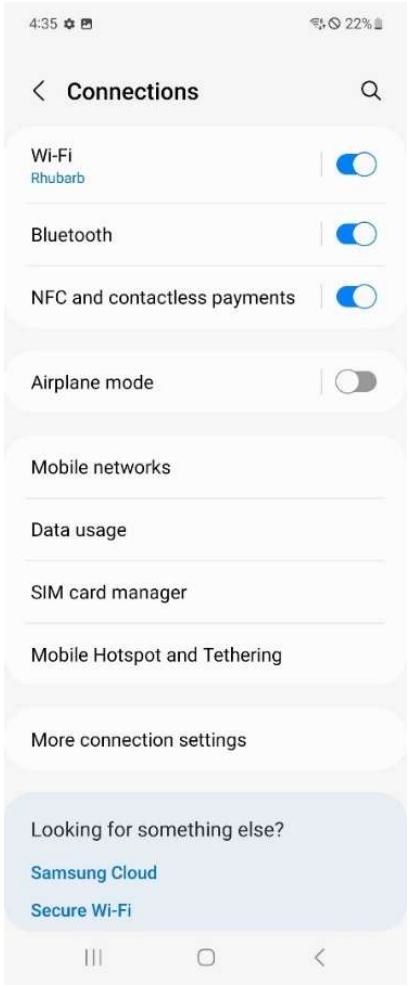
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As an additional example of controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into "Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options. User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip capable of transmitting information and using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

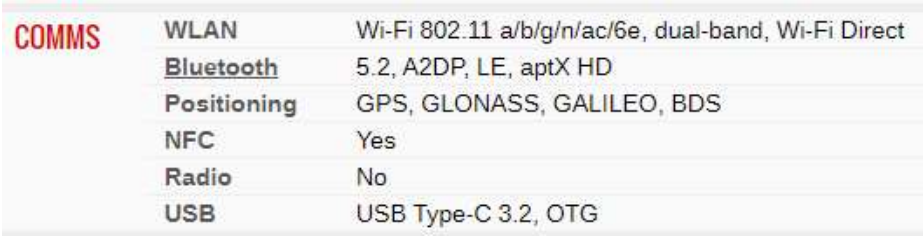
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

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UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
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NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
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NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
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U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
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NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

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LTE Band 13	Voice/Data	779.5 - 784.5 MHz
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LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
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LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
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Bluetooth	Data	2402 - 2480 MHz
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NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes (market/region dependent) Radio: No USB: USB Type-C 2.0, OTG Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

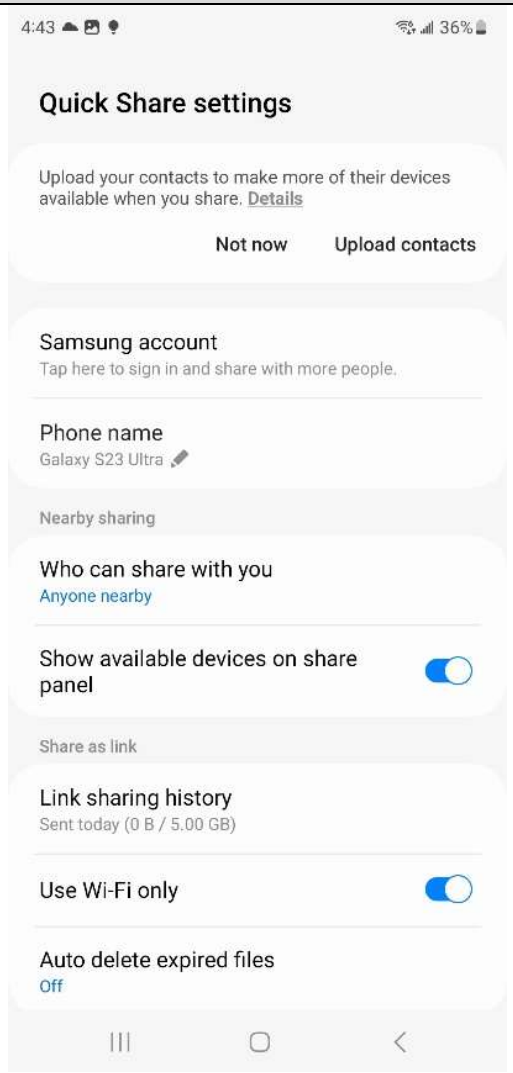
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

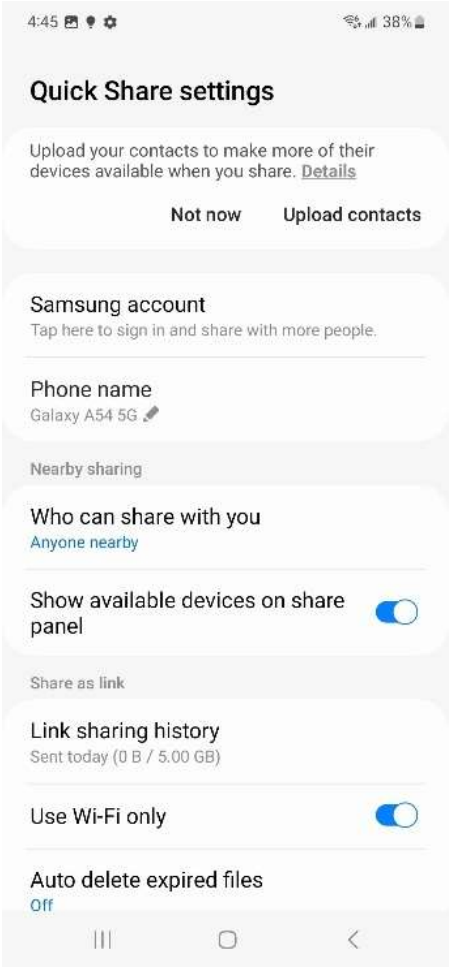
	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

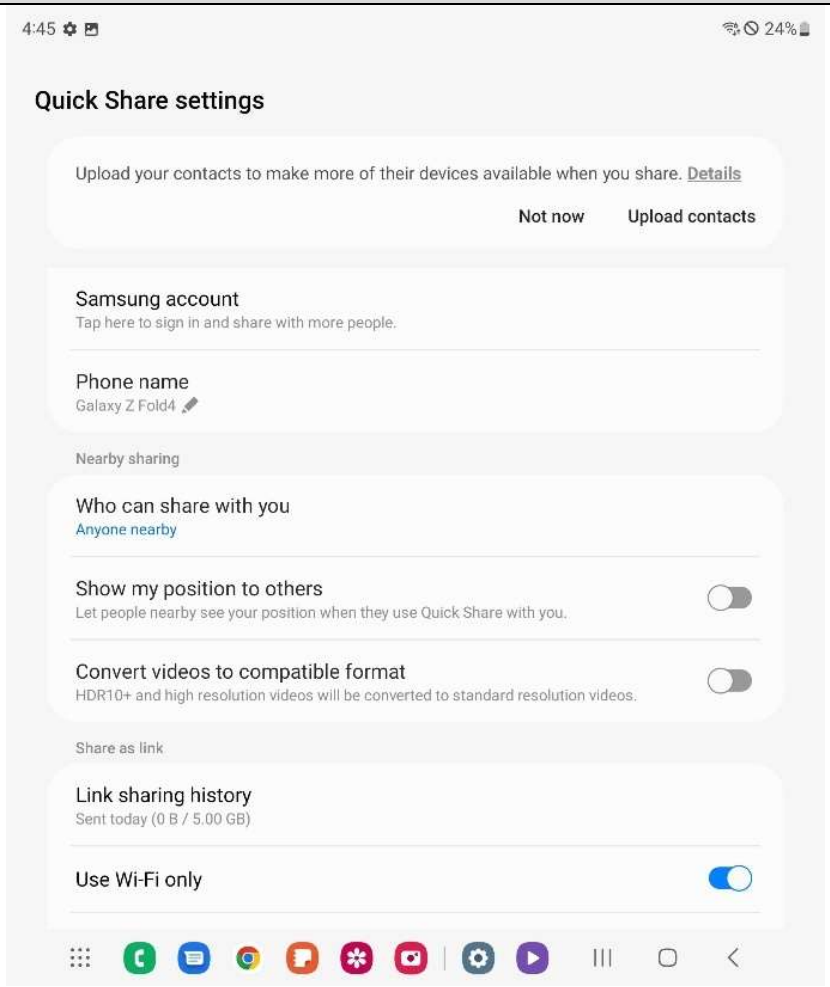
See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

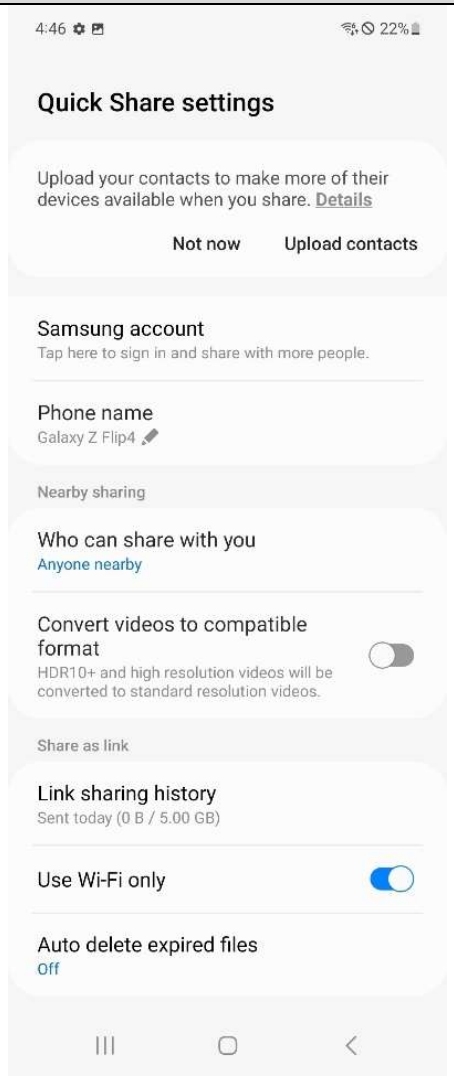
For example, the following screenshots show that in an exemplary Accused Samsung '590 Product that includes a Wi-Fi chip, the controller is controlling assignment of connection to the Wi-Fi chip:

Samsung Galaxy 23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

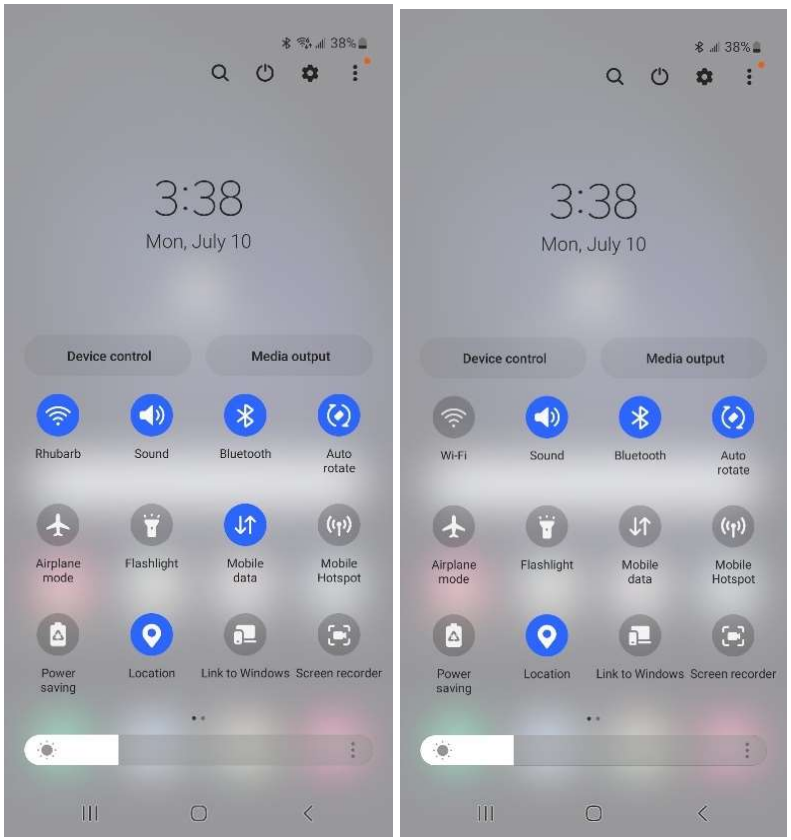
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

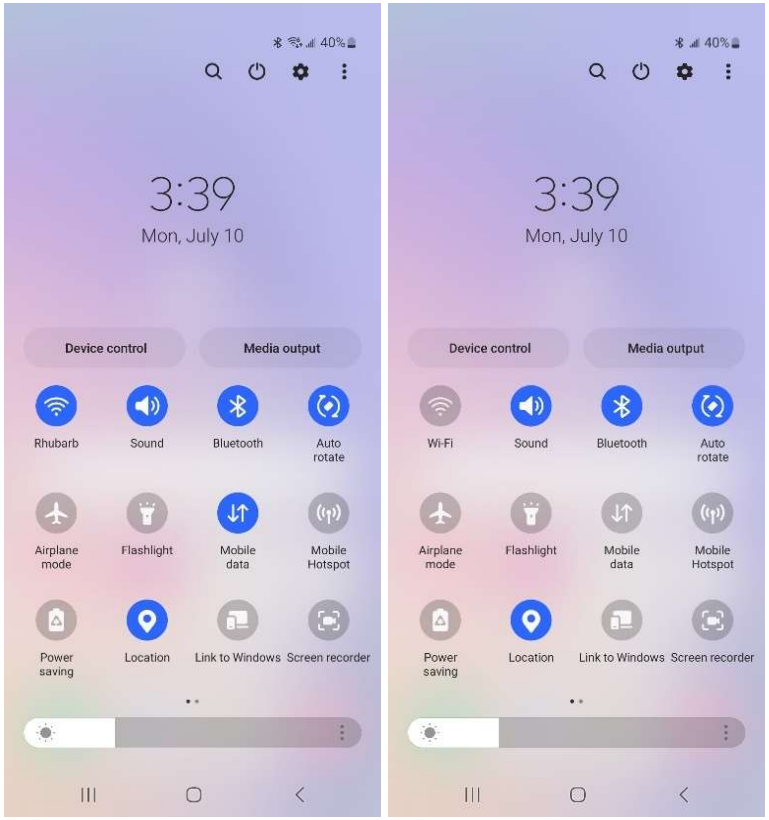
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

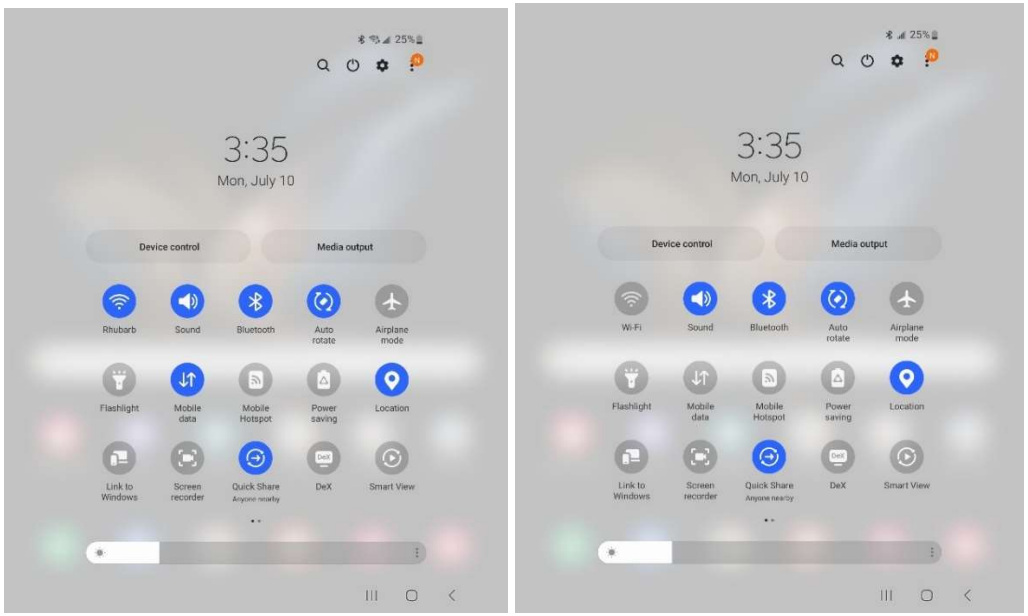
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

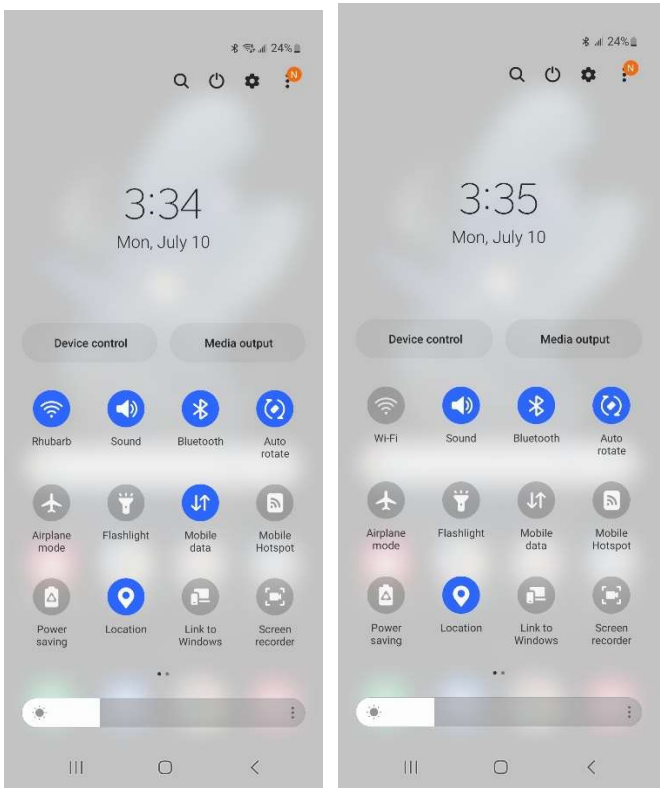
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

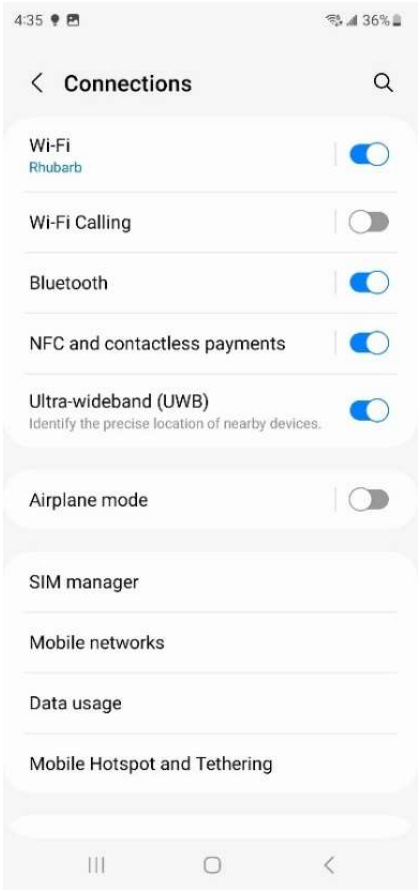


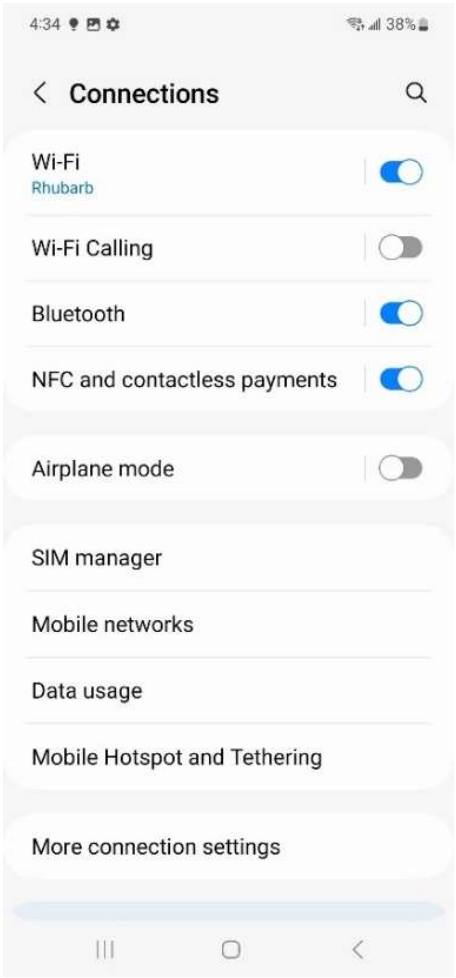
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

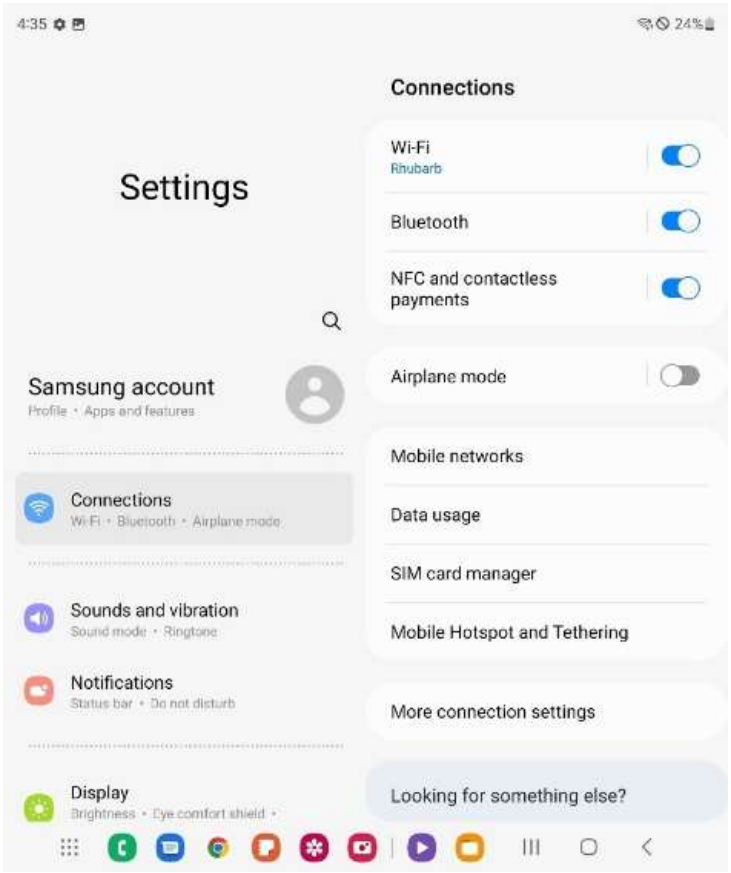
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

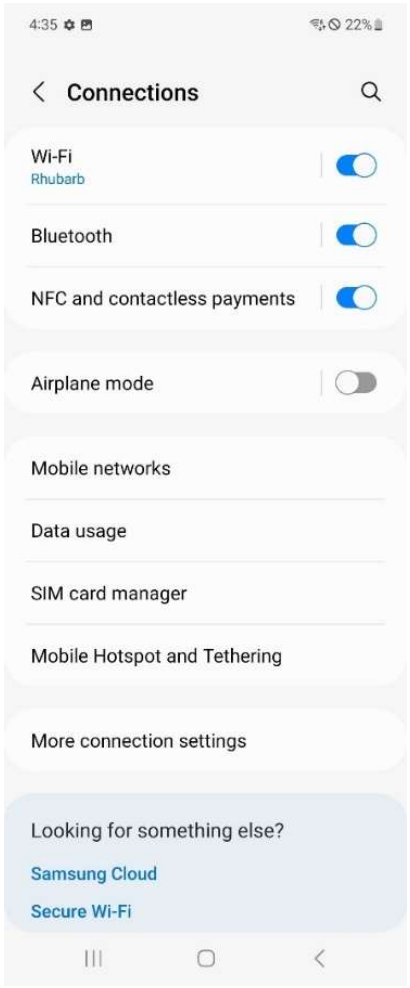
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)  As an additional example of controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into "Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products also include a Bluetooth or Wifi chipset and a chipset that controls the assignment of connection in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/.
[12] The video processing apparatus of claim 1, wherein the third transmission frequency band is different from the first and second transmission frequency bands.	The Accused Samsung '590 Products include a third transmission frequency band which is different from the first and second transmission frequency bands. For example, the Accused Samsung '590 Products include a NFC transmission frequency band that is different from the Bluetooth, Wi-Fi, and cellular transmission frequency bands. **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Galaxy Z Flip4:

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

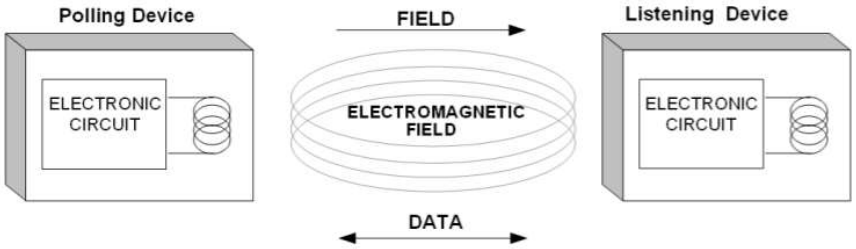
Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
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NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **NFC Frequency Bandwidth:** 3 Basics of Data Transmission with NFC Like the RFID Standards 14443 and FeliCa NFC uses an inductive coupling. Similar to the transformer principle, the magnetic near-field of two conductor coils is used to couple the polling device (initiator) and listening device (target).  ***Figure 1: Polling device (initiator) and listening device (target) configuration [15]*** The operating frequency is 13.56 MHz, and a bitrate of 106 kbit/s (partly also 212 kbit/s and 424 kbit/s) is used. Modulation schemes are amplitude on/off keying (OOK) with different modulation depth (100 % or 10 %) and BPSK. *See* https://cdn.rohde-schwarz.com/pws/dl_downloads/dl_application/application_notes/1ma182/1MA182_5E_NFC_WHITE_PAPER.pdf **Wi-Fi Frequency Bandwidth:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

Bluetooth Frequency Bandwidth:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Bluetooth **2 FREQUENCY BANDS AND CHANNEL ARRANGEMENT** The Bluetooth system operates in the 2.4 GHz ISM band. This frequency band is 2400 - 2483.5 MHz. **Regulatory Range** | **RF Channels** 2.400-2.4835 GHz | f=2402+k MHz, k=0,…,78 *Table 2.1: Operating frequency bands* RF channels are spaced 1 MHz and are ordered in channel number k as shown in Table 2.1. *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 2, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/ Bluetooth devices operate in the unlicensed 2.4 GHz Industrial, Scientific and Medical (ISM) band. Many other technologies utilize the ISM band, including wireless LAN, cordless phones, and microwave ovens. The ISM band is also close enough to other frequency bands that Bluetooth devices may be an interferer of or a victim of other technologies. *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 1, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/ **Cellular Frequency Bandwidth:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **2G:**

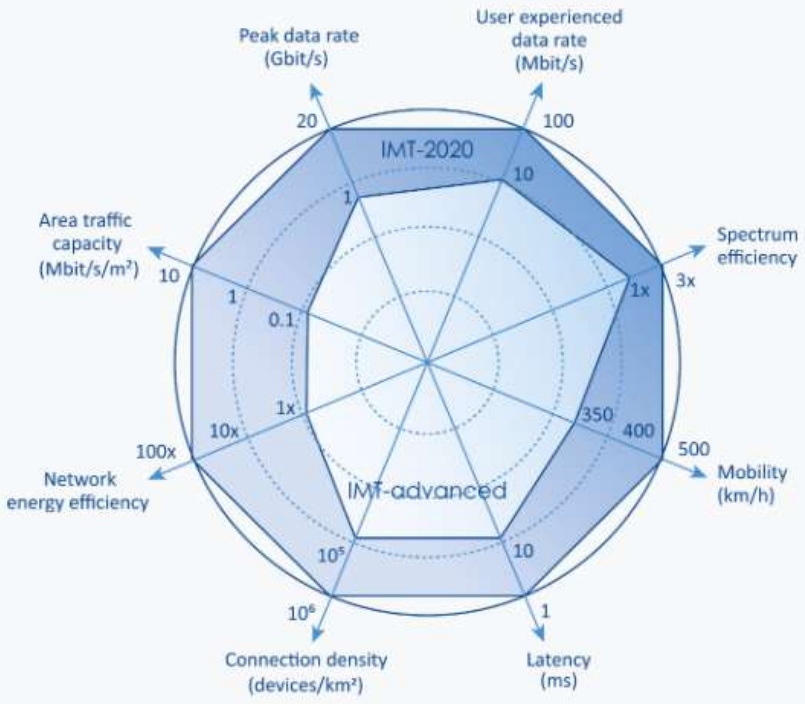
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Global System for Mobile communication (GSM) The technology behind the Global System for Mobile communication (GSM™) uses Gaussian Minimum Shift Keying (GMSK) modulation a variant of Phase Shift Keying (PSK) with Time Division Multiple Access (TDMA) signalling over Frequency Division Duplex (FDD) carriers. The physical layer is specified in 3GPP TS 45.001 and the logical channels in 3GPP TS 45.002. The channel coding is specified in 3GPP TS 45.003 and the modulation is specified in 3GPP TS 45.004. Although originally designed for operation in the 900 MHz band, it was soon adapted for 1800 MHz. The introduction of GSM into North America meant further adaptation to the 800 and 1900 MHz bands. Over the years, the versatility of GSM has resulted in the specifications being adapted to many more frequency bands to meet niche markets. A full list can be found in 3GPP TS 45.005. GSM has a channel spacing of 200kHz and was designed principally for voice telephony, but a range of bearer services was defined (a subset of those available for fixed line Integrated Services Digital Networks, ISDN), allowing circuit-switched data connections at up to 9600 bits/s. At the time of the original system design, this rate compared favourably to those available over fixed connections. However, with the passage of time, fixed connection data rates increased dramatically. The GSM channel structure and modulation technique did not permit faster rates, and thus the High Speed Circuit-Switched Data (HSCSD) service was introduced in the GSM Phase 2+. **Enhanced Data rates for Global Evolution (EDGE)** As its name suggests, EDGE (Enhanced Data rates for Global Evolution) is an enhancement of the GSM™ radio access technology to provide faster bit rates for data applications, both circuit- and packet-switched. As an enhancement of the existing GSM physical layer, EDGE is realized via modifications of the existing layer 1 3GPP specifications TS 45.000 rather than by separate, stand-alone specifications. The increased data rate is accomplished by a new modulation technique (8PSK as opposed to GSM/GPRS's GMSK, yielding a three-fold increase in bit rate for an identical symbol rate) coupled with new channel coding, resulting in improved spectral efficiency. This is important, because it allows EDGE to be introduced piecemeal into existing GSM networks without disrupting the frequency reuse plan of the existing deployment.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	By way of illustration, the General Packet Radio Service (GPRS) can offer a data rate of 115 (and a theoretical data rate of 171) kbit/s whereas EDGE on top of GPRS can increase this theoretical data rate to 384 kbit/s. This is comparable with the rate for early implementations of Wideband Code Division Multiple Access (W-CDMA) of the 3rd generation of UMTS and a reason why EDGE is considered to be the bridge between the 2nd and the 3rd generation of mobile communication systems. https://www.etsi.org/technologies/mobile/2g **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111): • **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h • **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h • **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	LONG TERM EVOLUTION (LTE) Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example: • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM • LTE DL 4 Rx antenna ports https://www.etsi.org/technologies/mobile/4g **5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	So 5G should deliver significantly increased operational performance (e.g. increased spectral efficiency, higher data rates, low latency), as well as superior user experience (near to fixed network but offering full mobility and coverage). 5G needs to cater for massive deployment of Internet of Things, while still offering acceptable levels of energy consumption, equipment cost and network deployment and operation cost. It needs to support a wide variety of applications and services. Comparison of key capabilities of IMT-Advanced (4th generation) with IMT-2020 (5th generation) according to ITU-R M.2083: 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

The minimum requirements:

- for peak data rate: Downlink: 20 Gbit/s, Uplink: 10 Gbit/s
- for peak spectral efficiencies: Downlink: 30 bit/s/Hz, Uplink: 15 bit/s/Hz
- user plane latency (single user, small packets): 4 ms for eMBB, 1 ms for URLLC
- control plane latency (idle => active): 10-20ms

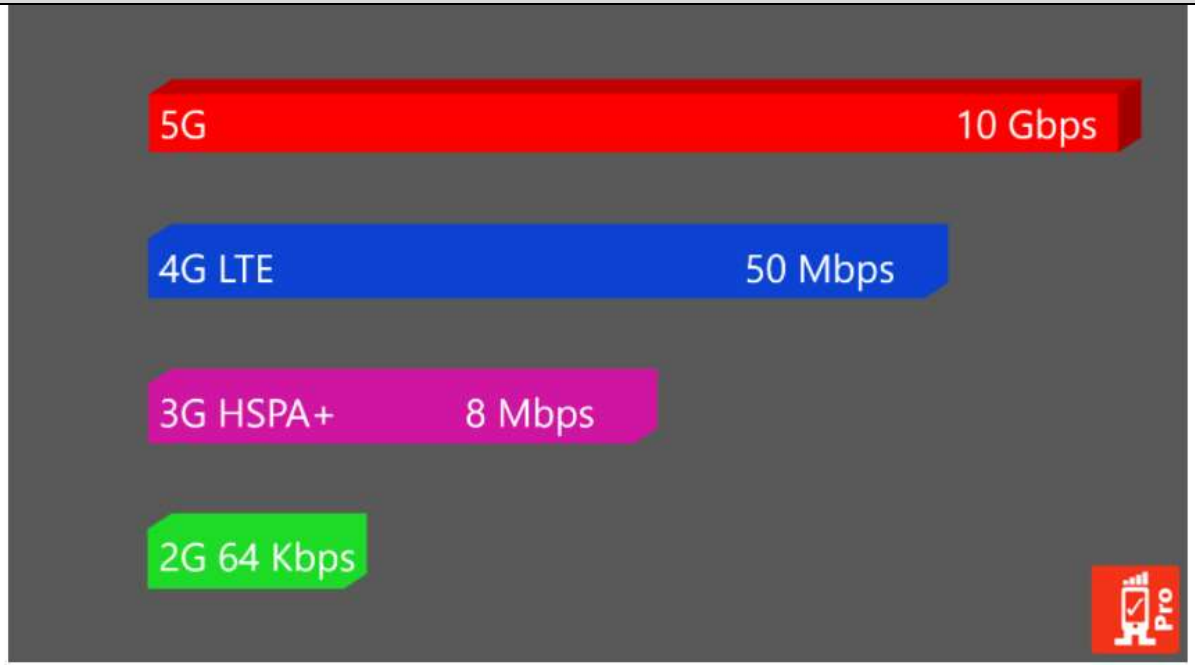
Other requirements:

- maximum aggregated system bandwidth: at least 100 MHz, up to 1GHz in higher frequency bands (above 6GHz)
- mobility: up to 500km/h in rural eMBB

- Add support of NR DL 256QAM for frequency range 2 (FR2)

https://www.etsi.org/technologies/mobile/5g

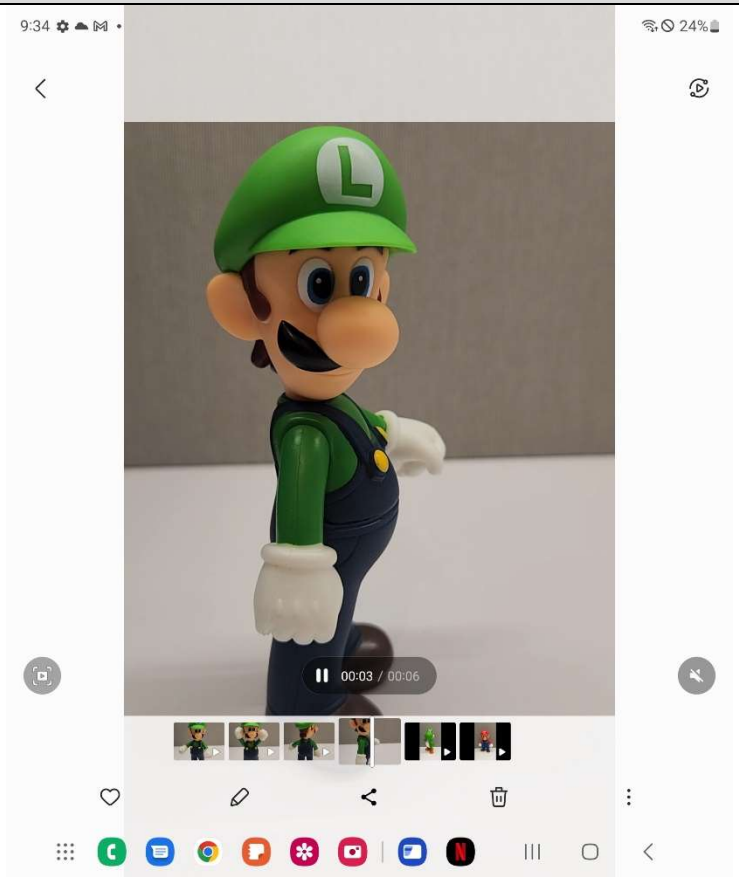
Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 https://rantcell.com/comparison-of-2g-3g-4g-5g.html *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include an NFC chipset. *See* https://www.samsung.com/us/samsung-pay/.
[15] The video processing apparatus of claim 1, wherein the input device is capable of receiving a user's selection of content to be displayed on the video processing apparatus.	Each of the Accused Samsung '590 Products includes an input device that is capable of receiving a user's selection of content to be displayed on the video processing apparatus. For example, the Accused Samsung '590 Products include a touch screen whereby a user can select a recorded video content via a Gallery application or via a Camera application such that the content is displayed based on the user's selection. Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a display with touch interface for receiving user input in a similar manner.
[16] The video processing apparatus of claim 1, wherein the second or third radio	In each of the Accused Samsung '590 Products, the second or third radio communication circuits receive a signal from the internet indicating that an update for an application of the video processing apparatus is available, and the video processing apparatus executes an application

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
communication circuits receive a signal from the internet indicating that an update for an application of the video processing apparatus is available, and the video processing apparatus executes an application update process such that an updated application of the video processing apparatus is stored in the video processing apparatus after execution of the application update process.	update process such that an updated application of the video processing apparatus is stored in the video processing apparatus after execution of the application update process. For example, in each of the Accused Samsung '590 Products, at least a Wi-Fi or cellular communication circuit receives a signal from the internet indicating that an update for an application of the video processing apparatus is available, and the video processing apparatus executes an application update process such that an updated application of the video processing apparatus is stored in the video processing apparatus after execution of the application update process. **Galaxy Z Fold4 and Z Flip4:** Security update You can easily check the date of the last installed security software update and find out if newer updates are available. ○ From Settings, tap **Security and privacy** > **Updates** > **Security update** to see the latest security update installed and check if a newer update is available. Galaxy Z Fold4 and Z Flip4 User Guide at p. 150.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Update apps from the Galaxy Store

Galaxy Apps has exclusive content made just for Samsung devices. You will need to update these apps separately from your Play Store apps.

Open **Galaxy Store**, tap the **Menu** icon (the three horizontal lines), in the bottom right corner, and then tap **Updates**. From here, you can either tap the **circling arrow** next to individual apps to update one at a time, or tap **Update all** to install all available updates.

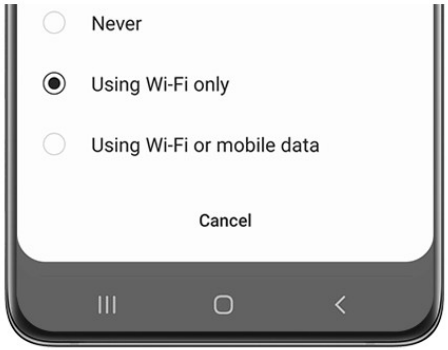


See https://www.samsung.com/us/support/answer/ANS00080581/

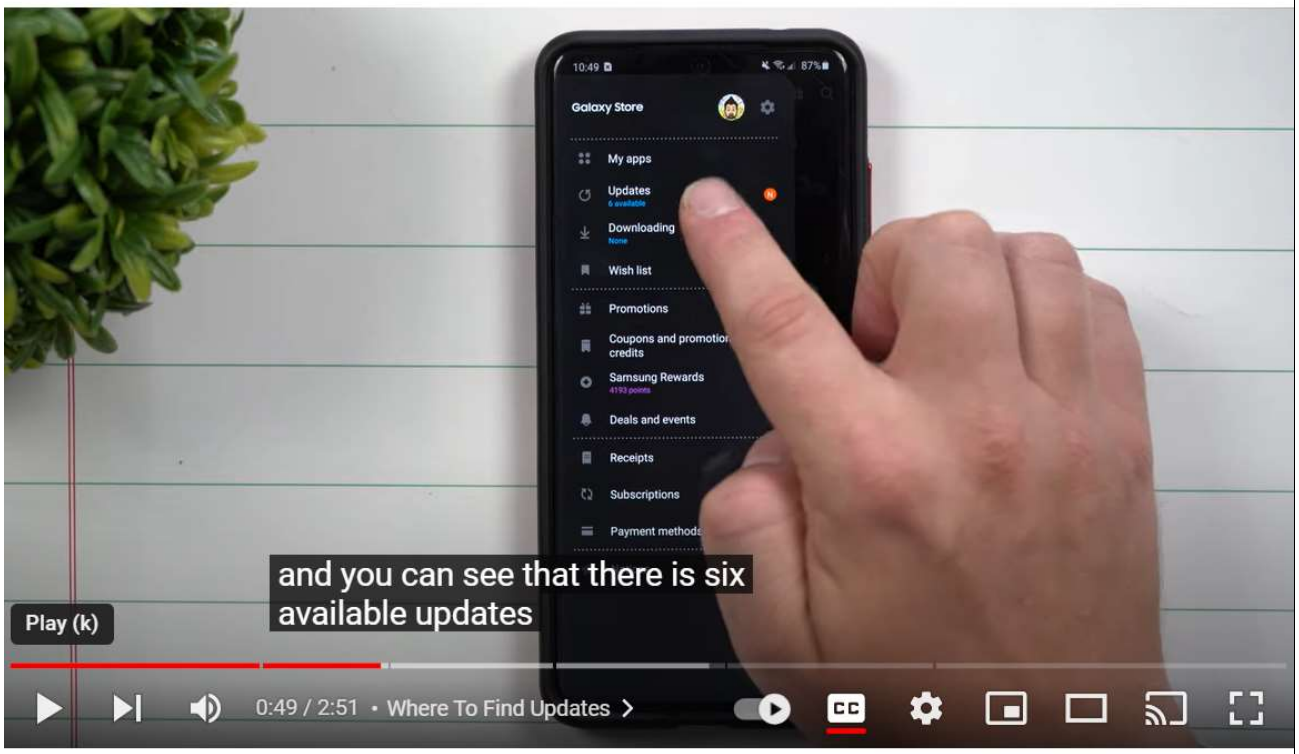
Turn on automatic updates in the Galaxy Store

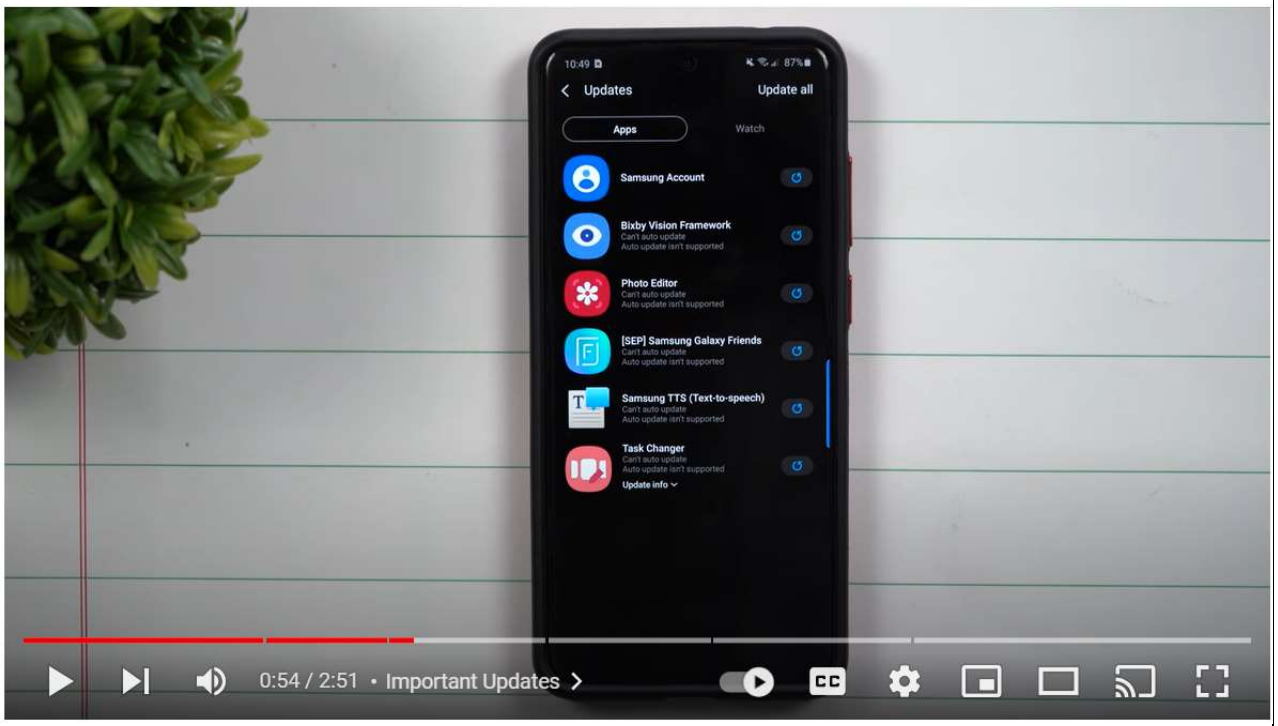
When apps update automatically, you won't have to give updating them a second thought. Follow these steps to turn on Auto Updates in the Galaxy Store:

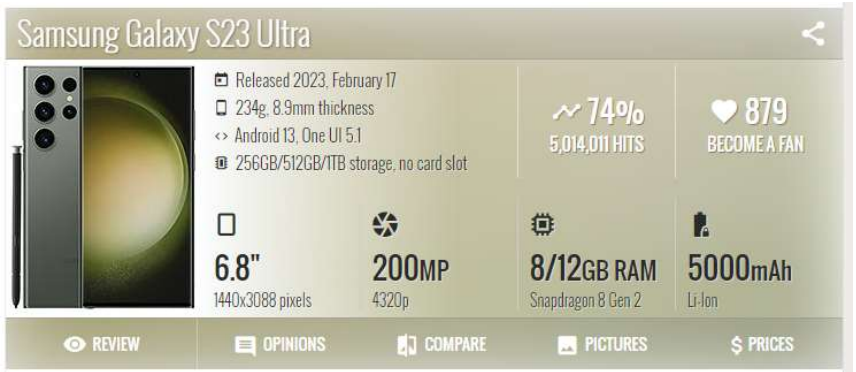
Open **Galaxy Store**, and then tap the **Menu** icon (the three horizontal lines), in the bottom right corner. Tap the **Settings** icon (it looks like a gear), and then tap **Auto update apps**. Select your desired setting.

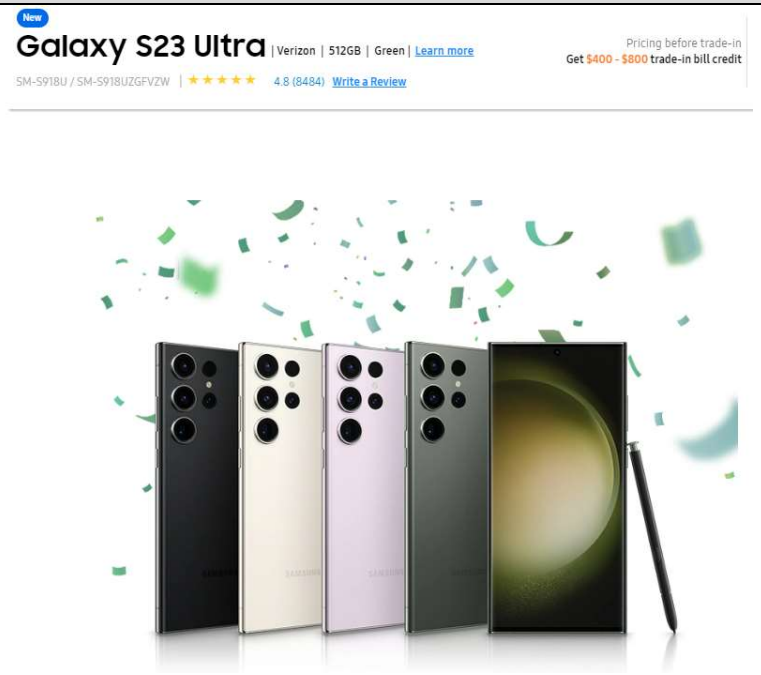


See https://www.samsung.com/us/support/answer/ANS00080581/

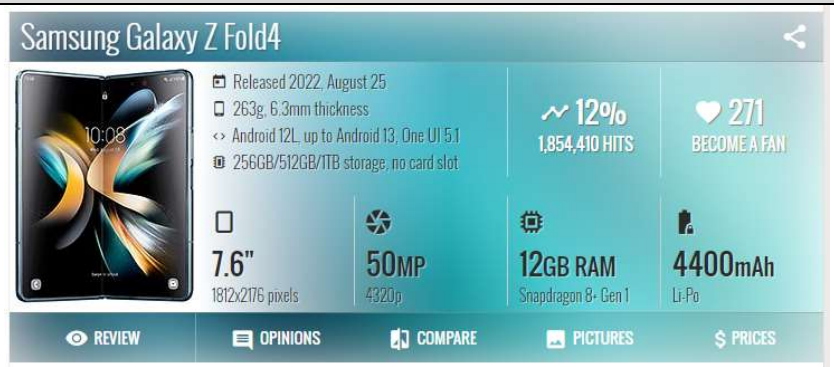
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=SikWbEgGW1Y *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for receiving a signal from the Internet and updating an application in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00077582/.
[17.a] The video processing apparatus of claim 1, further comprising: a display for	Each of the Accused Samsung '590 Products includes a display for displaying a screen requesting user input.

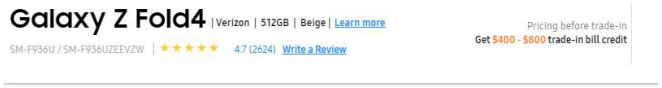
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
displaying a screen requesting user input,	For example, each of the Accused Samsung '590 Products includes a display, *e.g.*, an OLED, LED, Retina, or LCD display, for displaying a screen requesting user input. *See*, for example: **Galaxy S23 Ultra:**  DISPLAY Type: Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (HBM), 1750 nits (peak) Size: 6.8 inches, 114.7 cm^2 (~89.9% screen-to-body ratio) Resolution: 1440 x 3088 pixels, 19.3:9 ratio (~500 ppi density) Protection: Corning Gorilla Glass Victus 2 Always-on display

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

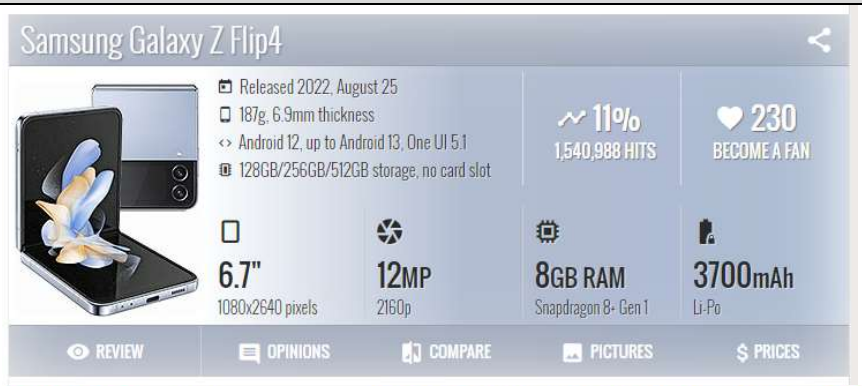


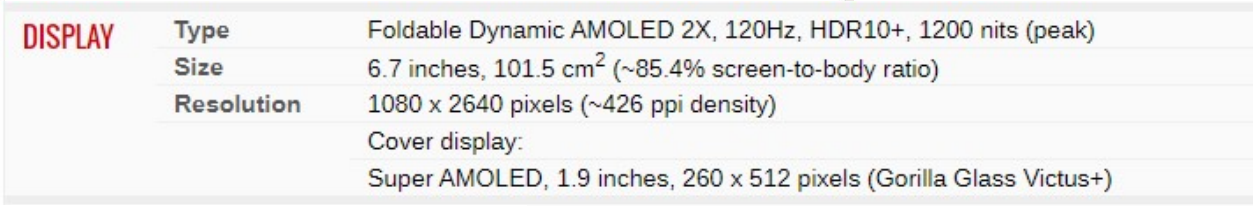
DISPLAY	Type	Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak)
	Size	7.6 inches, 183.2 cm^2 (~90.9% screen-to-body ratio)
	Resolution	1812 x 2176 pixels (~373 ppi density)
		Cover display:
		Dynamic AMOLED 2X, 120Hz, Corning Gorilla Glass Victus+
		6.2 inches, 904 x 2316 pixels, 23.1:9 ratio

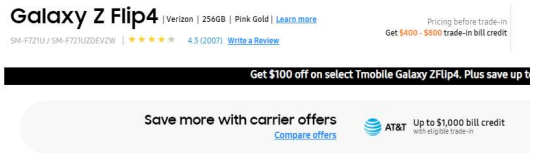
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php **Galaxy Z Flip4:**

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

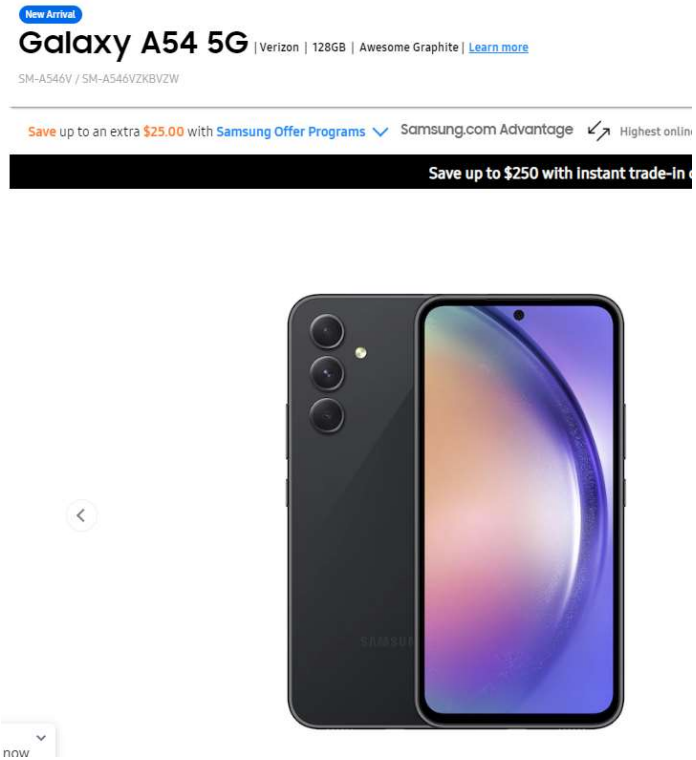








U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php **Galaxy Z Fold4:**  DISPLAY Type: Foldable Dynamic AMOLED 2X, 120Hz, HDR10+, 1200 nits (peak) Size: 7.6 inches, 183.2 cm^2 (~90.9% screen-to-body ratio) Resolution: 1812 x 2176 pixels (~373 ppi density) Cover display: Dynamic AMOLED 2X, 120Hz, Corning Gorilla Glass Victus+ 6.2 inches, 904 x 2316 pixels, 23.1:9 ratio

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a54/buy/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php. *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a display with touch interface for receiving user input in a similar manner.
[17.b] wherein the displayed screen prompts the user for a user input that indicates whether the user allows a connection between the first radio communication circuit and the external device to be established, wherein in response to receiving the user input indicating allowance of the connection, the first radio communication circuit transmits the accumulated video information to the external device.	In each of the Accused Samsung '590 Products, the displayed screen prompts the user for a user input that indicates whether the user allows a connection between the first radio communication circuit and the external device to be established, wherein in response to receiving the user input indicating allowance of the connection, the first radio communication circuit transmits the accumulated video information to the external device. **First Infringement Theory:** For example, in each of the Accused Samsung '590 Products, the displayed screen prompts the user for a user input that indicates whether the user allows a connection between Wi-Fi communication circuit and the external device to be established, wherein in response to receiving the user input indicating allowance of the connection, the Wi-Fi communication circuit transmits the accumulated video information to the external device. For example, the following screenshots show exemplary Accused Samsung '590 Products where the displayed screen prompts the user to select "Quick Share" and then select the person and/or device to whom the user wants to send the accumulated video information.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



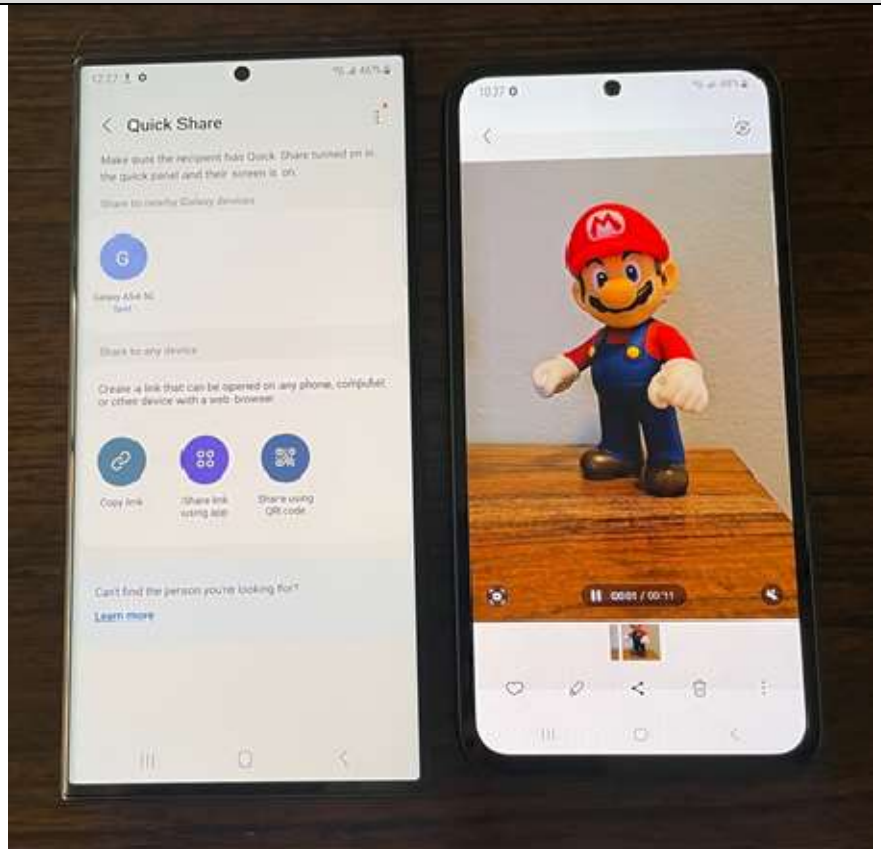
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

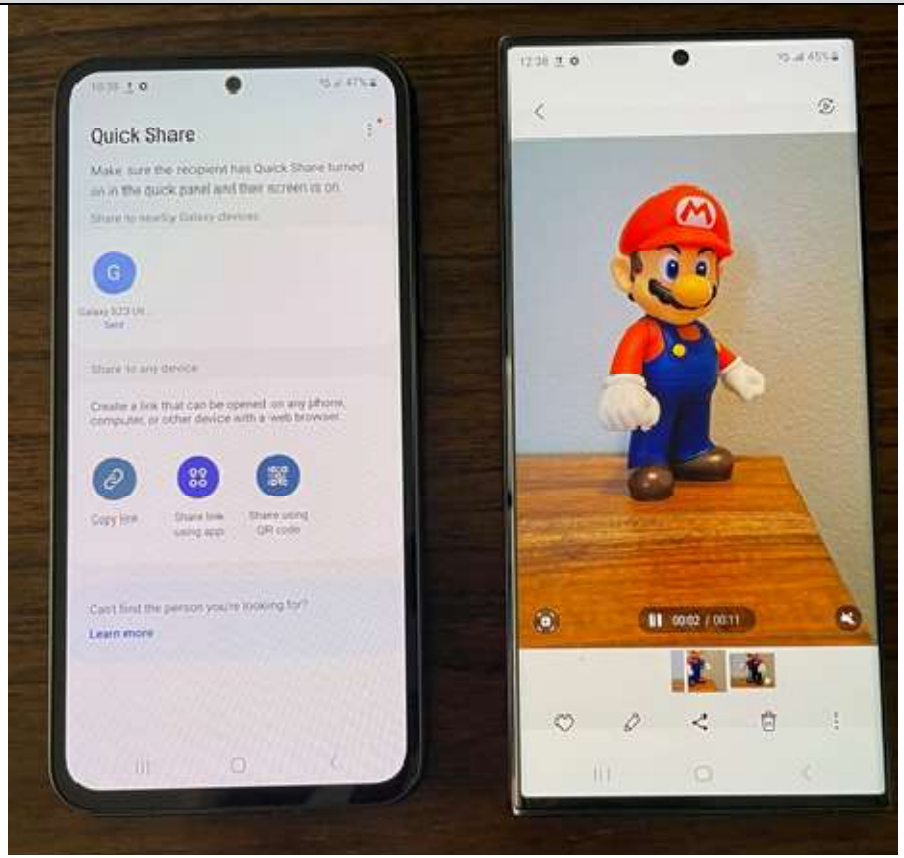
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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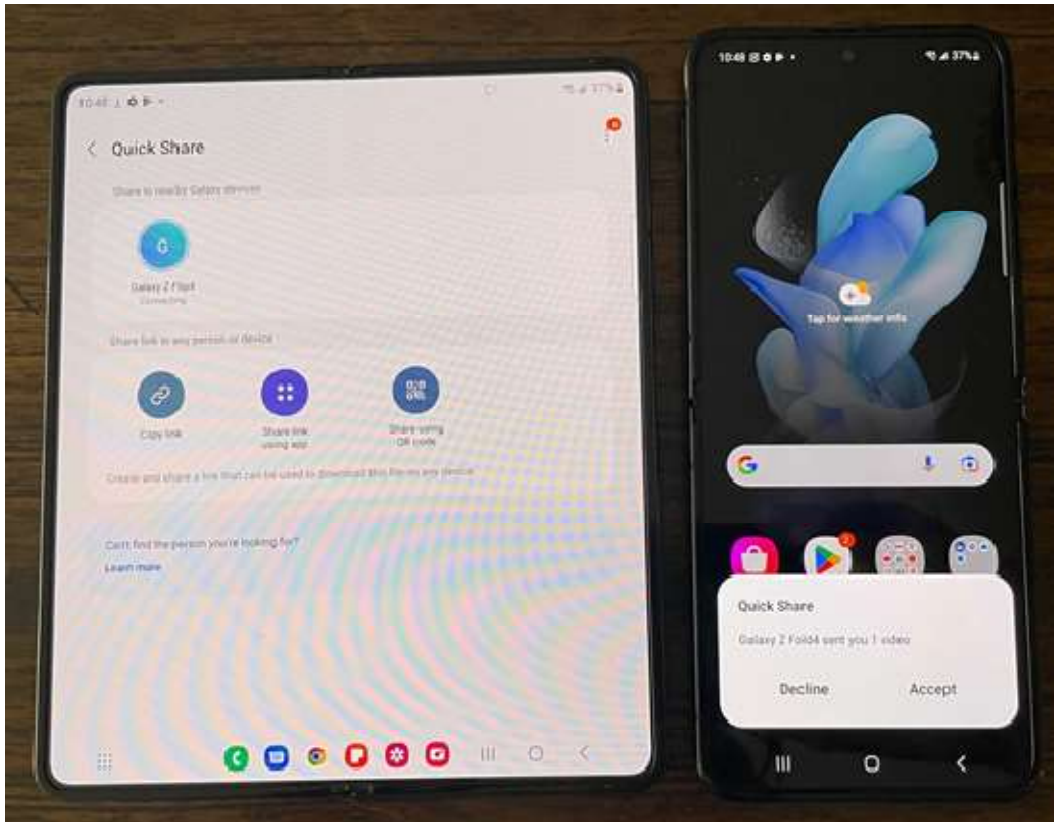


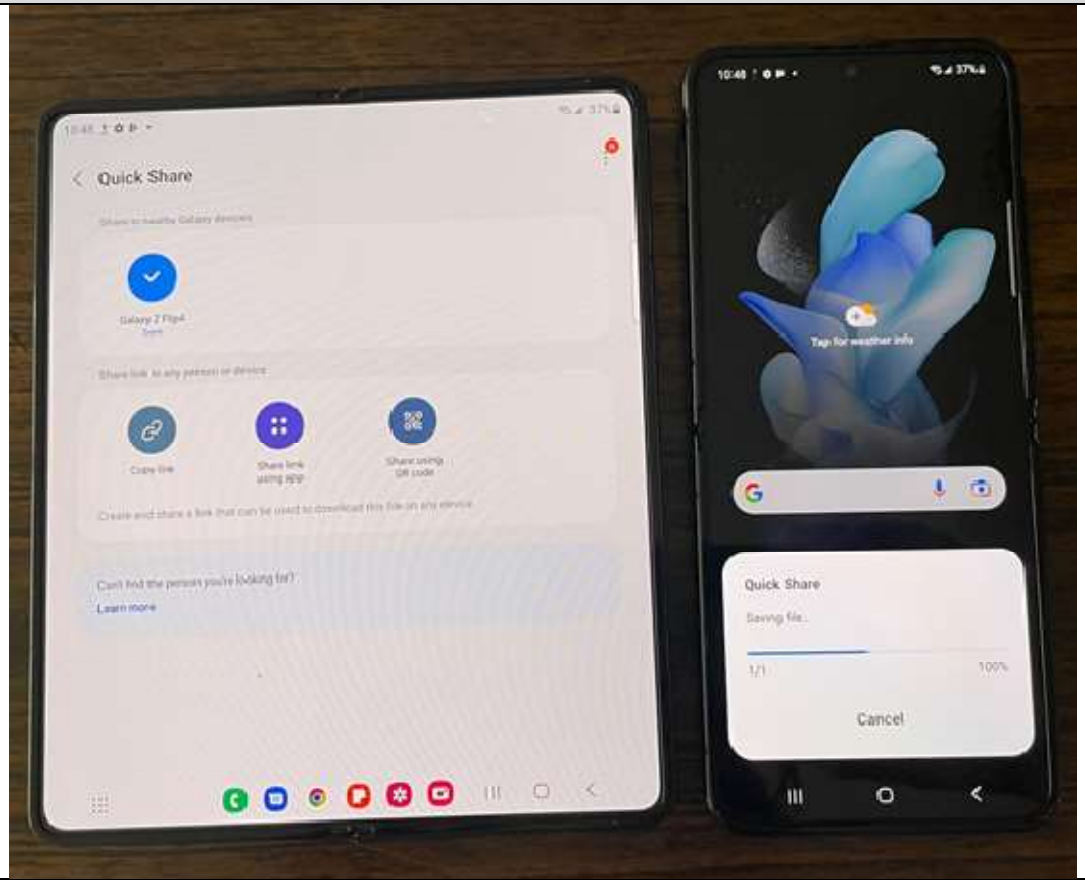
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

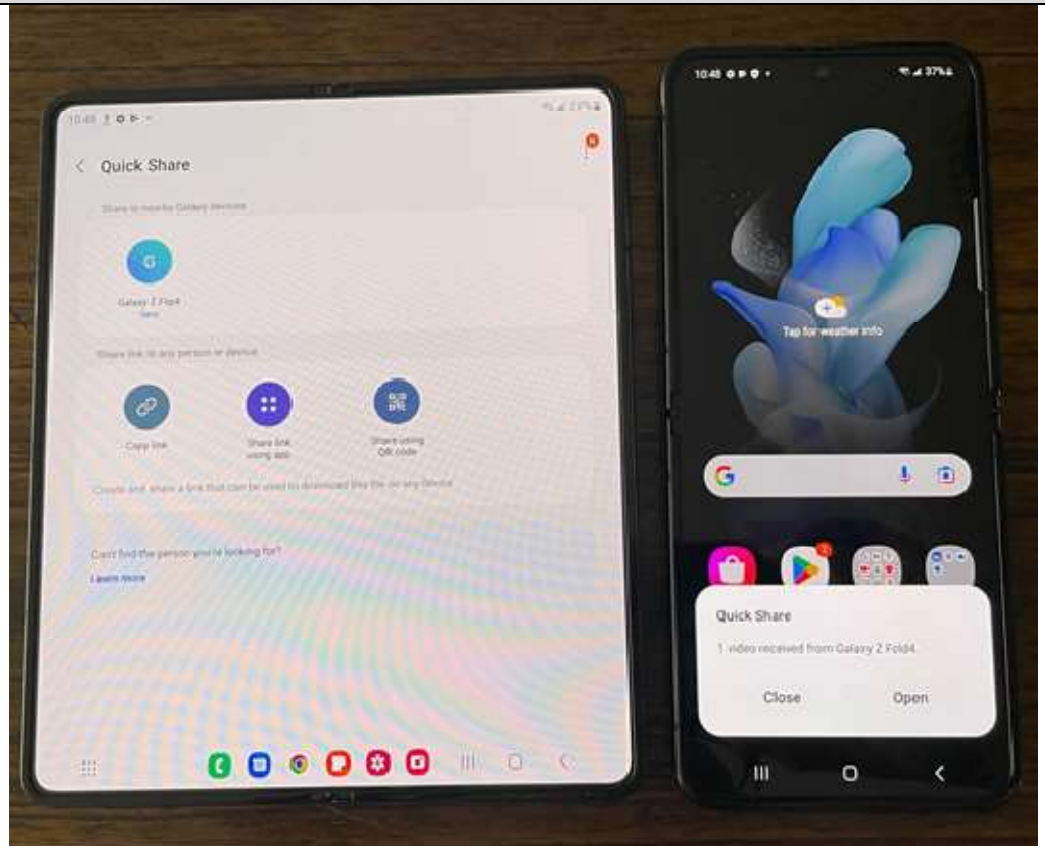
	


1 item
Galaxy Store
Play Store
Google
Microsoft

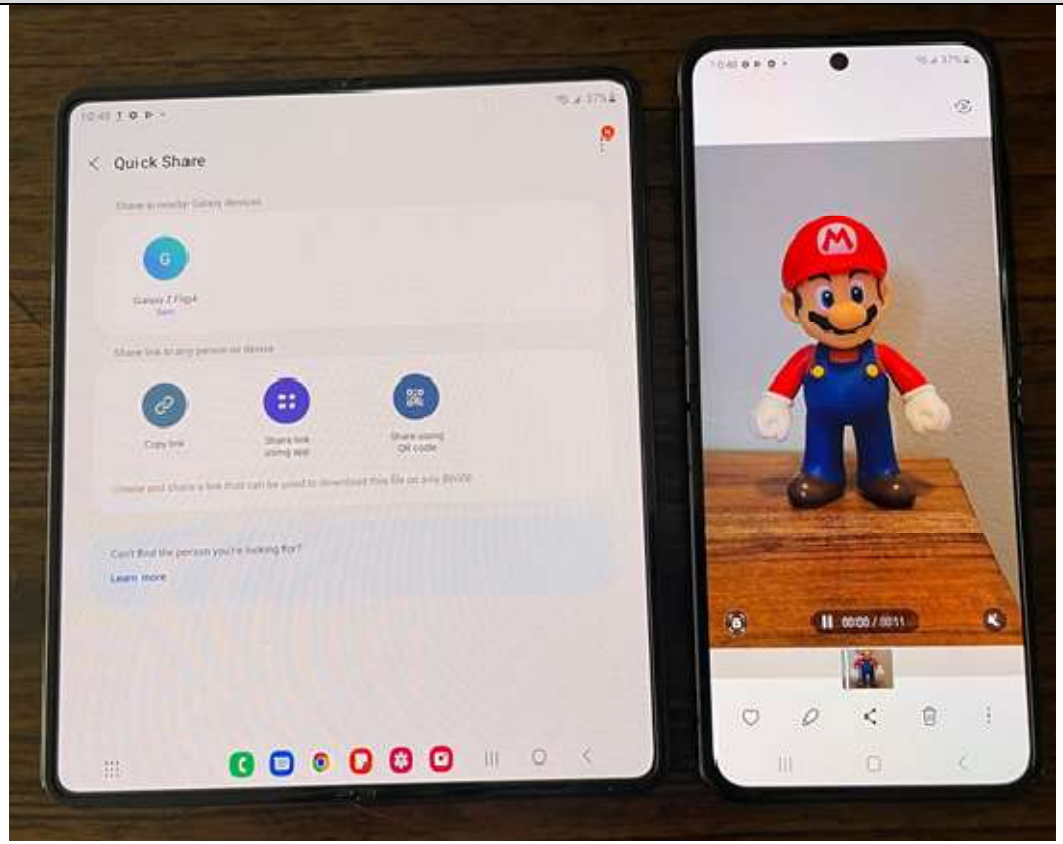
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

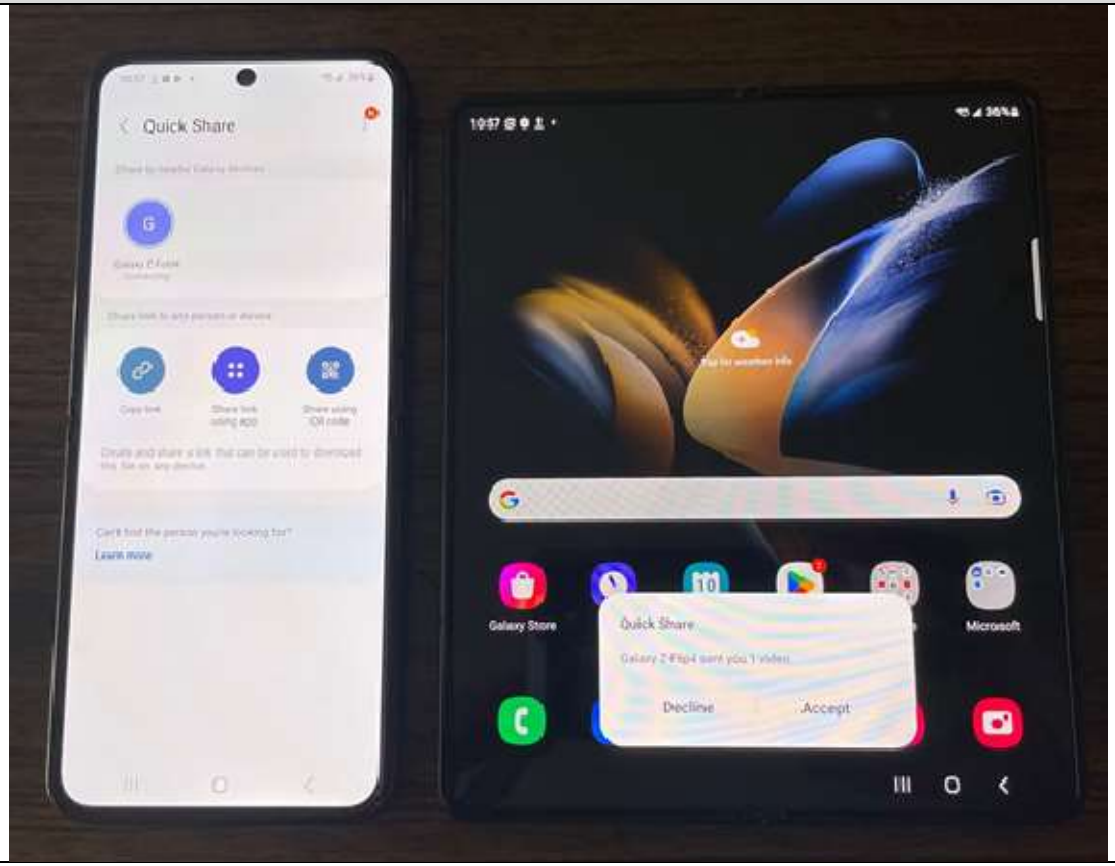


Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

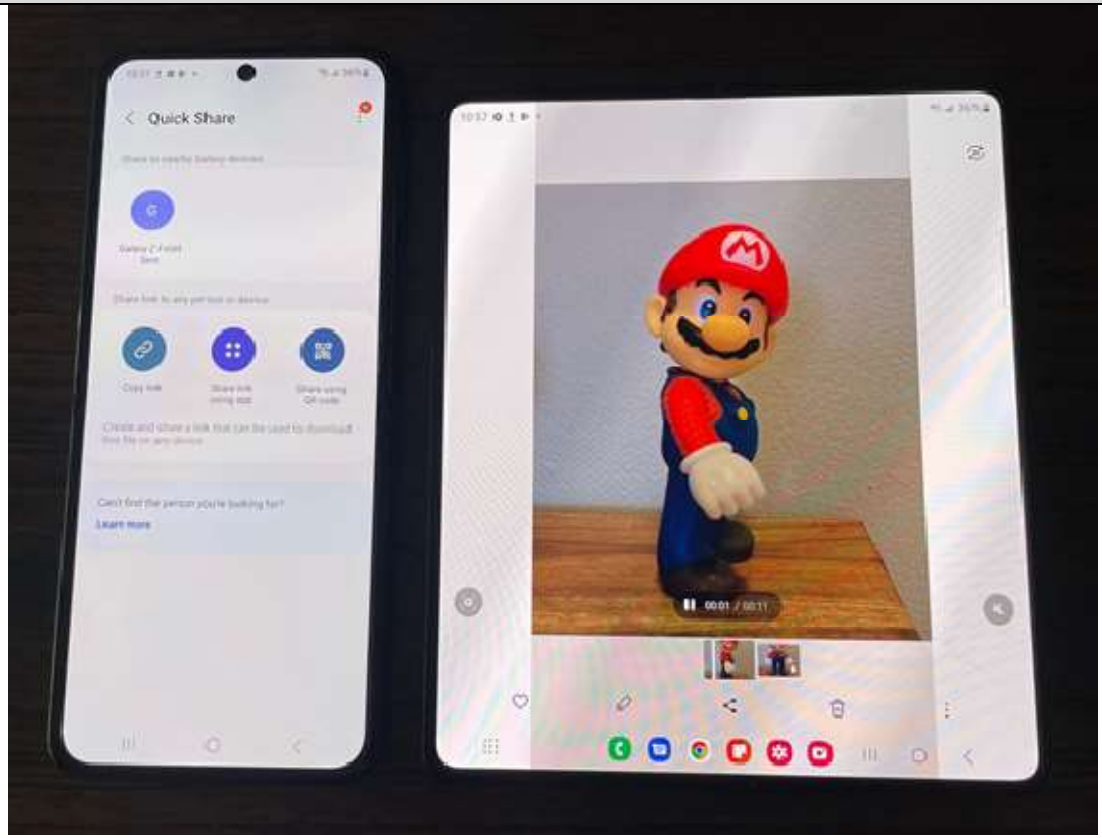
	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Quick Share Galaxy Store Microsoft Quick Share Close Open

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:** For example, in each of the Accused Samsung '590 Products, the displayed screen prompts the user for a user input that indicates whether the user allows a connection between Bluetooth communication circuit and the external device to be established, wherein in response to receiving the user input indicating allowance of the connection, the Bluetooth communication circuit transmits the accumulated video information to the external device.

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>For example, the following screenshots show exemplary Accused Samsung '590 Products where the displayed screen prompts the user to "Select device" and then the user selects a specific external device to indicate allowance to establish a connection between the Bluetooth communication circuit and the external device, and then the Bluetooth communication circuit transmits the accumulated video information to the external device by using Bluetooth for sharing files:
<table>
<tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr>
</table>
</td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

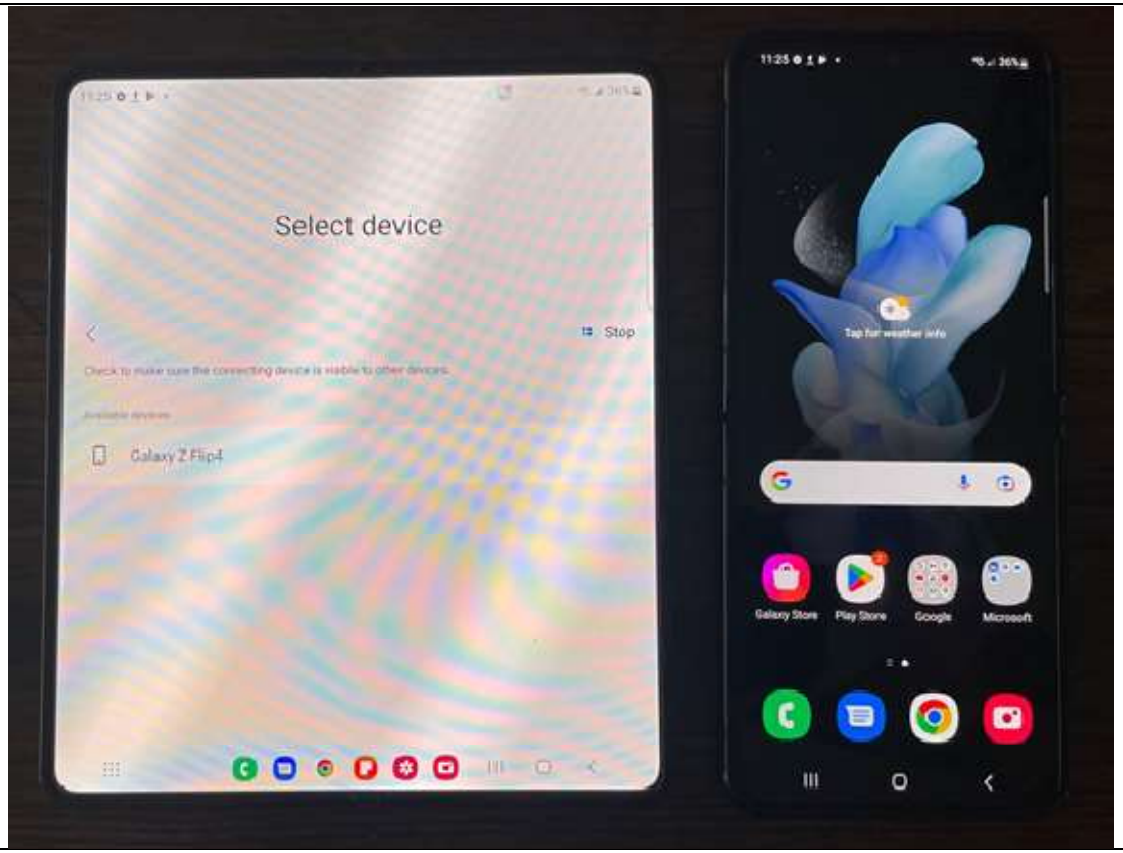
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

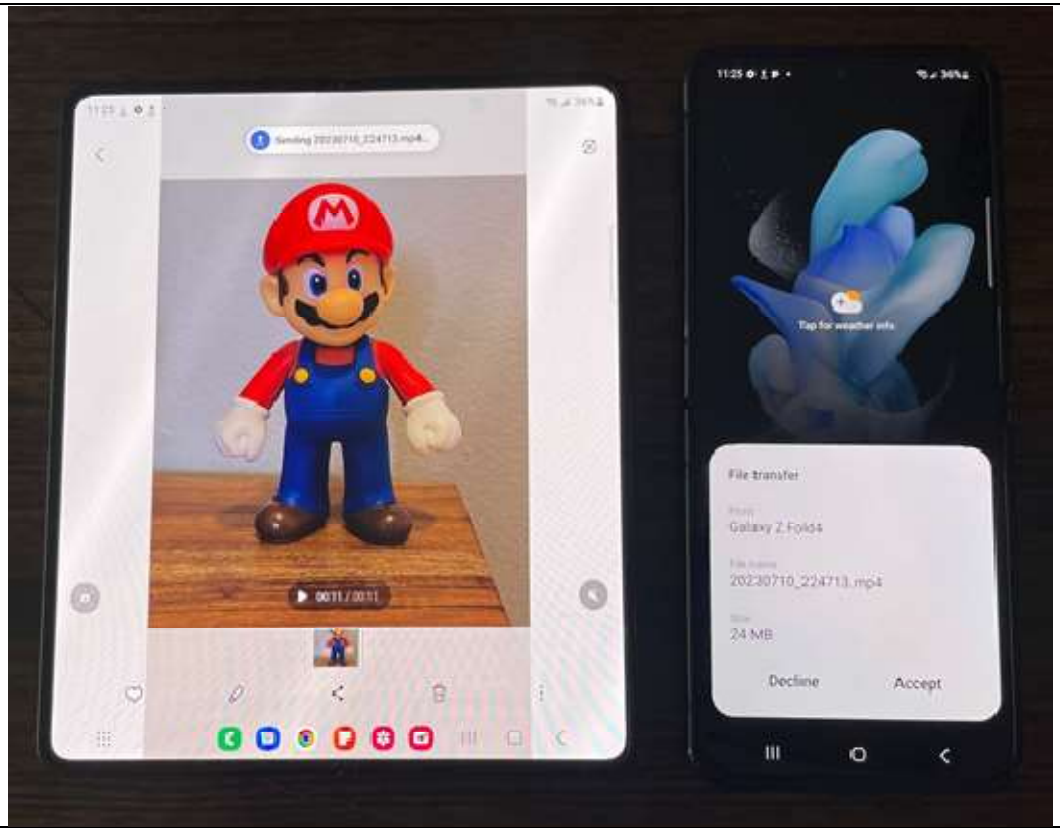


Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Galaxy Store Play Store Google Microsoft


Tap for weather info
File transfer
Galaxy Z Fold4
20230710_224713.mp4
24 MB
Decline
Accept

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



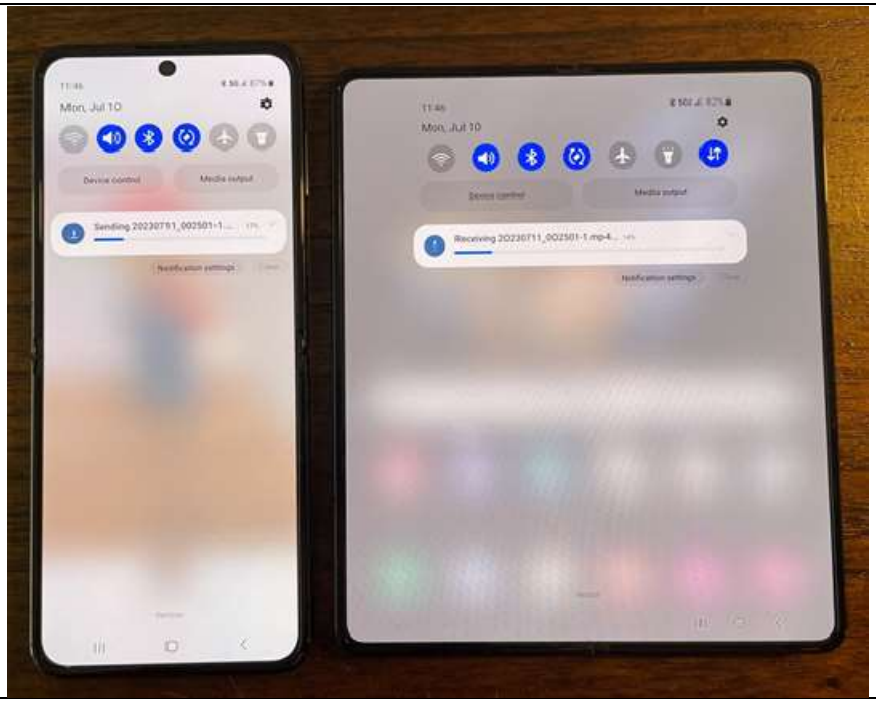
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

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	 Galaxy Store Microsoft 23.2 MB Decline Accept	


Mon, Jul 10
Mon, Jul 10

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a display with touch interface and a WiFi or Bluetooth chipset for operating in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/.
[18] The video processing apparatus of claim 1, wherein the second modulation scheme comprises quadrature	In each of the Accused Samsung '590 Products, the second modulation scheme comprises quadrature amplitude modulation (QAM).

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
amplitude modulation (QAM).	For example, each of the Accused Samsung '590 Products includes a cellular communication circuit which uses a QAM modulation scheme. **Galaxy S23 Ultra:**

Table 9-20
LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

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Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

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Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

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Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

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Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

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- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Cellular Frequency Bandwidth and Modulation/Demodulation Method:

ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work:

- from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE),
- over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA)
- over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP
- up to ongoing development in 3GPP of the 5th generation (5G)

https://www.etsi.org/technologies/mobile

3G: UMTS

UMTS is offering greater spectral efficiency than GSM™ and has 2 modes:

- an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA;
- a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

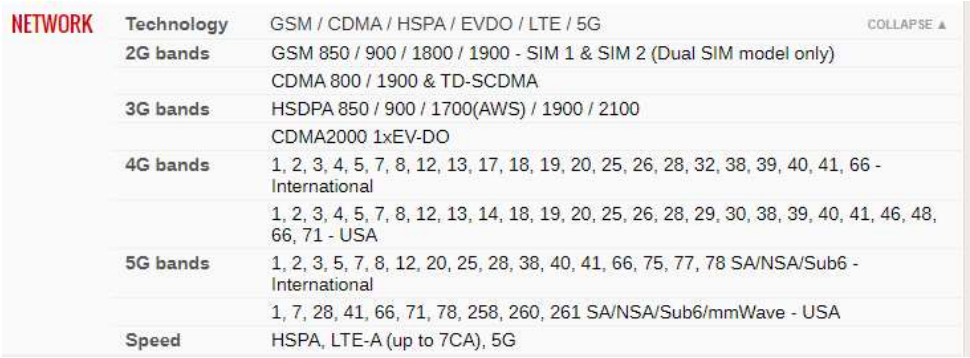
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	LONG TERM EVOLUTION (LTE) Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-13 (Sep.14-Dec.15, ASN.1 freeze: March 16): • Narrowband Internet of Things (IOT) • Further LTE Physical Layer Enhancements for MTC • Dual Connectivity enhancements for LTE Extension of Dual Connectivity in E-UTRAN • Licensed-Assisted Access (LAA) using LTE • Elevation Beamforming/Full-Dimension (FD) MIMO for LTE • Indoor Positioning enhancements for UTRA and LTE • Further Enhancements of Minimization of Drive Tests for E-UTRAN • Enhanced LTE Device to Device Proximity Services • Multicarrier Load Distribution of UEs in LTE • Support of single-cell point-to-multipoint transmission in LTE • Enhanced Signalling for Inter-eNB Coordinated Multi-Point (CoMP) for LTE • RAN enhancements for extended DRX in LTE • LTE-WLAN Radio Level Integration and Interworking Enhancement, LTE-WLAN RAN Level Integration supporting legacy WLAN • RAN aspects of Application specific Congestion control for Data Communication • Base Station (BS) RF requirements for Active Antenna System (AAS), SON for AAS-based deployments • Dedicated Core Networks • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-15 (March 17-June 18, ASN.1 freeze: Sep.18): • Further NB-IoT enhancements • Even further enhanced MTC for LTE • Enhancements to LTE operation in unlicensed spectrum • V2X phase 2 based on LTE • Further enhancements to Coordinated Multi-Point (CoMP) Operation for LTE • UE Positioning Accuracy Enhancements for LTE • Enhancements for high capacity stationary wireless link and intro of DL 1024 QAM • Bluetooth/WLAN measurement collection in LTE Minimization of Drive Tests • Quality of Experience Measurement Collection for streaming services in E-UTRAN • UL data compression in LTE • Increased number of E-UTRAN data bearers • Further video enhancements for LTE https://www.etsi.org/technologies/mobile/4g **5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-16 considered e.g. the following NR enhancements: • eNB(s) Architecture Evolution for E-UTRAN and NG-RAN • Enhancements on MIMO for NR • NR positioning support • 5G V2X with NR sidelink • Cross Link Interference handling and Remote Interference Management for NR • NR-based access to unlicensed spectrum • 2-step RACH for NR • L1 enhancements for NR Ultra-Reliable and Low Latency Communication (URLLC) • UE Power Saving in NR • NR mobility enhancements • Multi-RAT Dual-Connectivity and Carrier Aggregation enhancements (LTE, NR) • Integrated access and backhaul for NR • Single Radio Voice Call Continuity from 5G to 3G • Optimisations on UE radio capability signalling – NR/E-UTRA Aspects • Support of NR Industrial Internet of Things (IoT) • Private Network Support for NG-RAN • NG interface usage for Wireless Wireline Convergence • RF requirements for NR frequency range 1 (FR1) • Add support of NR DL 256QAM for frequency range 2 (FR2)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	REL-17 IS WORKING E.G. ON THE FOLLOWING NR ENHANCEMENTS: • ◦ Further enhancements on MIMO for NR ◦ NR Sidelink enhancement ◦ NR Dynamic spectrum sharing (DSS) ◦ Enhanced Industrial Internet of Things (IoT) and ultra-reliable and low latency communication (URLLC) support for NR ◦ Solutions for NR to support non-terrestrial networks (NTN) ◦ UE power saving enhancements for NR ◦ NR multicast and broadcast services ◦ Enhancements to Integrated Access and Backhaul (IAB) for NR ◦ NR small data transmissions in INACTIVE state ◦ Multiple Input Multiple Output (MIMO) Over-the-Air (OTA) requirements for NR UEs ◦ Enhancement of Private Network support for NG-RAN ◦ Introduction of DL 1024QAM for NR FR1 ◦ Enhanced NR support for high speed train scenario for frequency range 1 (FR1) https://www.etsi.org/technologies/mobile/5g *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for operating in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/.
[19] The video processing apparatus of claim 1, wherein the second radio communication circuit is controllable to change from the second modulation scheme to a different modulation scheme.	In each of the Accused Samsung '590 Products, the second radio communication circuit is controllable to change from the second modulation scheme to a different modulation scheme. For example, each of the Accused Samsung '590 Products includes a cellular communication circuit which is controllable to change different modulation schemes based on cellular conditions and/or whether communications are in uplink or downlink and/or whether the communications are in 2G/3G/4G LTE/5G (*e.g.*, 16 QAM v. 64 QAM v. 256 QAM v. 1024 QAM v. OFDM v. QPSK v. BPSK etc.)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy S23 Ultra:  Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

NETWORK		COLLAPSE ▲
	Technology	GSM / CDMA / HSPA / EVDO / LTE / 5G
	2G bands	GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only)
		CDMA 800 / 1900 & TD-SCDMA
	3G bands	HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100
		CDMA2000 1xEV-DO
	4G bands	1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International
		1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA
	5G bands	1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International
		1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA
	Speed	HSPA, LTE-A (up to 7CA), 5G

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-20

LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

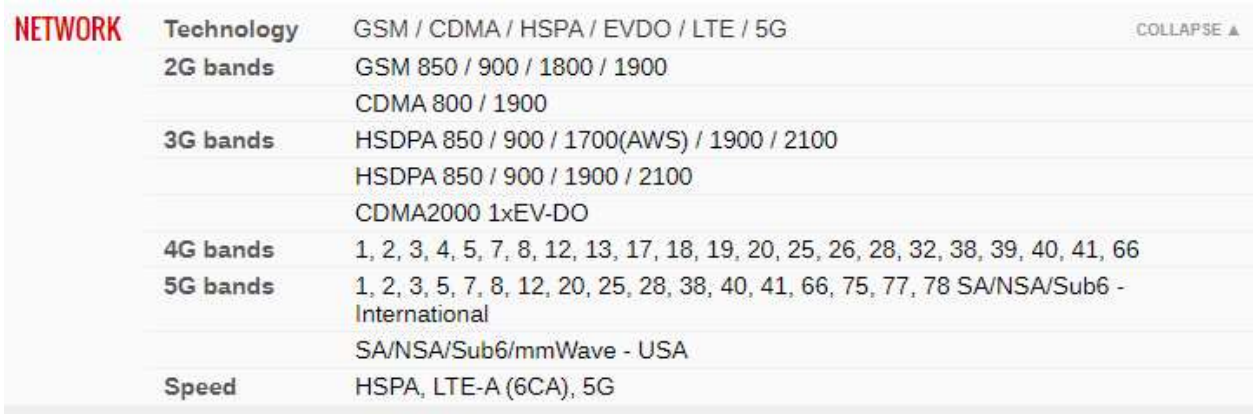
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

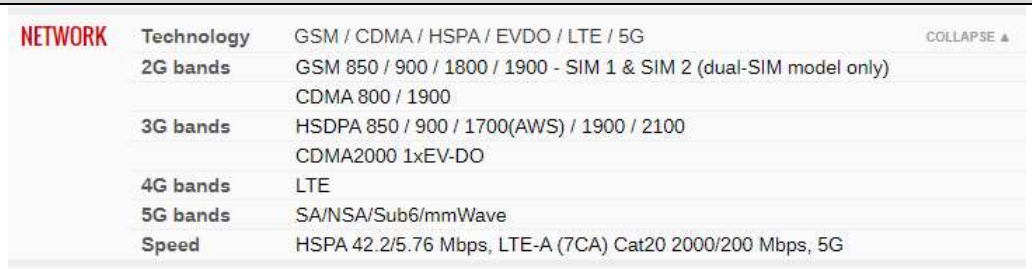
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

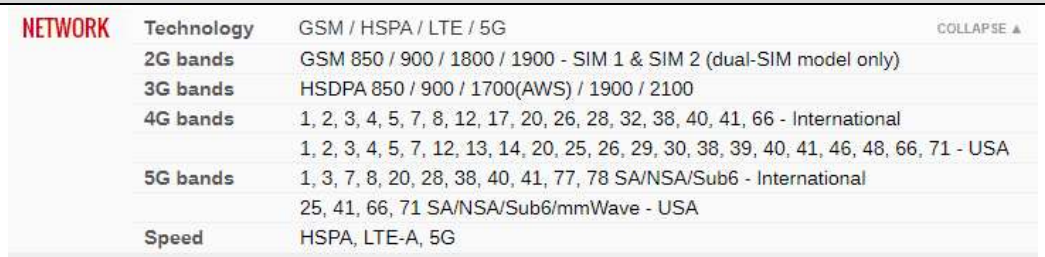
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	LONG TERM EVOLUTION (LTE) Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

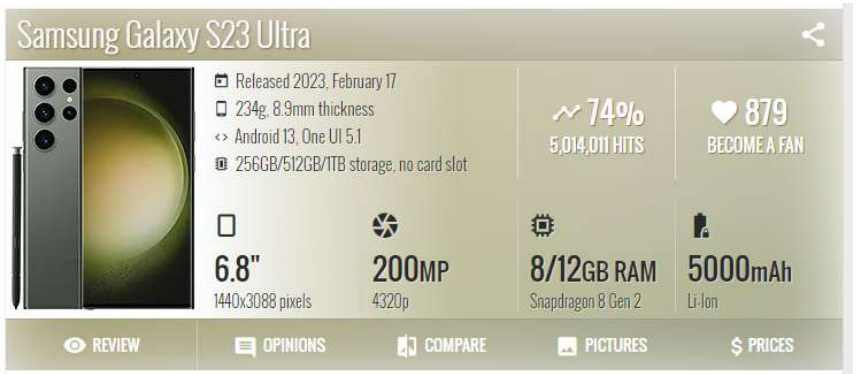
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-13 (Sep.14-Dec.15, ASN.1 freeze: March 16): • Narrowband Internet of Things (IOT) • Further LTE Physical Layer Enhancements for MTC • Dual Connectivity enhancements for LTE Extension of Dual Connectivity in E-UTRAN • Licensed-Assisted Access (LAA) using LTE • Elevation Beamforming/Full-Dimension (FD) MIMO for LTE • Indoor Positioning enhancements for UTRA and LTE • Further Enhancements of Minimization of Drive Tests for E-UTRAN • Enhanced LTE Device to Device Proximity Services • Multicarrier Load Distribution of UEs in LTE • Support of single-cell point-to-multipoint transmission in LTE • Enhanced Signalling for Inter-eNB Coordinated Multi-Point (CoMP) for LTE • RAN enhancements for extended DRX in LTE • LTE-WLAN Radio Level Integration and Interworking Enhancement, LTE-WLAN RAN Level Integration supporting legacy WLAN • RAN aspects of Application specific Congestion control for Data Communication • Base Station (BS) RF requirements for Active Antenna System (AAS), SON for AAS-based deployments • Dedicated Core Networks • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM

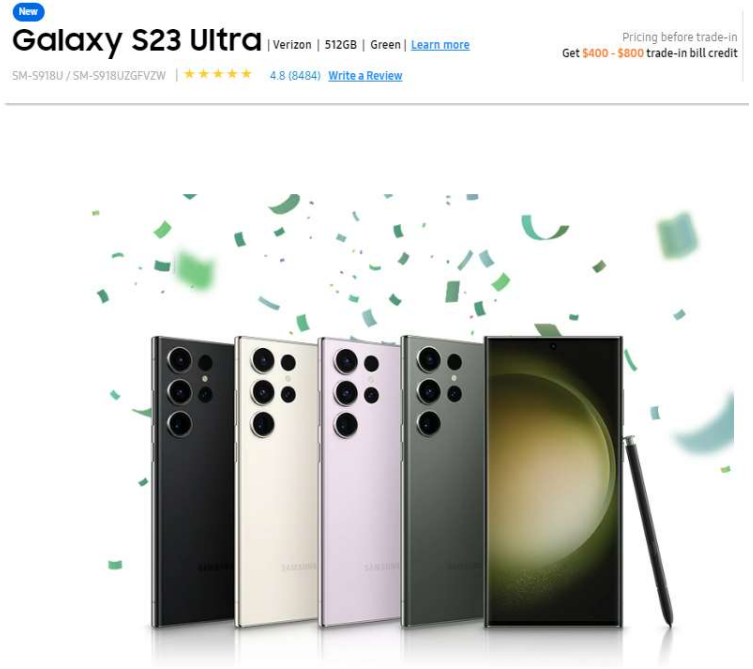
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-15 (March 17-June 18, ASN.1 freeze: Sep.18): • Further NB-IoT enhancements • Even further enhanced MTC for LTE • Enhancements to LTE operation in unlicensed spectrum • V2X phase 2 based on LTE • Further enhancements to Coordinated Multi-Point (CoMP) Operation for LTE • UE Positioning Accuracy Enhancements for LTE • Enhancements for high capacity stationary wireless link and intro of DL 1024 QAM • Bluetooth/WLAN measurement collection in LTE Minimization of Drive Tests • Quality of Experience Measurement Collection for streaming services in E-UTRAN • UL data compression in LTE • Increased number of E-UTRAN data bearers • Further video enhancements for LTE

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture https://www.etsi.org/technologies/mobile/4g **5G:**

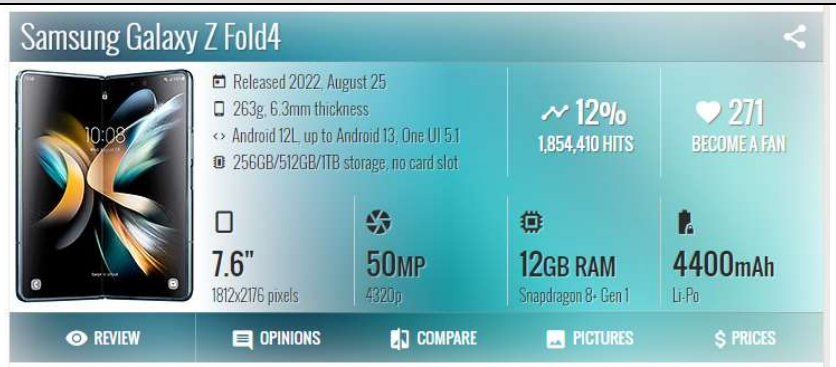
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-16 considered e.g. the following NR enhancements: • eNB(s) Architecture Evolution for E-UTRAN and NG-RAN • Enhancements on MIMO for NR • NR positioning support • 5G V2X with NR sidelink • Cross Link Interference handling and Remote Interference Management for NR • NR-based access to unlicensed spectrum • 2-step RACH for NR • L1 enhancements for NR Ultra-Reliable and Low Latency Communication (URLLC) • UE Power Saving in NR • NR mobility enhancements • Multi-RAT Dual-Connectivity and Carrier Aggregation enhancements (LTE, NR) • Integrated access and backhaul for NR • Single Radio Voice Call Continuity from 5G to 3G • Optimisations on UE radio capability signalling – NR/E-UTRA Aspects • Support of NR Industrial Internet of Things (IoT) • Private Network Support for NG-RAN • NG interface usage for Wireless Wireline Convergence • RF requirements for NR frequency range 1 (FR1) • Add support of NR DL 256QAM for frequency range 2 (FR2)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	REL-17 IS WORKING E.G. ON THE FOLLOWING NR ENHANCEMENTS: • ◦ Further enhancements on MIMO for NR ◦ NR Sidelink enhancement ◦ NR Dynamic spectrum sharing (DSS) ◦ Enhanced Industrial Internet of Things (IoT) and ultra-reliable and low latency communication (URLLC) support for NR ◦ Solutions for NR to support non-terrestrial networks (NTN) ◦ UE power saving enhancements for NR ◦ NR multicast and broadcast services ◦ Enhancements to Integrated Access and Backhaul (IAB) for NR ◦ NR small data transmissions in INACTIVE state ◦ Multiple Input Multiple Output (MIMO) Over-the-Air (OTA) requirements for NR UEs ◦ Enhancement of Private Network support for NG-RAN ◦ Introduction of DL 1024QAM for NR FR1 ◦ Enhanced NR support for high speed train scenario for frequency range 1 (FR1) https://www.etsi.org/technologies/mobile/5g *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for operating in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/.

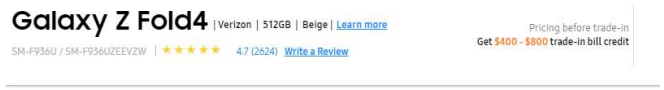
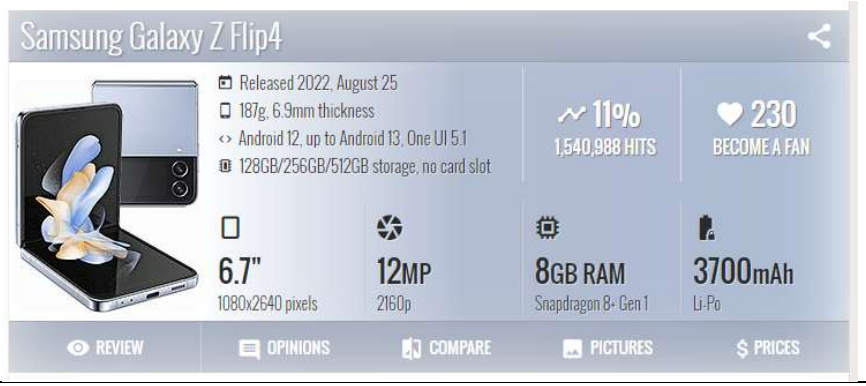
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[20] The video processing apparatus of claim 1, wherein the video processing apparatus comprises a cellular phone.	In each of the Accused Samsung '590 Products, the video processing apparatus comprises a cellular phone.  NETWORK — COLLAPSE ▲ Technology: GSM / CDMA / HSPA / EVDO / LTE / 5G 2G bands: GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only) CDMA 800 / 1900 & TD-SCDMA 3G bands: HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 CDMA2000 1xEV-DO 4G bands: 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA 5G bands: 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International 1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA Speed: HSPA, LTE-A (up to 7CA), 5G

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

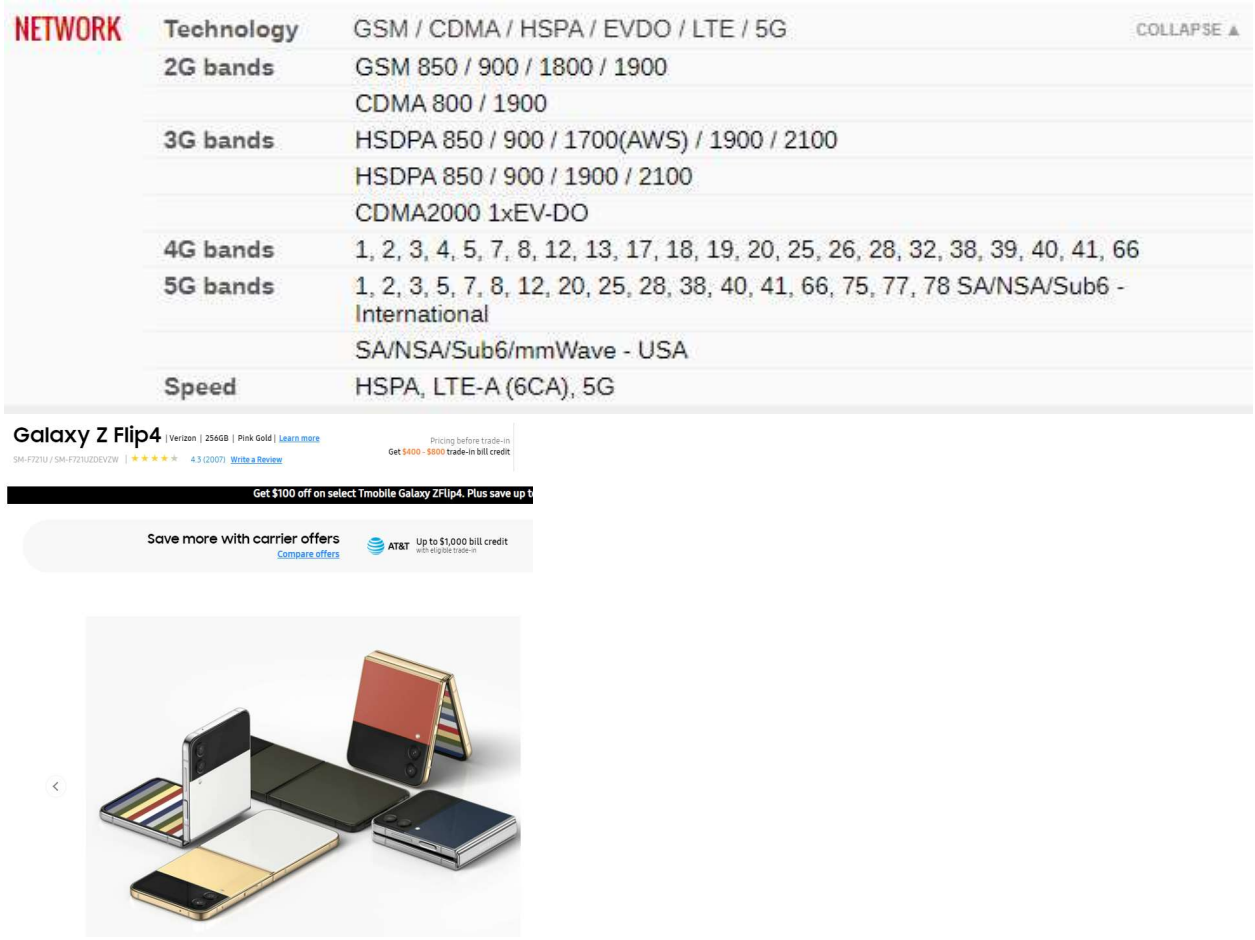
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



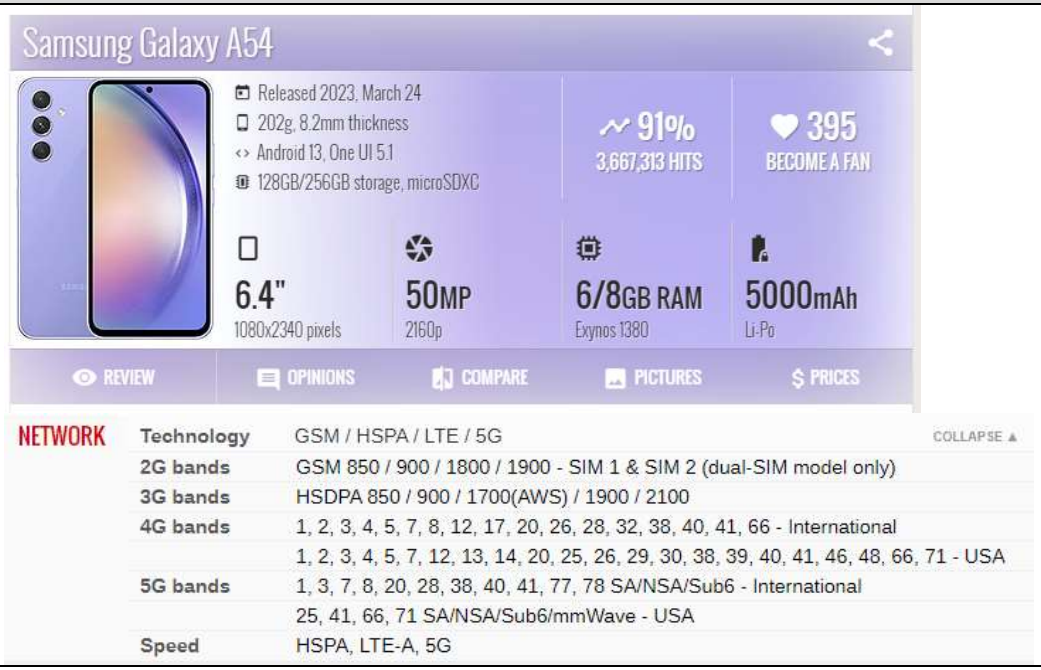
NETWORK		COLLAPSE ▲
	Technology	GSM / CDMA / HSPA / EVDO / LTE / 5G
	2G bands	GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (dual-SIM model only)
		CDMA 800 / 1900
	3G bands	HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100
		CDMA2000 1xEV-DO
	4G bands	LTE
	5G bands	SA/NSA/Sub6/mmWave
	Speed	HSPA 42.2/5.76 Mbps, LTE-A (7CA) Cat20 2000/200 Mbps, 5G

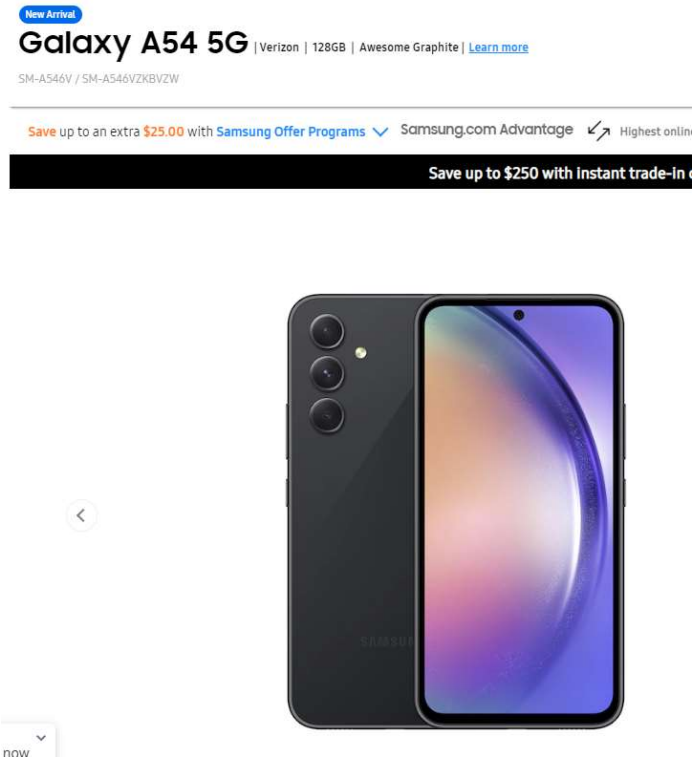
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

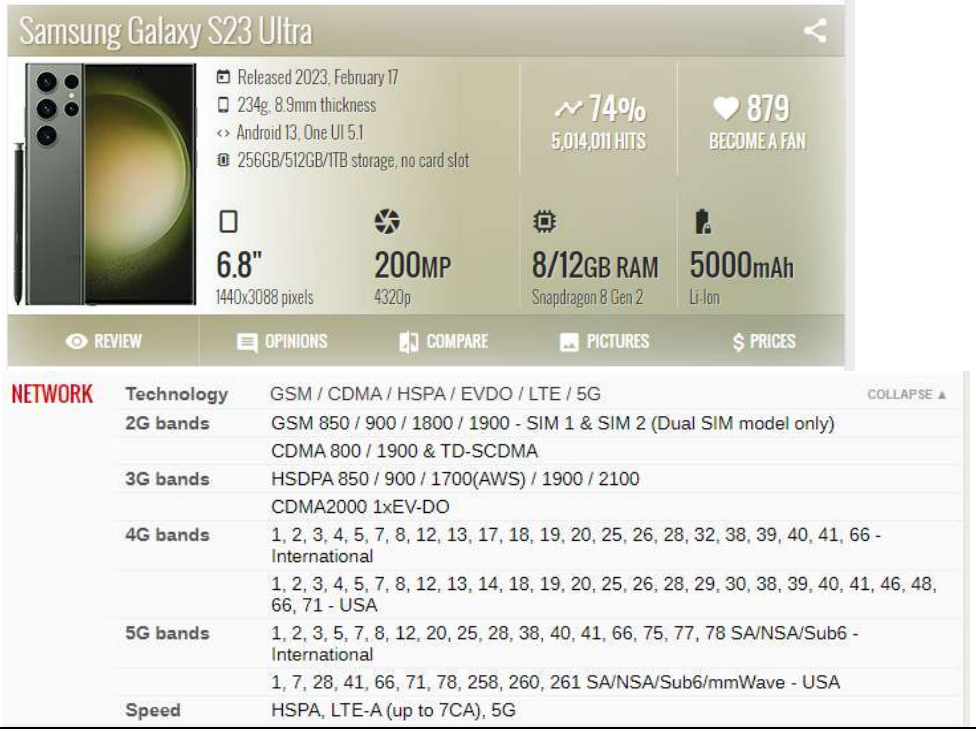


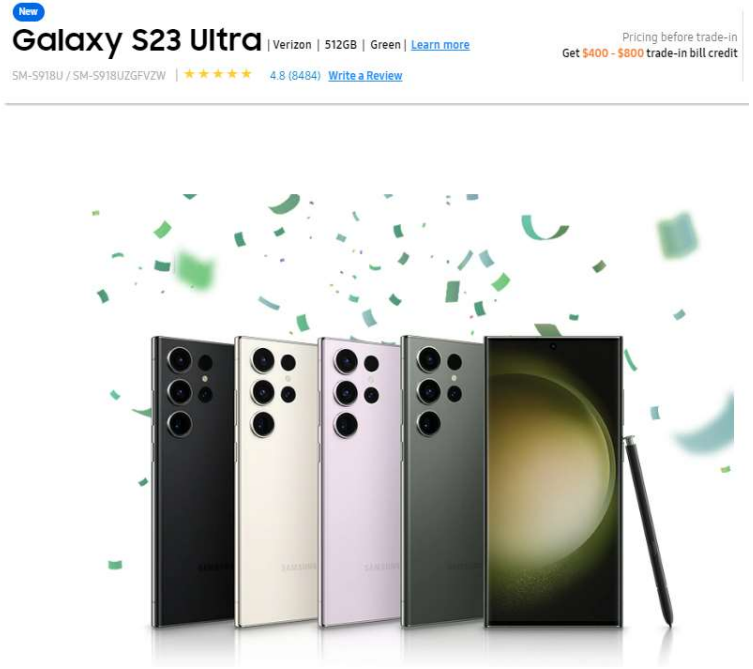
Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php

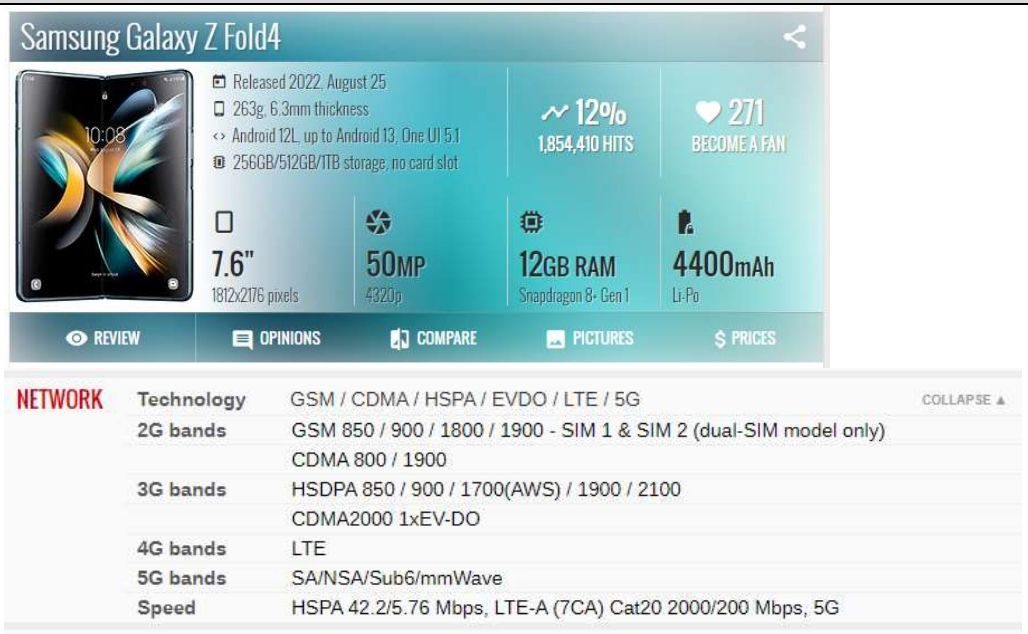
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

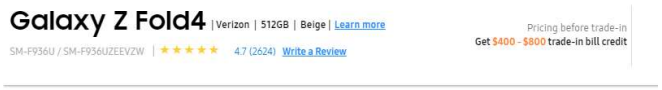
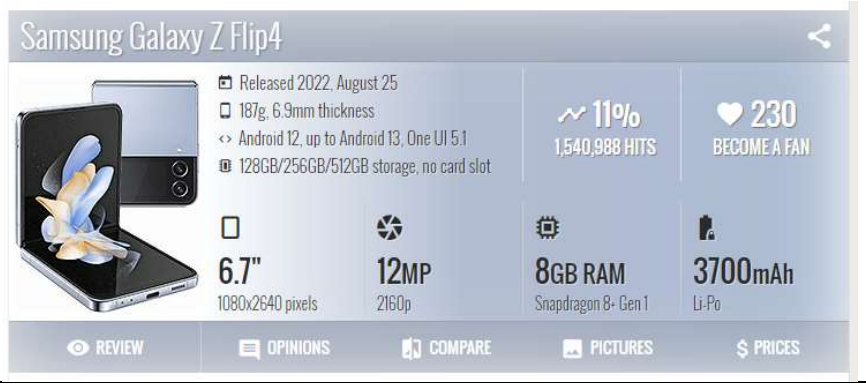
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a54/buy/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php *See also* Appendix 8 providing evidence that the remaining Accused Samsung '590 Products also include a cellular phone.
[23. preamble] A cellular phone, comprising:	Each of the Accused Samsung '590 Products is a cellular phone. *See*, for example:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

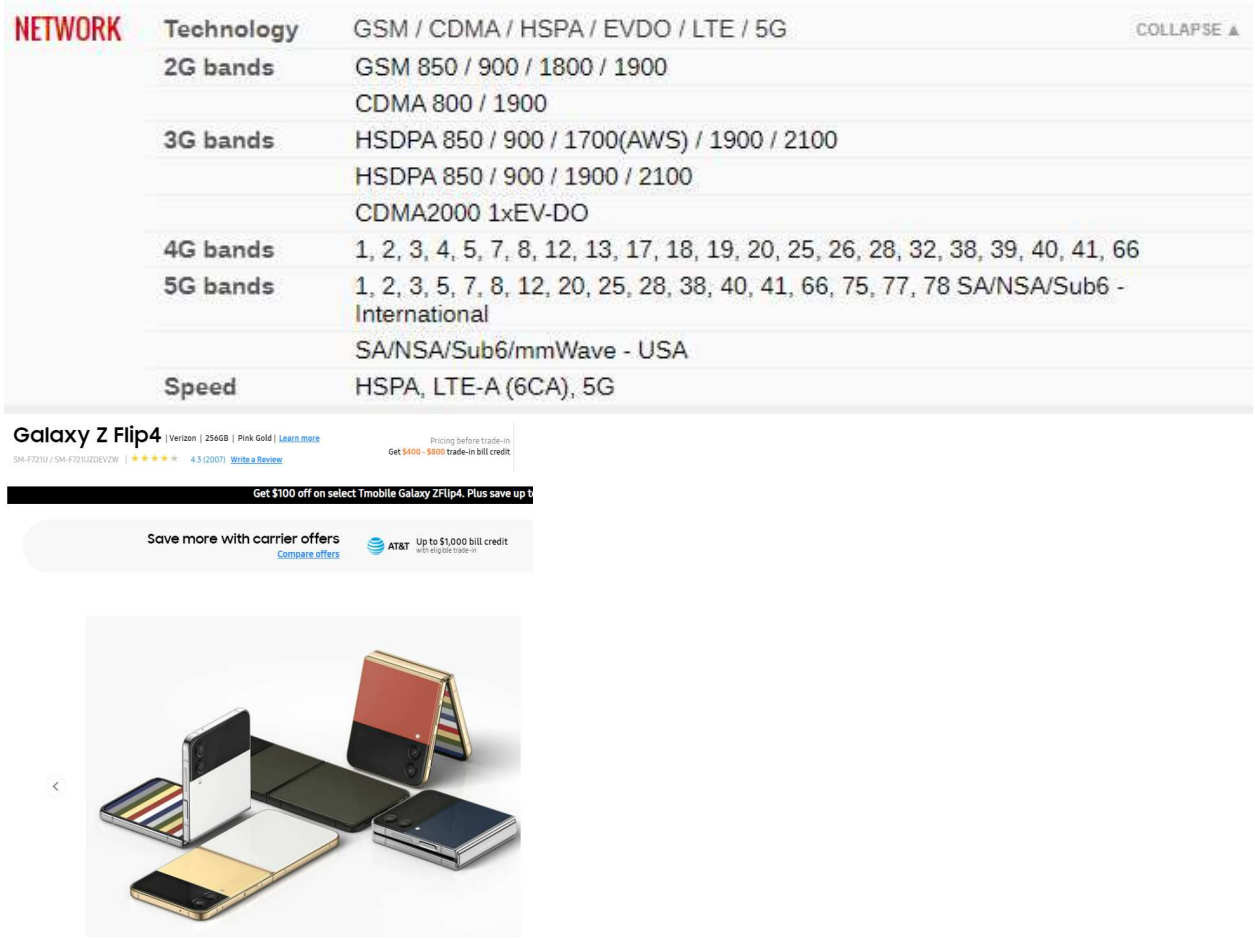


U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

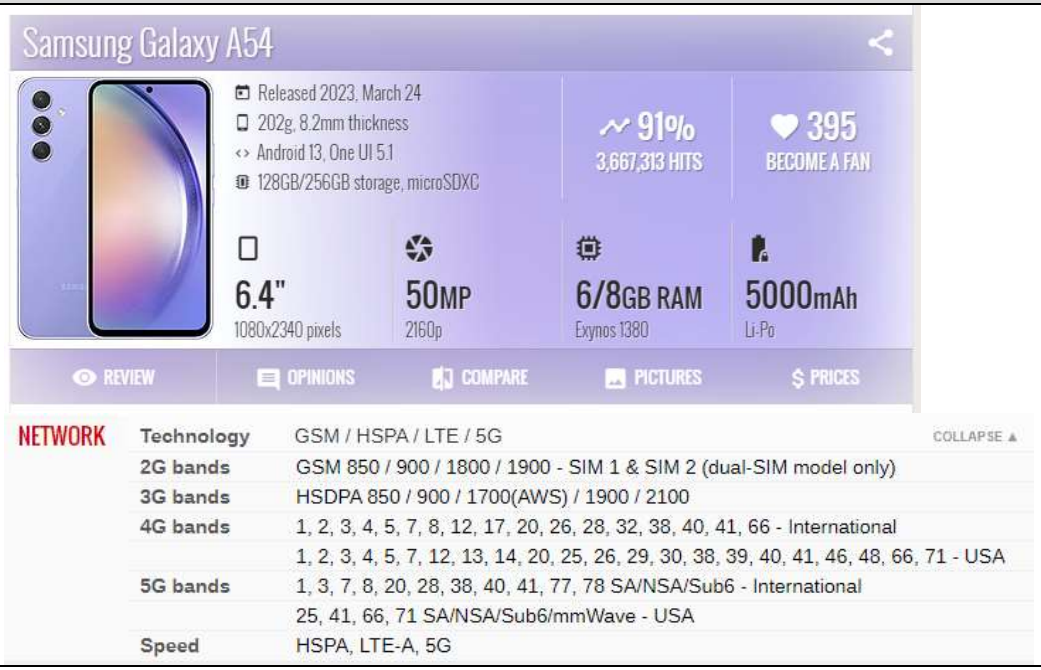
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

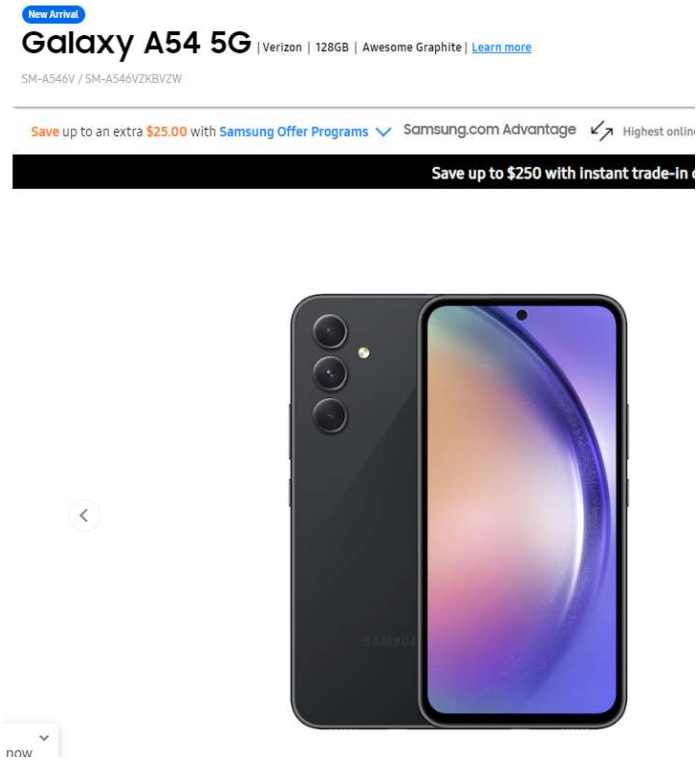
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	  Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php 

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Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php

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	 Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a54/buy/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include front and back cameras for recording video, a display for displaying video, and one or more processors (*e.g.*, a CPU, ISP, and/or DSP) with image and video processing capability. *See* https://www.samsung.com/us/support/answer/ANS00089063/.
[23.a] a first radio communication circuit implementing a first	Each of the Accused Samsung '590 Products includes a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission

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transmission scheme having a first modulation scheme and first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band;	frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band. **First Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the Wi-Fi communication chip capable of transmitting video information via Wi-Fi communications (e.g., Quick Share) using the first transmission frequency band. **How to use Quick Share feature on Galaxy device** Last Update date : Jul 15, 2022 **Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.** Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps: **Step 1**. Go to **Settings > Software update**. **Step 2**. Tap on **Download and install**. **Step 3**. Follow the on-screen instructions. **Quick Share feature highlights** Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices. 

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	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ **Galaxy S23 Ultra:**

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	COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

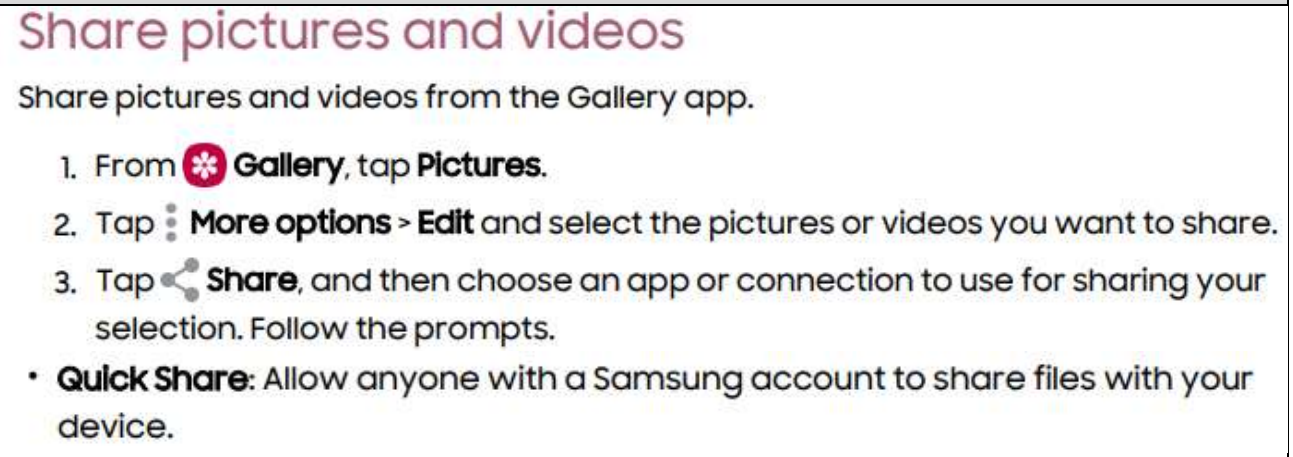
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	# Sharing content Share content by using various sharing options. The following actions are an example of sharing images. 1 Open the **Gallery** app and select an image. 2 Tap and select a sharing method you want. You may incur additional charges when sharing files through the mobile network. ## Quick Share ### Sharing content with nearby devices Share content with nearby devices through Wi-Fi Direct or Bluetooth, or with some SmartThings supported devices. 1 Open the **Gallery** app and select an image. 2 On the other device, open the notification panel, swipe downwards, and then tap (**Quick Share**) to turn it on. If you cannot find (**Quick Share**) on the quick panel, tap and drag the button over to add it.

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	3 Tap → **Quick Share** and select a device to receive the image. 4 Accept the file transfer request on the other device. This feature does not support sharing videos with TVs or SmartThings supported devices. To watch videos on TV, use the Smart View feature. **Setting who can find your phone** Set who is allowed to find and send content to your phone. 1 Open the notification panel, swipe downwards, and then tap (**Quick Share**). 2 Select an option. • **No one**: Do not allow others to find your phone. • **Contacts only**: Only allow Samsung users in your contacts to share with your phone. • **Anyone nearby**: Allow any nearby devices to share with your phone. **Sharing through Web link** Upload large files to the Samsung storage server and share them with others through Web link. 1 Open the **Gallery** app and select an image. 2 Tap → **Quick Share** and select an option you want under **Share to any device**. • **Copy link**: Share the link copied to the clipboard. • **Share link using app**: Share the link by selecting an app. • **Share using QR code**: Share the link with the created QR code. Galaxy S23 Series User Guide at pg. 111-112.

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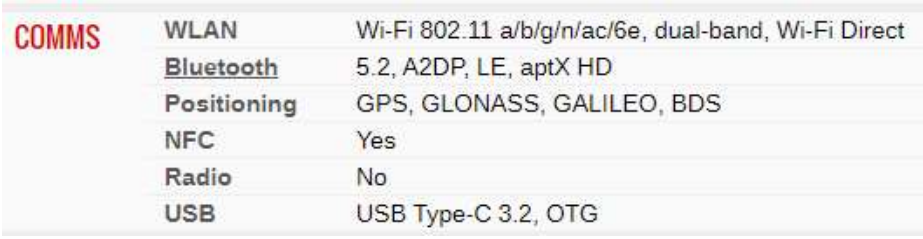
Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

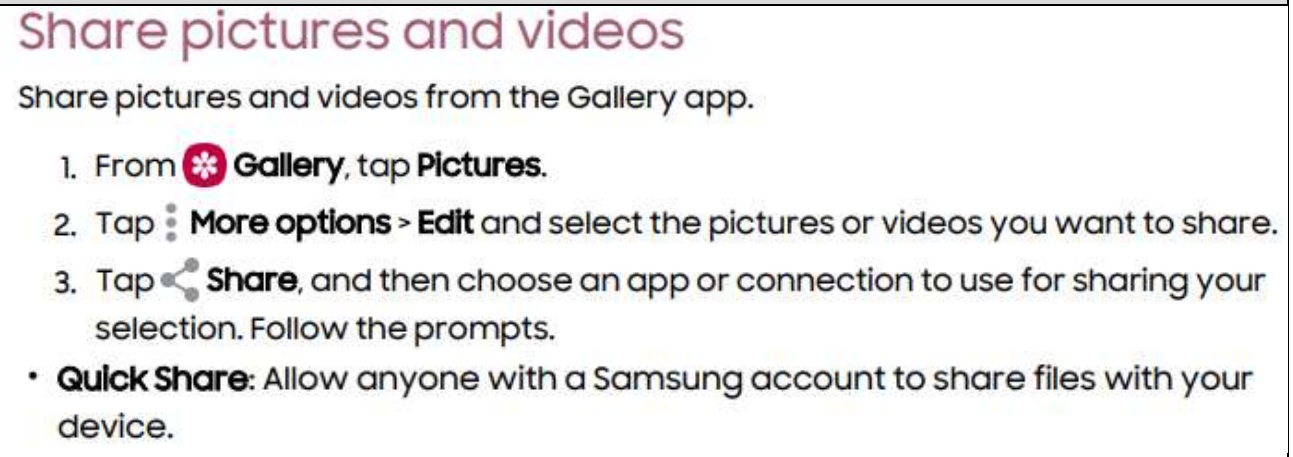
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	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pgs. 68, 133.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
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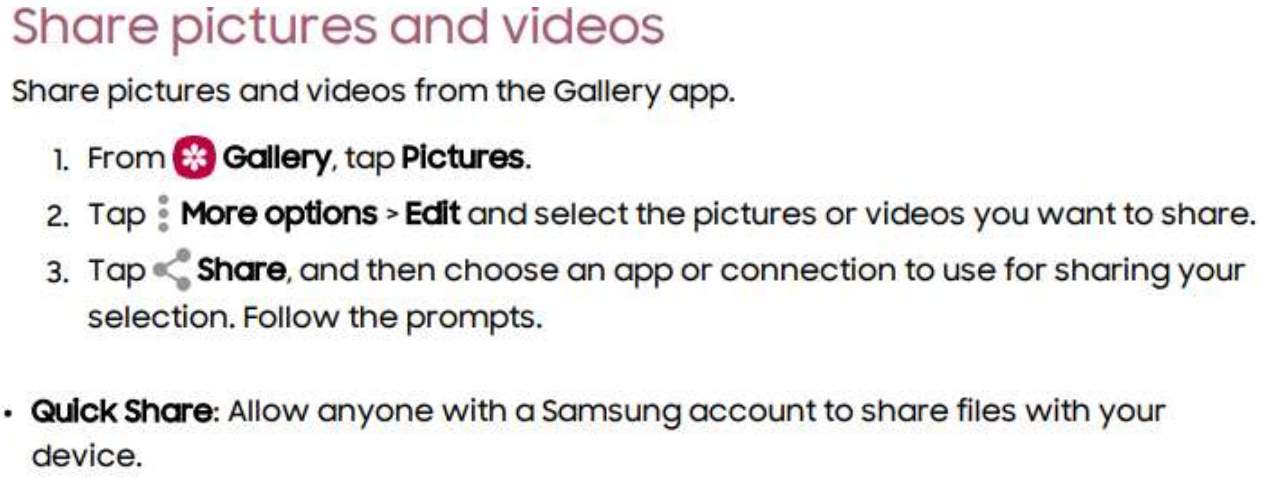
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U-NII-8	Voice/Data	6895 - 7115 MHz
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NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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	 Galaxy A54 User Guide at pg. 49, 112.

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Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

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- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

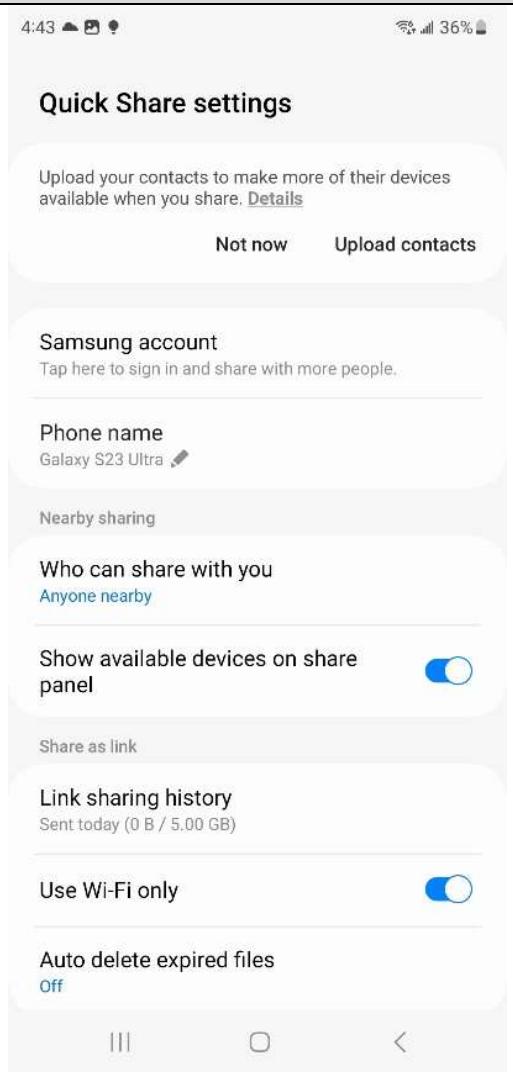
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

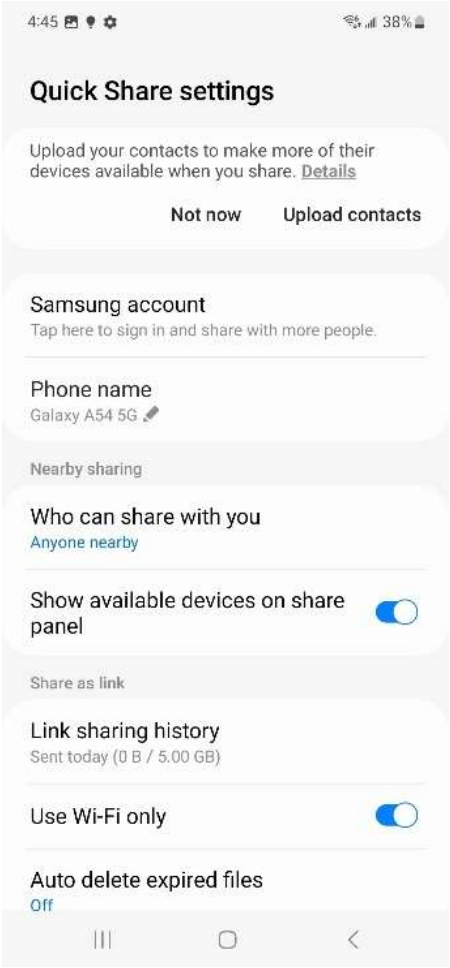
	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

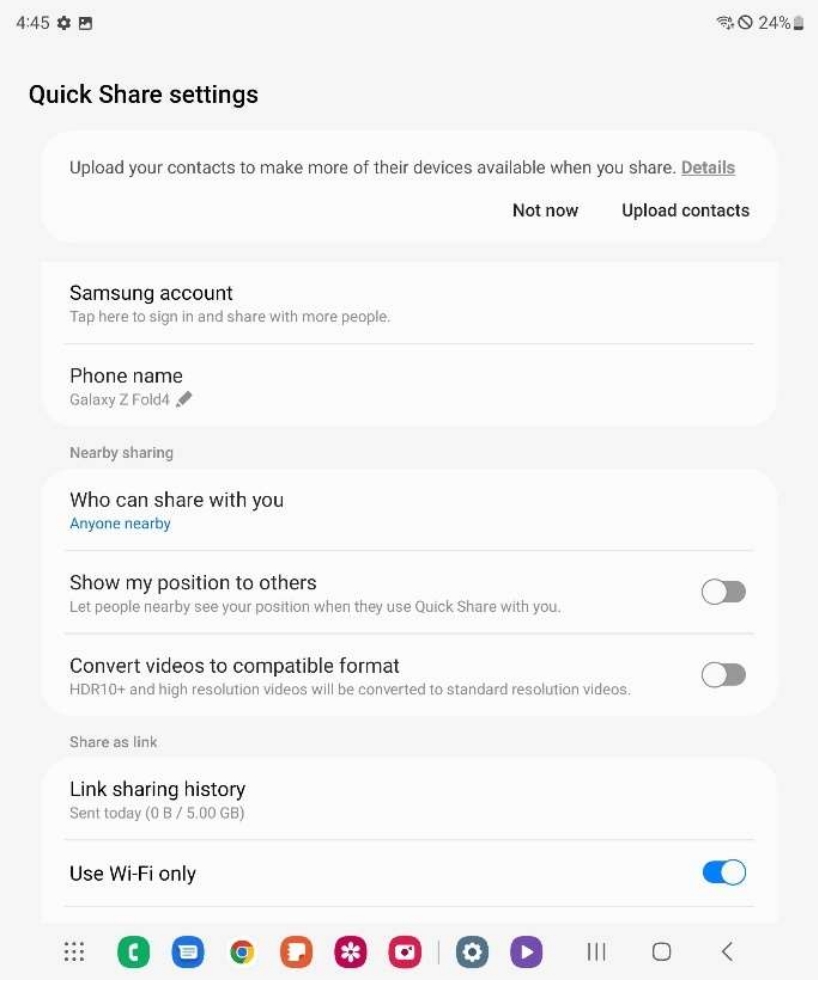
See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

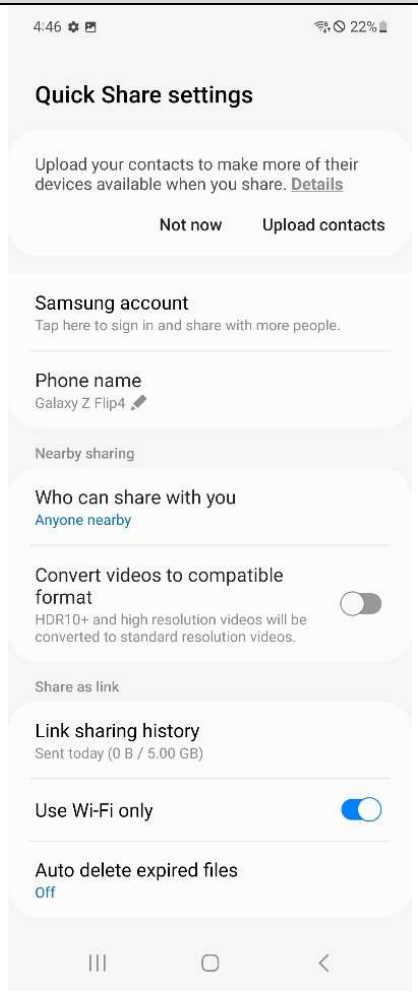
For example, the following screenshots show exemplary Accused Samsung '590 Products using a Wi-Fi communication chip to transmit video information by using Quick Share app:

Samsung Galaxy 23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



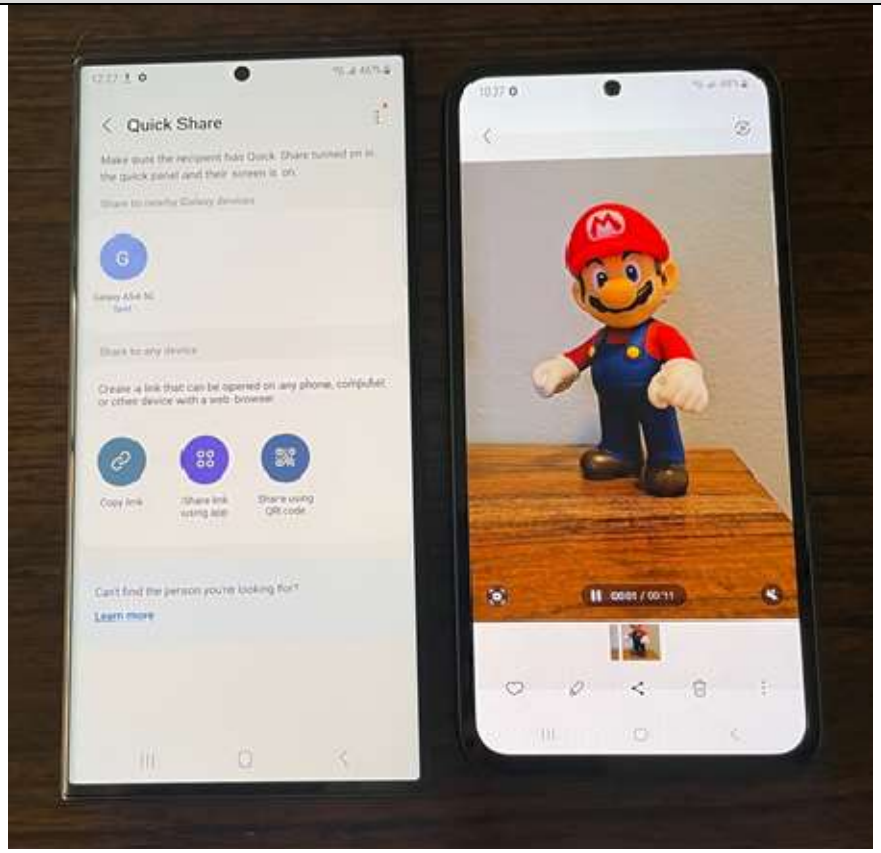
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

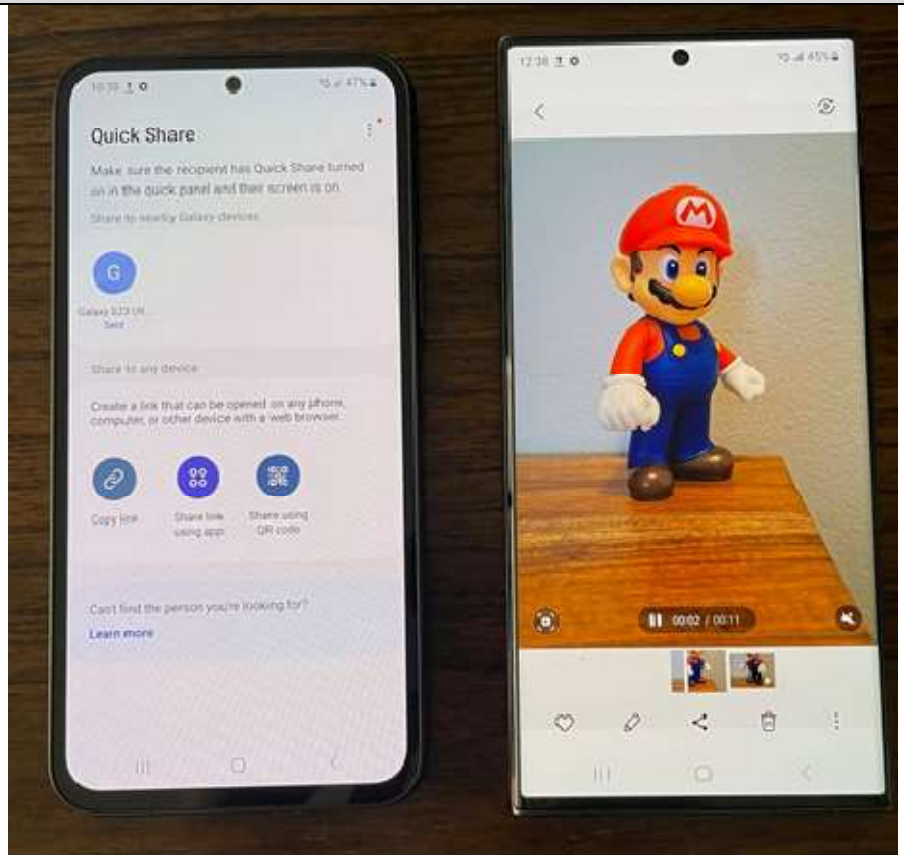
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

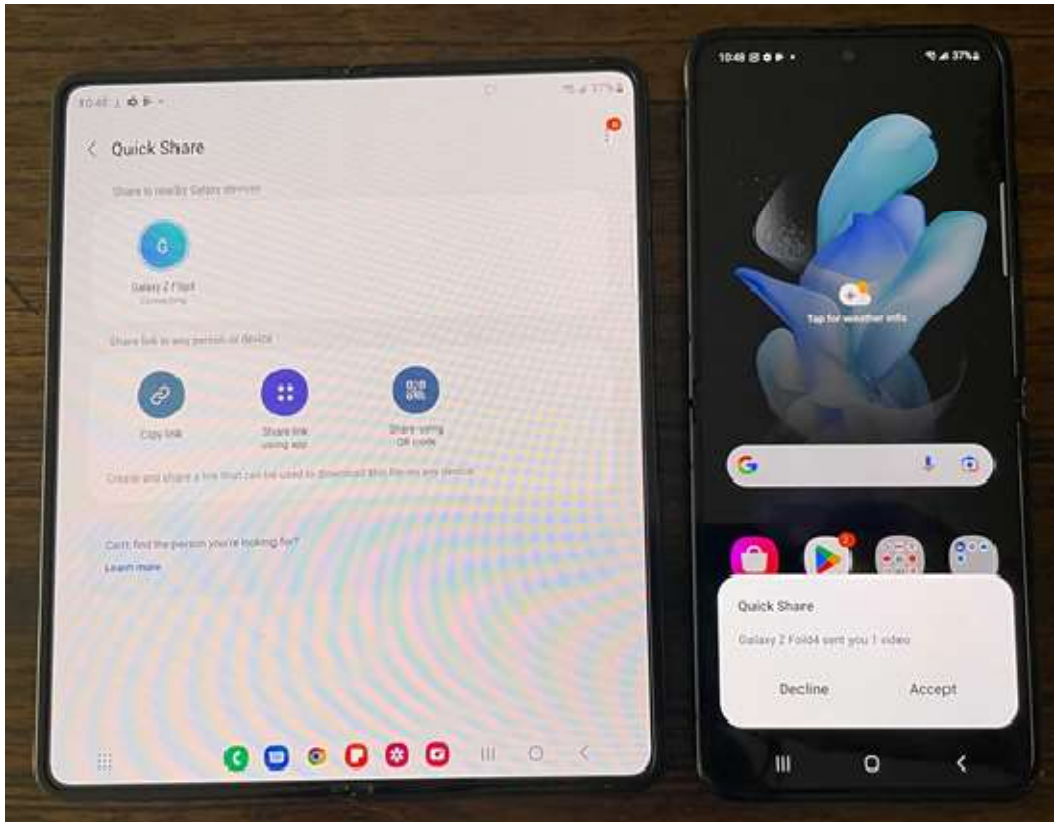


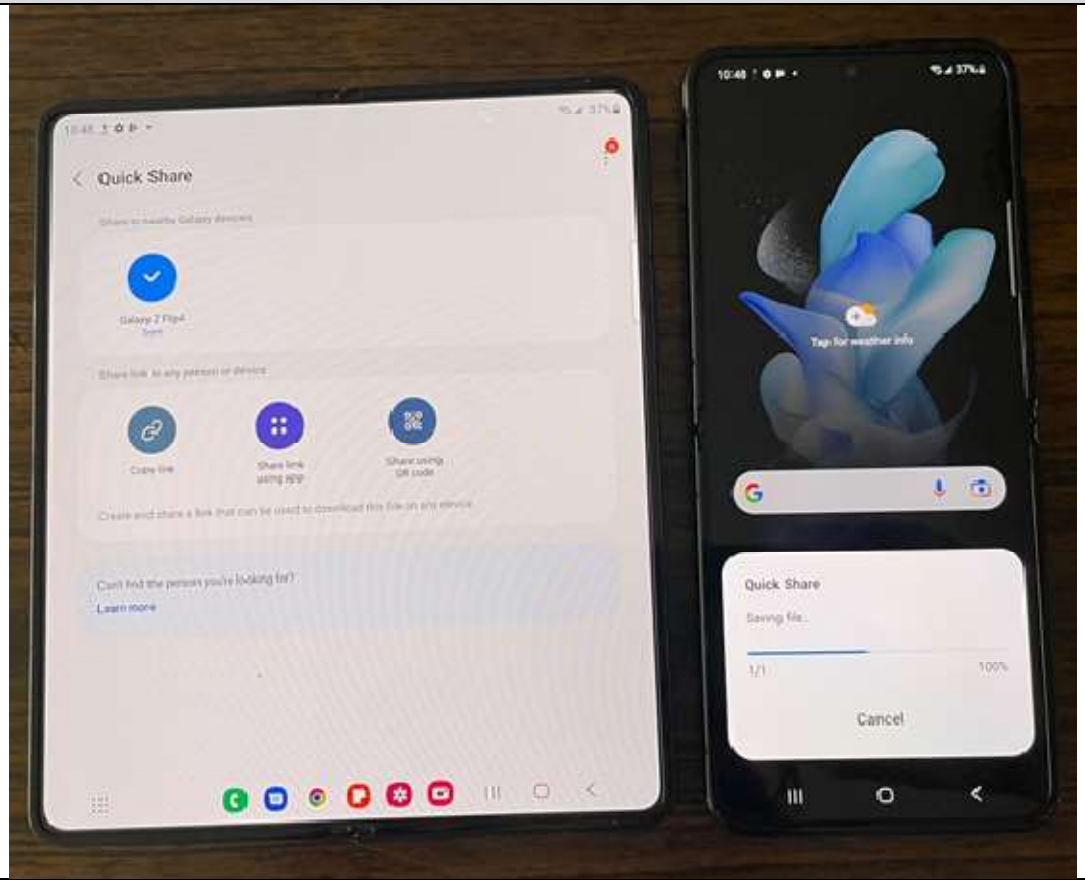
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

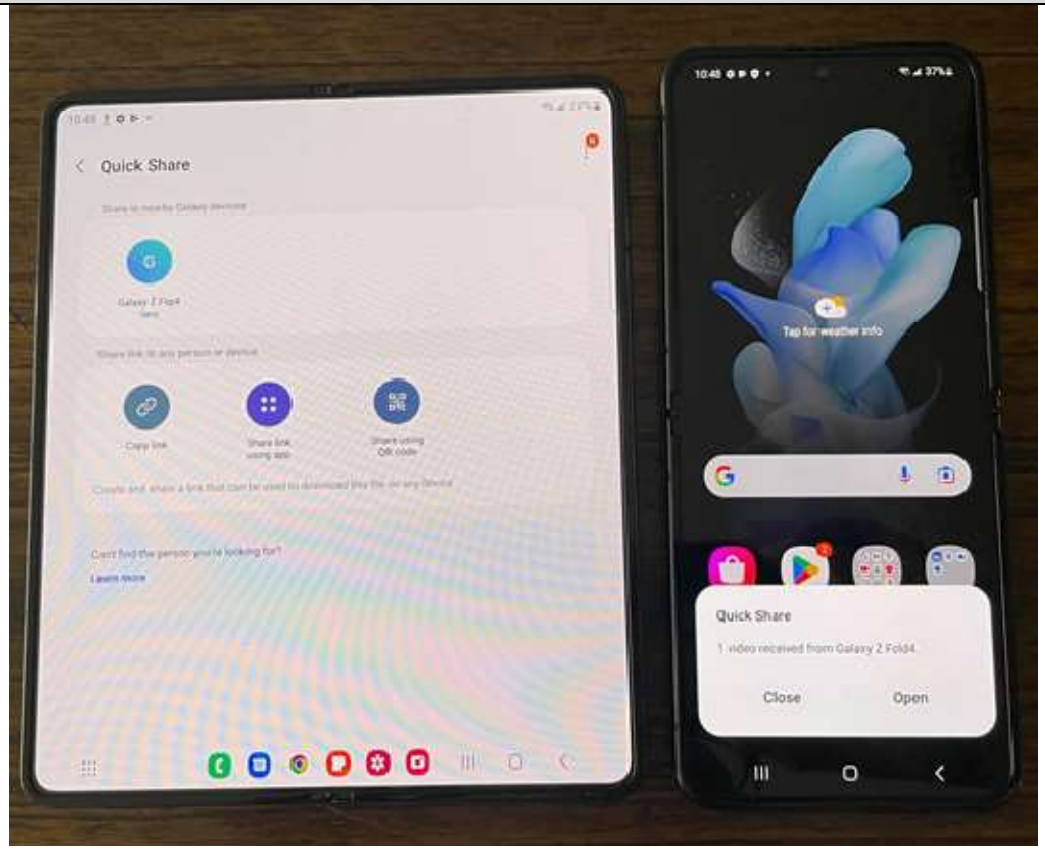
	


1 item
Galaxy Store
Play Store
Google
Microsoft

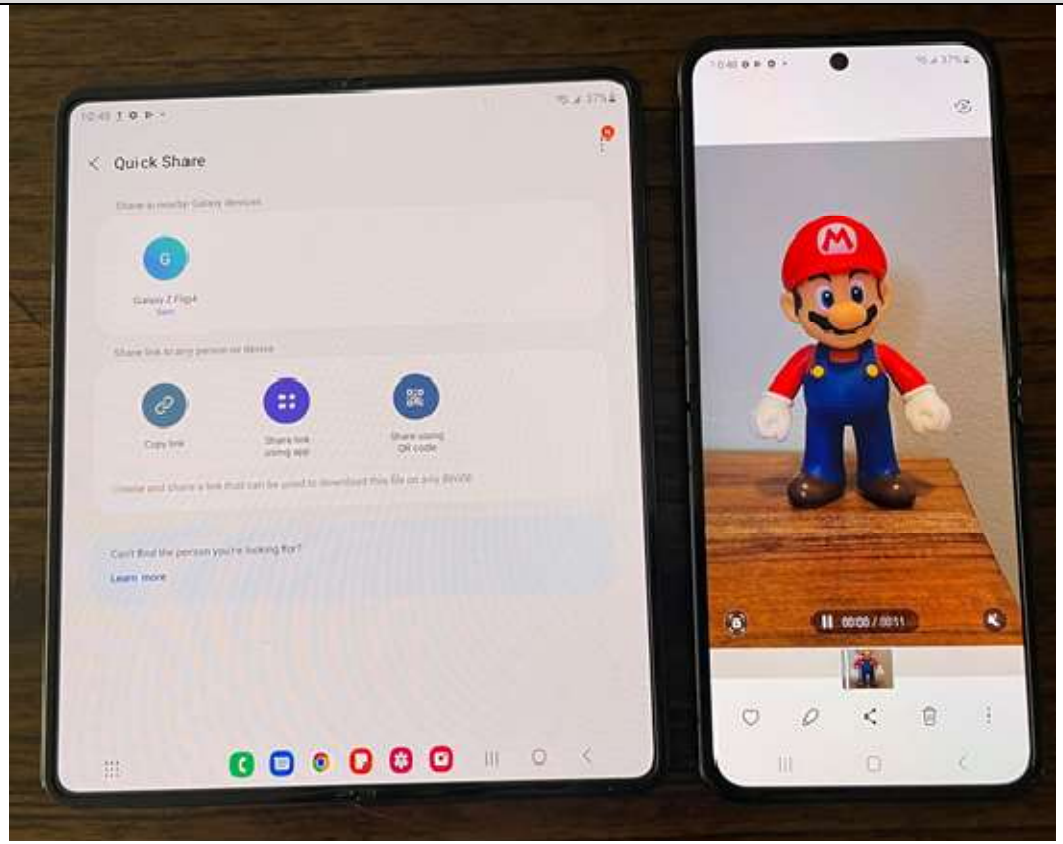
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

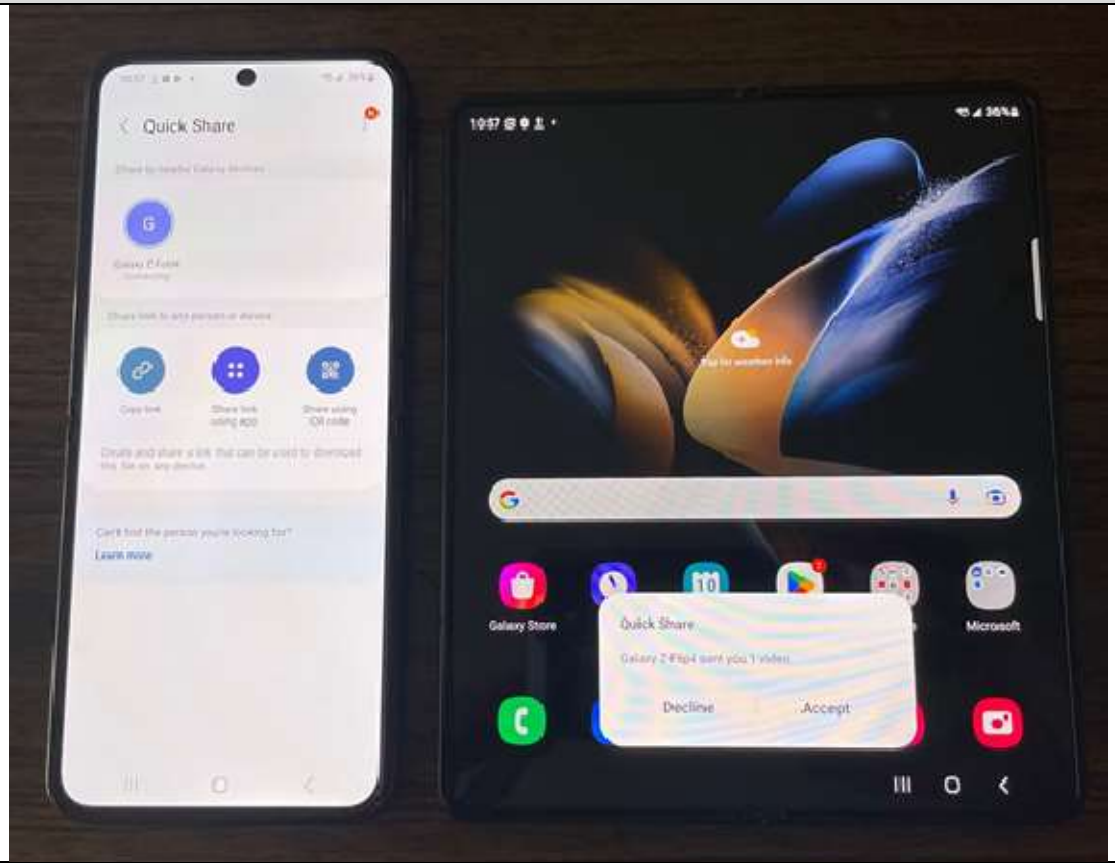


Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

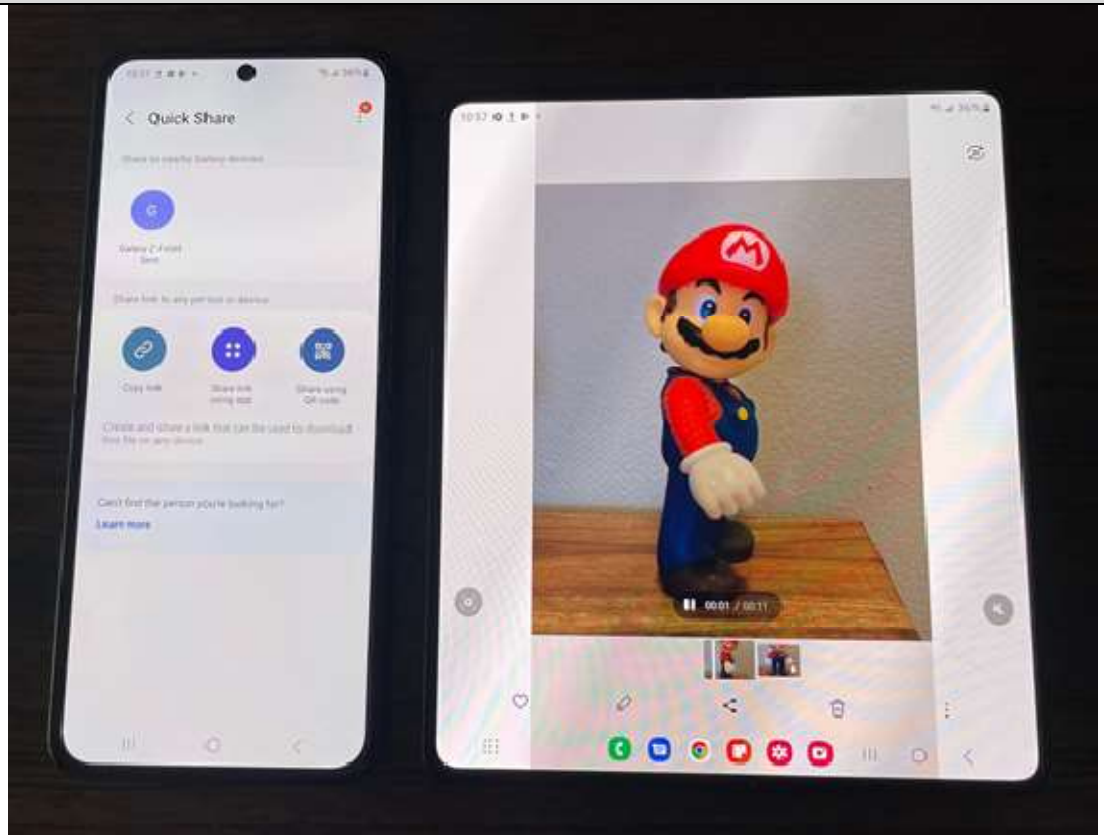
	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Quick Share Galaxy Store Microsoft Quick Share Close Open

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Wi-Fi communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/. **Second Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip implementing a first transmission scheme having a first modulation scheme and a first

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	transmission frequency band, the Bluetooth communication chip capable of transmitting video information via Bluetooth communications using the first transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php. Bluetooth Use Bluetooth to exchange data or media files with other Bluetooth-enabled devices. Precautions for using Bluetooth • Samsung is not responsible for the loss, interception, or misuse of data sent or received through Bluetooth. • Always ensure that you share and receive data with devices that are trusted and properly secured. If there are obstacles between the devices, the operating distance may be reduced. • Some devices, especially those that are not tested or approved by the Bluetooth SIG, may be incompatible with your device. • Do not use the Bluetooth feature for illegal purposes (for example, pirating copies of files or illegally tapping communications for commercial purposes). Samsung is not responsible for the repercussion of illegal use of the Bluetooth feature.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Pairing with other Bluetooth devices 1 On the Settings screen, tap **Connections** → **Bluetooth** and tap the switch to turn it on. The detected devices will be listed. 2 Select a device to pair with. If the device you want to pair with is not on the list, set the device to enter Bluetooth pairing mode. Refer to the other device's user manuals. Your phone is visible to other devices while the Bluetooth settings screen is open. 3 Accept the Bluetooth connection request on your phone to confirm. The devices will be connected when the other device accepts the Bluetooth connection request. To unpair the devices, tap next to the device name to unpair and tap **Unpair**. **Sending and receiving data** Many apps support data transfer through Bluetooth. You can share data, such as contacts or media files, with other Bluetooth devices. The following actions are an example of sending an image to another device. 1 Open the **Gallery** app and select an image. 2 Tap → **Bluetooth** and select a device to receive the image. If the device you want to pair with is not in the list, turn on its visibility option. 3 Accept the Bluetooth connection request on the other device. Galaxy S23 Series User Guide at pg. 124-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

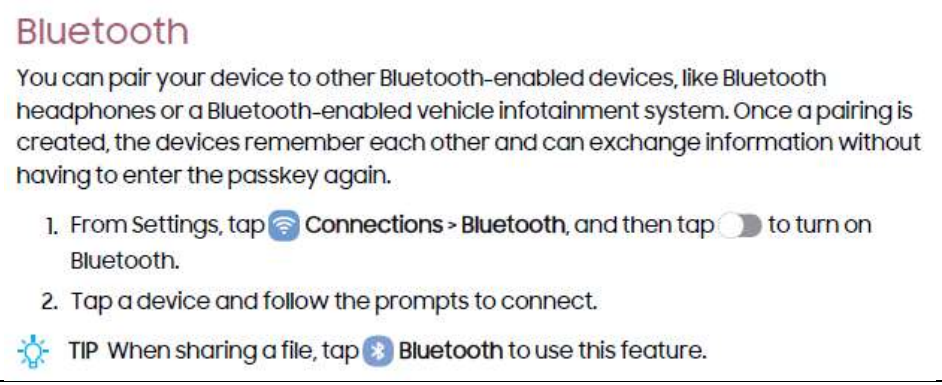
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power [dBm]	Avg Conducted Power [mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power [dBm]	Peak Conducted Power [mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Bluetooth You can pair your device to other Bluetooth-enabled devices, like Bluetooth headphones or a Bluetooth-enabled vehicle infotainment system. Once a pairing is created, the devices remember each other and can exchange information without having to enter the passkey again. 1. From Settings, tap Connections > Bluetooth, and then tap to turn on Bluetooth. 2. Tap a device and follow the prompts to connect. TIP When sharing a file, tap Bluetooth to use this feature.

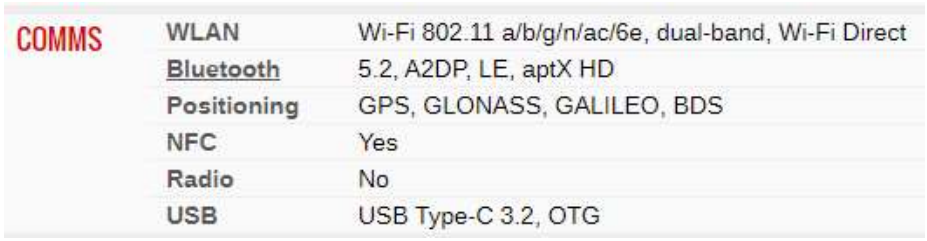
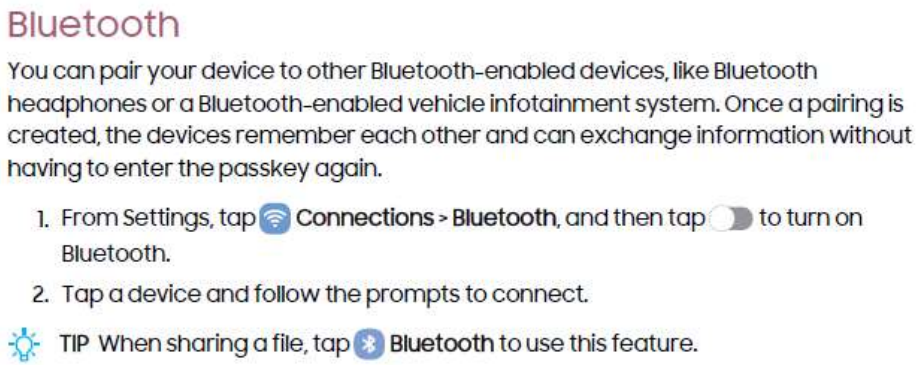
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy Z Flip4 and Fold4 User Guide at pgs. 123-125.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
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NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php 

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6e, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE, aptX HD
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 3.2, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rename a paired device You can rename a paired device to make it easier to recognize. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device name, and then tap **Rename**. 3. Enter a new name, and tap **Rename**. **Unpair from a Bluetooth device** When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

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Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

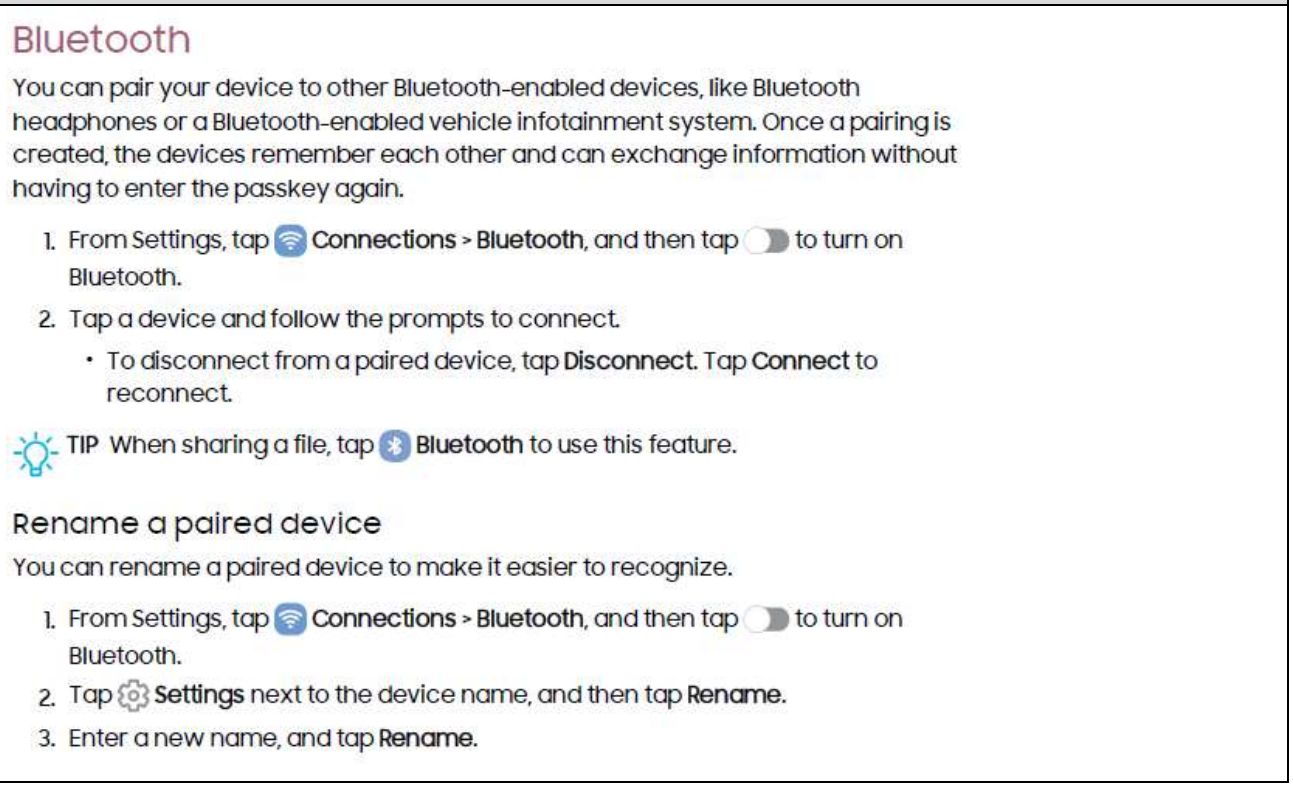
Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Unpair from a Bluetooth device When you unpair from a Bluetooth device, the two devices no longer recognize each other and you will need to pair with the device again in order to connect to it. 1. From Settings, tap **Connections** > **Bluetooth**, and then tap to turn on Bluetooth. 2. Tap **Settings** next to the device, and then tap **Unpair**. 3. Tap **Unpair** to confirm. **Advanced Bluetooth settings** Additional Bluetooth features are available in the Advanced menu. Options may vary by service provider. 1. From Settings, tap **Connections** > **Bluetooth**. 2. Tap **Advanced settings** or **More options** > **Advanced settings** for the following options: • **Sync with Samsung Cloud/account:** Sync files transferred through Bluetooth with your Samsung account. • **Phone name:** Change the name of your device for Bluetooth connections. • **Received files:** View a list of files received using Bluetooth. • **Music Share:** Let friends play music on your Bluetooth speaker or headphones. • **Ringtone sync:** Use the ringtone set on your device when you receive calls through a connected Bluetooth device. • **Bluetooth control history:** View apps that have used Bluetooth recently. • **Block pairing requests:** Add devices to block pairing requests. • **Bluetooth scan history:** View which apps have recently scanned for nearby Bluetooth devices and manage Bluetooth features for apps.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Dual audio You can play audio from your device to two connected Bluetooth audio devices. 1. Connect Bluetooth audio devices to your device. 2. From the Notification panel, tap **Media output**. 3. Under Audio output, tap next to each audio device to play audio to them (up to two devices). Galaxy A54 User Guide at pg. 103-105.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

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and fading.

Two modulation modes are defined. A mandatory mode, called Basic Rate, uses a shaped, binary FM modulation to minimize transceiver complexity. An optional mode, called Enhanced Data Rate, uses PSK modulation and has two variants: π/4-DQPSK and 8DPSK. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate, 2 Mb/s for Enhanced Data Rate using π/4-DQPSK and 3 Mb/s for Enhanced Data Rate using 8DPSK.

Bluetooth

2 FREQUENCY BANDS AND CHANNEL ARRANGEMENT

The Bluetooth system operates in the 2.4 GHz ISM band. This frequency band is 2400 - 2483.5 MHz.

Regulatory Range	RF Channels
2.400-2.4835 GHz	f=2402+k MHz, k=0,…,78

Table 2.1: Operating frequency bands

RF channels are spaced 1 MHz and are ordered in channel number k as shown in Table 2.1.

Bluetooth devices are classified into three power classes based on their highest output power capabilities.

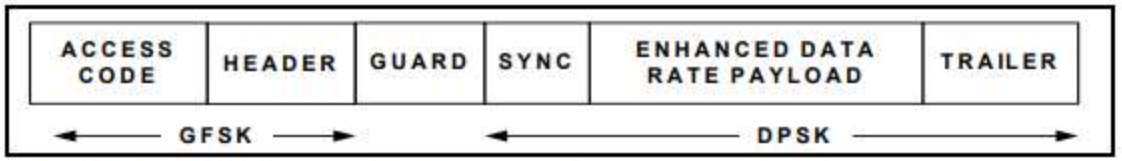
Power Class	Maximum Output Power (Pmax)	Nominal Output Power	Minimum Output Power[1]	Power Control
1	100 mW (20 dBm)	N/A	1 mW (0 dBm)	Pmin<+4 dBm to Pmax Optional: Pmin[2] to Pmax
2	2.5 mW (4 dBm)	1 mW (0 dBm)	0.25 mW (-6 dBm)	Optional: Pmin[2] to Pmax
3	1 mW (0 dBm)	N/A	N/A	Optional: Pmin[2] to Pmax

Table 3.1: Power classes

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	3.1 BASIC RATE **3.1.1 Modulation Characteristics** The Modulation is GFSK (Gaussian Frequency Shift Keying) with a bandwidth-bit period product BT=0.5. The Modulation index shall be between 0.28 and 0.35. A binary one shall be represented by a positive frequency deviation, and a binary zero shall be represented by a negative frequency deviation. The symbol timing shall be less than ±20 ppm.

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	3.2.1 Modulation Characteristics During access code and packet header transmission the Basic Rate GFSK modulation mode shall be used. During the transmission of the synchronization sequence, payload, and trailer sequence a PSK type of modulation with a data rate of 2 Mb/s or optionally 3 Mb/s shall be used. The following subsections specify the PSK modulation for this transmission. ***3.2.1.1 Modulation Method Overview*** The PSK modulation format defined for the 2 Mb/s transmission shall be π/4 rotated differential encoded quaternary phase shift keying (π/4-DQPSK). The PSK modulation format defined for the 3 Mb/s transmission shall be differential encoded 8-ary phase shift keying (8DPSK). The modulation shall employ square-root raised cosine pulse shaping to generate the equivalent lowpass information-bearing signal v(t). The output of the transmitter shall be a bandpass signal that can be represented as $$S(t) = Re\left[v(t)e^{j2\pi F_c t}\right] \quad \text{(EQ 1)}$$ with F_c denoting the carrier frequency. ***3.2.1.2 Differential Phase Encoding*** For the M-ary modulation, the binary data stream $\{b_n\}$, n=1,2,3, ...N, shall be mapped onto a corresponding sequence {Sk}, k=1,2, ...N/$\log_2$(M) of complex valued signal points. M=4 applies for 2 Mb/s and M=8 applies for 3 Mb/s. Gray coding shall be applied as shown in Table 3.4 and Table 3.5. In the event that the length of the binary data stream N is not an integer multiple of log2(M), the last symbol of the sequence $\{S_k\}$ shall be formed by appending data zeros to the appropriate length. The signal points S_k shall be defined by: $$S_k = S_{k-1}e^{j\varphi_k} \qquad k = 1, 2, ..N/\log_2(M) \quad \text{(EQ 2)}$$ $$S_0 = e^{j\phi} \qquad \text{with } \phi \in [0, 2\pi) \quad \text{(EQ 3)}$$ Receiver:

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	4.2.1 Actual Sensitivity Level The actual sensitivity level shall be defined as the input level for which a raw bit error rate (BER) of 0.01% is met. The requirement for a Bluetooth π/4-DQPSK and 8DPSK Enhanced Data Rate receiver shall be an actual sensitivity level of –70 dBm or better. The receiver shall achieve the –70 dBm sensitivity level with any Bluetooth transmitter compliant to the Enhanced Data Rate transmitter specification as defined in Section 3.2. **4.2.6 Reference Signal Definition** A 2 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = π/4-DQPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB A 3 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = 8DPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 1, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Data is transmitted over the air in packets. Two modes are defined: a mandatory mode called Basic Rate and an optional mode called Enhanced Data Rate. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate. Enhanced Data Rate has a primary modulation mode that provides a gross air data rate of 2 Mb/s, and a secondary modulation mode that provides a gross air data rate of 3 Mb/s. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 354, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ The general Enhanced Data Rate packet format is shown in Figure 1.3. Each packet consists of 6 entities: the access code, the header, the guard period, the synchronization sequence, the Enhanced Data Rate payload and the trailer. The access code and header use the same modulation mode as for Basic Rate packets while the synchronization sequence, the Enhanced Data Rate payload and the trailer use the Enhanced Data Rate modulation mode. The guard time allows for the transition between the modulation modes.  *Figure 1.3: Standard Enhanced Data Rate packet format* *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 355, https://www.bluetooth.com/specifications/specs/core-specification-5-0/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	6.5 PACKET TYPES The packets used on the piconet are related to the logical transports on which they are used. Four logical transports with distinct packet types are defined (see Section 4): • SCO logical transport • eSCO logical transport • ACL logical transport • CSB logical transport. To indicate the different packets on a logical transport, the 4-bit TYPE code is used. The packet types are divided into four segments. The first segment is reserved for control packets. All control packets occupy a single time slot. The second segment is reserved for packets occupying a single time slot. The third segment is reserved for packets occupying three time slots. The fourth segment is reserved for packets occupying five time slots. The slot occupancy is reflected in the segmentation and can directly be derived from the type code. Table 6.2 summarizes the packets defined for the SCO, eSCO, ACL, and CSB logical transport types; a dash means the value is reserved for future use. All packet types with a payload shall use GFSK modulation unless specified otherwise in the following sections. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 410, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ For example, the following screenshots show exemplary Accused Samsung '590 Products using a Bluetooth communication chip to transmit video information by using Bluetooth file sharing:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

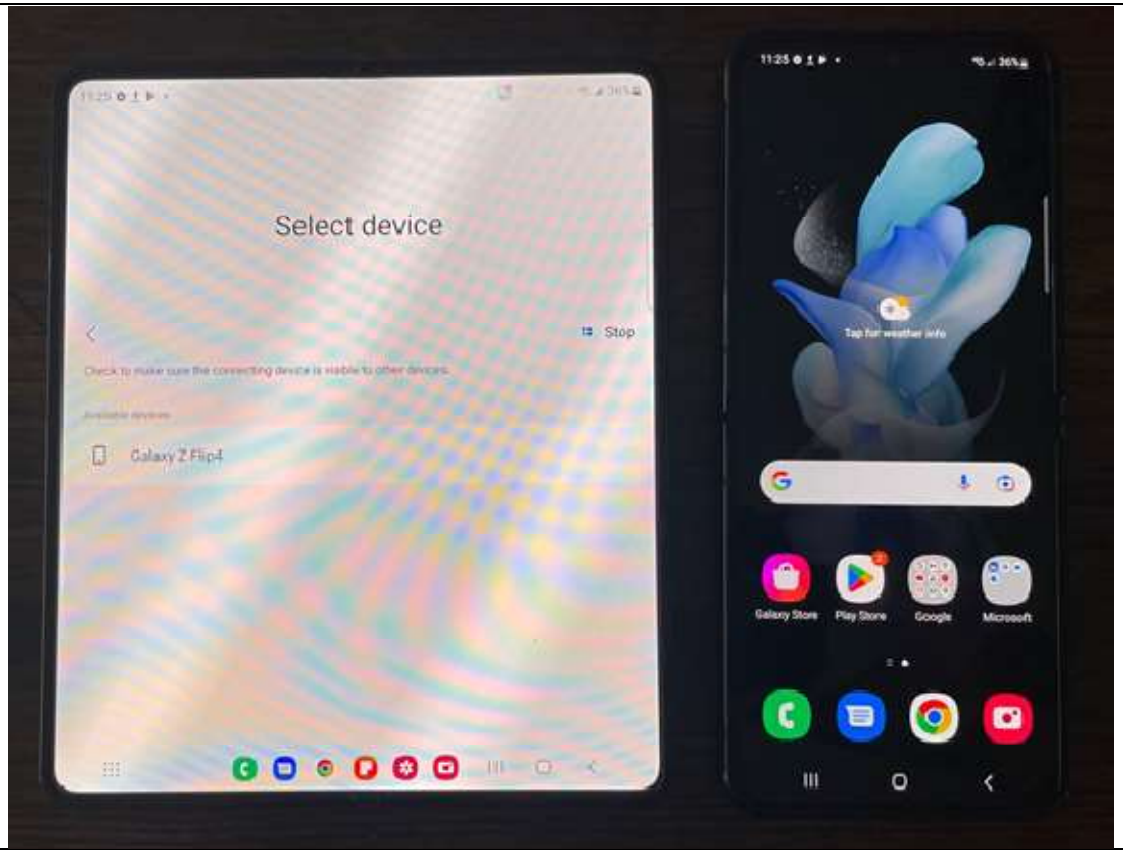
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

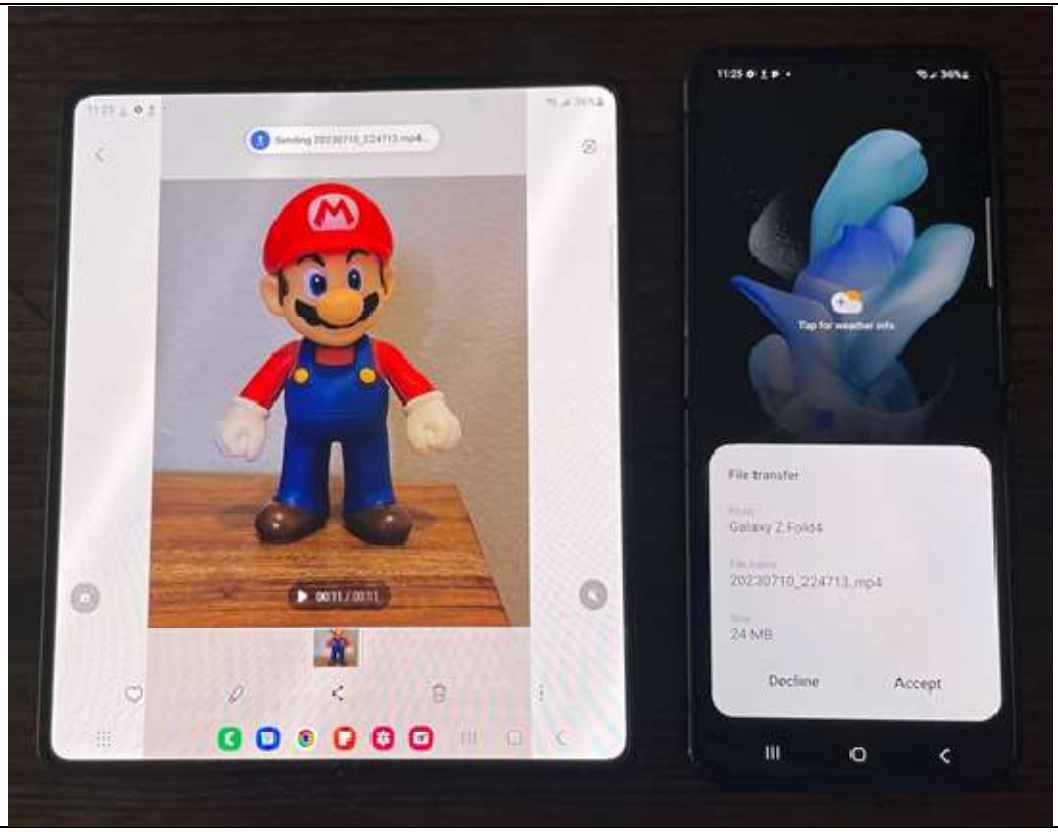


Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

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		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft

		 Tap for weather info File transfer Galaxy Z Fold4 20230710_224713.mp4 24 MB Decline Accept

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



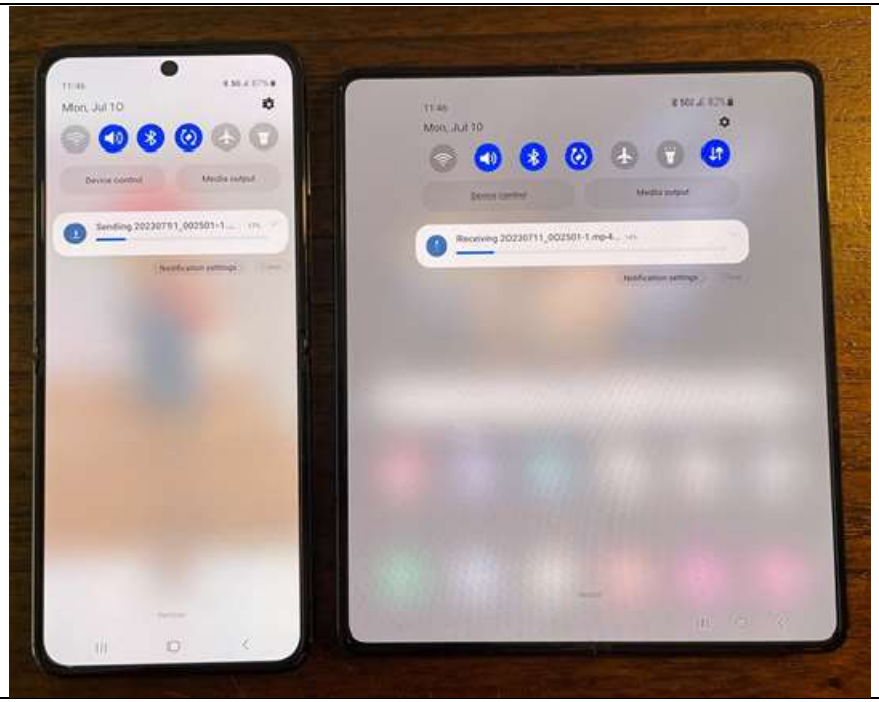
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	


Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a Bluetooth communication chip and operate in a similar manner.
[23.b] a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a	Each of the Accused Samsung '590 Products includes a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;	For example, each of Accused Samsung '590 Products includes a cellular communication chip implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the cellular communication chip capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band. Specifically, the Accused Samsung '590 Products use a cellular communication chip configured to operate in one or more of 2G/3G/LTE/5G protocols to connect to the external display apparatus (*e.g.*, connect to another smartphone via email/MMS/phone call/Internet) accessing to an internet or a home network (*e.g.*, connect to the internet via cellular data services), and receiving digital information (*e.g.*, receiving digital information via the Internet, email, and/or MMS by using cellular data services). **Galaxy S23 Ultra:** For example, the Galaxy S23 Ultra is configured for at least one or more of GSM, 3G, 4G LTE, and 5G cellular communications in order to connect to another device, access the Internet, and receive digital information by using cellular data services. For example, the Galaxy S23 Ultra comprises a cellular communication chip and processor and/or CPU that is capable of these functions (*e.g.*, via a multi media message (MMS) or email over cellular network). NETWORK Technology: GSM / CDMA / HSPA / EVDO / LTE / 5G (COLLAPSE) 2G bands: GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (Dual SIM model only) CDMA 800 / 1900 & TD-SCDMA 3G bands: HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 CDMA2000 1xEV-DO 4G bands: 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 32, 38, 39, 40, 41, 66 - International 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 46, 48, 66, 71 - USA 5G bands: 1, 2, 3, 5, 7, 8, 12, 20, 25, 28, 38, 40, 41, 66, 75, 77, 78 SA/NSA/Sub6 - International 1, 7, 28, 41, 66, 71, 78, 258, 260, 261 SA/NSA/Sub6/mmWave - USA Speed: HSPA, LTE-A (up to 7CA), 5G Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-20

LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

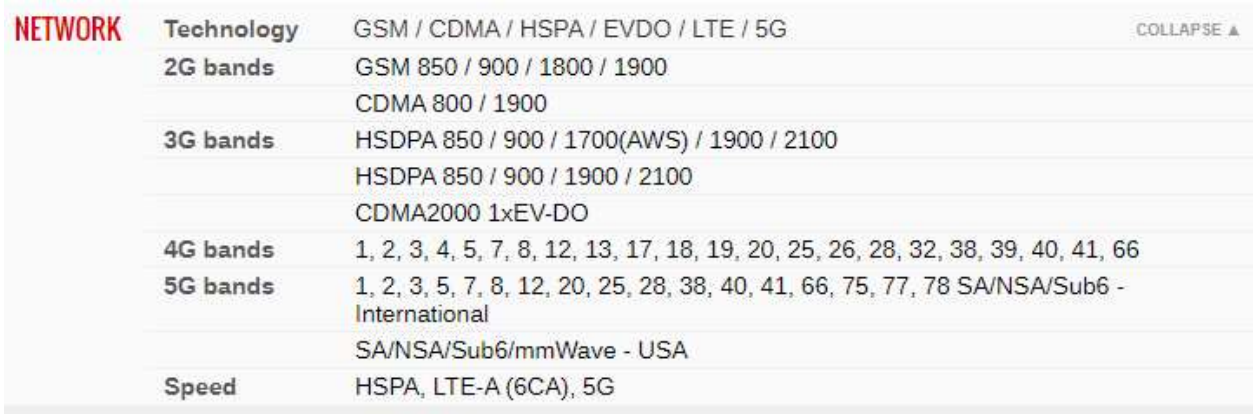
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-4
LTE Band 66 (AWS) Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	Designed MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.62	23.50	23.81	0
	1	50	23.69	23.58	23.97	0
	1	99	23.52	23.39	**24.02**	0
	50	0	21.58	21.45	21.71	2
	50	25	21.65	21.54	21.89	2
	50	50	21.54	21.41	**21.93**	2
	100	0	21.56	21.45	21.80	2
16QAM	1	0	22.80	22.79	23.44	1
	1	50	23.47	23.01	23.41	1
	1	99	22.90	23.07	23.39	1
	50	0	21.61	21.50	21.75	2
	50	25	21.70	21.60	21.88	2
	50	50	21.53	21.51	21.91	2
	100	0	21.61	21.48	21.77	2
64QAM	1	0	21.57	21.44	22.00	2
	1	50	21.79	21.76	22.03	2
	1	99	21.55	21.54	22.31	2
	50	0	20.55	20.51	20.76	3
	50	25	20.65	20.58	20.89	3
	50	50	20.56	20.45	20.94	3
	100	0	20.60	20.46	20.78	3
256QAM	1	0	18.59	18.43	18.74	5
	1	50	18.93	18.73	19.21	5
	1	99	18.51	18.42	19.09	5
	50	0	18.54	18.47	18.75	5
	50	25	18.55	18.52	18.89	5
	50	50	18.58	18.48	18.87	5
	100	0	18.54	18.48	18.79	5

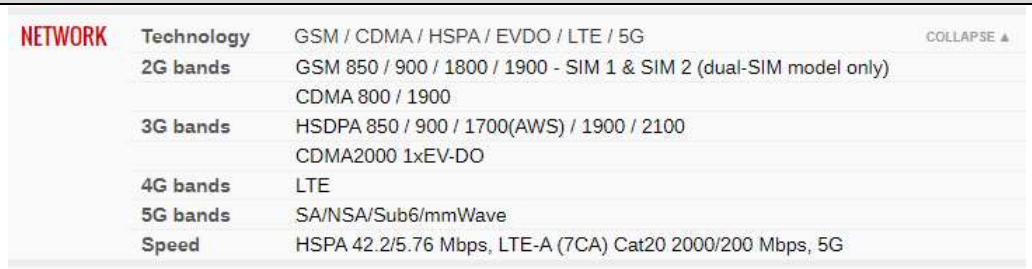
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-26
NR Band n66 Antenna A Measured P_{Max} for DSI = 2 (Head) or DSI = 0 (Body-worn, or Phablet with grip sensor inactive) - 40 MHz Bandwidth

NR Band n66 40 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	349000 (1745 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	23.60	0	0.0
	1	108	23.99		0.0
	1	214	24.03		0.0
	108	0	23.33	0-0.5	0.5
	108	54	23.84	0	0.0
	108	108	23.55	0-0.5	0.5
	216	0	23.30		0.5
DFT-s-OFDM QPSK	1	1	23.34	0	0.0
	1	108	23.43		0.0
	1	214	**23.54**		0.0
	108	0	23.00	0-1	1.0
	108	54	**23.72**	0	0.0
	108	108	23.10	0-1	1.0
	216	0	22.85		1.0
DFT-s-OFDM 16QAM	1	1	22.51	0-1	1.0
CP-OFDM QPSK	1	1	21.92	0-1.5	1.5

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

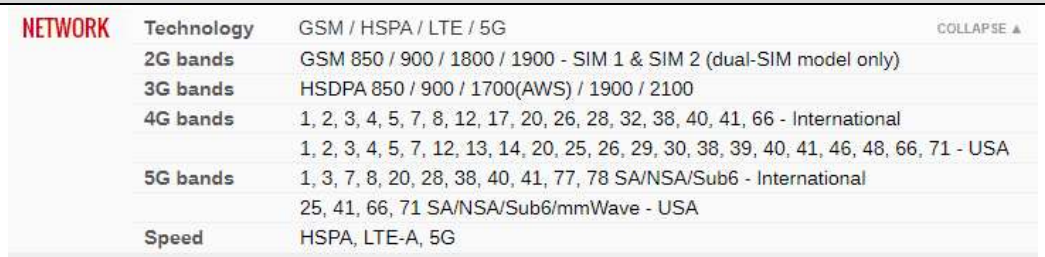
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **Cellular Frequency Bandwidth and Modulation/Demodulation Method:** ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **2G:**

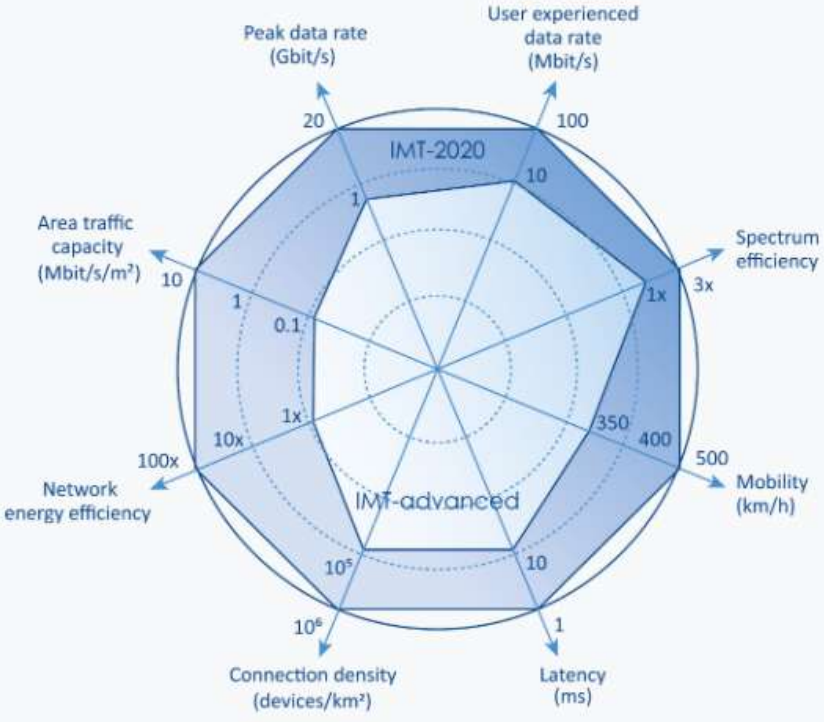
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	Global System for Mobile communication (GSM) The technology behind the Global System for Mobile communication (GSM™) uses Gaussian Minimum Shift Keying (GMSK) modulation a variant of Phase Shift Keying (PSK) with Time Division Multiple Access (TDMA) signalling over Frequency Division Duplex (FDD) carriers. The physical layer is specified in 3GPP TS 45.001 and the logical channels in 3GPP TS 45.002. The channel coding is specified in 3GPP TS 45.003 and the modulation is specified in 3GPP TS 45.004. Although originally designed for operation in the 900 MHz band, it was soon adapted for 1800 MHz. The introduction of GSM into North America meant further adaptation to the 800 and 1900 MHz bands. Over the years, the versatility of GSM has resulted in the specifications being adapted to many more frequency bands to meet niche markets. A full list can be found in 3GPP TS 45.005. GSM has a channel spacing of 200kHz and was designed principally for voice telephony, but a range of bearer services was defined (a subset of those available for fixed line Integrated Services Digital Networks, ISDN), allowing circuit-switched data connections at up to 9600 bits/s. At the time of the original system design, this rate compared favourably to those available over fixed connections. However, with the passage of time, fixed connection data rates increased dramatically. The GSM channel structure and modulation technique did not permit faster rates, and thus the High Speed Circuit-Switched Data (HSCSD) service was introduced in the GSM Phase 2+. **Enhanced Data rates for Global Evolution (EDGE)** As its name suggests, EDGE (Enhanced Data rates for Global Evolution) is an enhancement of the GSM™ radio access technology to provide faster bit rates for data applications, both circuit- and packet-switched. As an enhancement of the existing GSM physical layer, EDGE is realized via modifications of the existing layer 1 3GPP specifications TS 45.000 rather than by separate, stand-alone specifications. The increased data rate is accomplished by a new modulation technique (8PSK as opposed to GSM/GPRS's GMSK, yielding a three-fold increase in bit rate for an identical symbol rate) coupled with new channel coding, resulting in improved spectral efficiency. This is important, because it allows EDGE to be introduced piecemeal into existing GSM networks without disrupting the frequency reuse plan of the existing deployment.

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	By way of illustration, the General Packet Radio Service (GPRS) can offer a data rate of 115 (and a theoretical data rate of 171) kbit/s whereas EDGE on top of GPRS can increase this theoretical data rate to 384 kbit/s. This is comparable with the rate for early implementations of Wideband Code Division Multiple Access (W-CDMA) of the 3rd generation of UMTS and a reason why EDGE is considered to be the bridge between the 2nd and the 3rd generation of mobile communication systems. https://www.etsi.org/technologies/mobile/2g **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD. In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111): • **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h • **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h • **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h

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	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

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	LONG TERM EVOLUTION (LTE) Rel-8/Rel-9 UTRA (Universal Terrestrial Radio Access) as a 3rd generation system, with the enhancements provided by High Speed Packet Access (HSPA), for both downlink and uplink, will remain highly competitive for several years. Nevertheless, the industry that has developed the 3GPP technologies, launched a project in Dec. 2004 called Long Term Evolution (LTE) to study requirements for a new air interface called Evolved UTRA (E-UTRA). Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA. The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913: • Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink • Increased bitrates at the edge of cells assuming current site locations • Improved spectrum efficiency e.g. 2-4 x Rel-6 • Reduced latency • Scaleable bandwidth for a greater flexibility in frequency allocations • Reduced capital and operational expenditure including backhaul • Acceptable system and terminal complexity, cost and power consumption • Support for inter-working with existing 3G systems and non-3GPP specified systems • Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence) • Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h).

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	• while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system • while UMTS was using CDMA, LTE is using OFDMA (Orthogonal Frequency Division Multiple Access) in downlink (evolved NodeB (eNodeB) => User Equipment (UE)) and SC-FDMA (Single Carrier- Frequency Division Multiple Access) in uplink (UE => eNodeB) Note 1: SC-FDMA has lower peak-to-average power ratios (PAPR) than OFDMA which was preferred for an easier UE power amplifier design/a higher efficiency (increased coverage/lower power consumption) Note 2: SC-FDMA is also called DFT-S-OFDM which indicates that it can be understood as a precoding (by Discrete Fourier transform) plus the same OFDMA that is used in downlink • while UMTS (at least FDD and 3,84Mcps TDD) used a channel bandwidth of 5MHz, LTE allows 6 different channel bandwidths: 1,4/3/5/10/15/20MHz • while UMTS has an RNC (radio network controler) between NodeB and core network, the functionalities of this network entity are split between eNodeB and core network in LTE => no RNC in LTE => flat/simpler radio architecture All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example: • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM • LTE DL 4 Rx antenna ports https://www.etsi.org/technologies/mobile/4g **5G:**

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	So 5G should deliver significantly increased operational performance (e.g. increased spectral efficiency, higher data rates, low latency), as well as superior user experience (near to fixed network but offering full mobility and coverage). 5G needs to cater for massive deployment of Internet of Things, while still offering acceptable levels of energy consumption, equipment cost and network deployment and operation cost. It needs to support a wide variety of applications and services. Comparison of key capabilities of IMT-Advanced (4th generation) with IMT-2020 (5th generation) according to ITU-R M.2083: 

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The minimum requirements:

- for peak data rate: Downlink: 20 Gbit/s, Uplink: 10 Gbit/s
- for peak spectral efficiencies: Downlink: 30 bit/s/Hz, Uplink: 15 bit/s/Hz
- user plane latency (single user, small packets): 4 ms for eMBB, 1 ms for URLLC
- control plane latency (idle => active): 10-20ms

Other requirements:

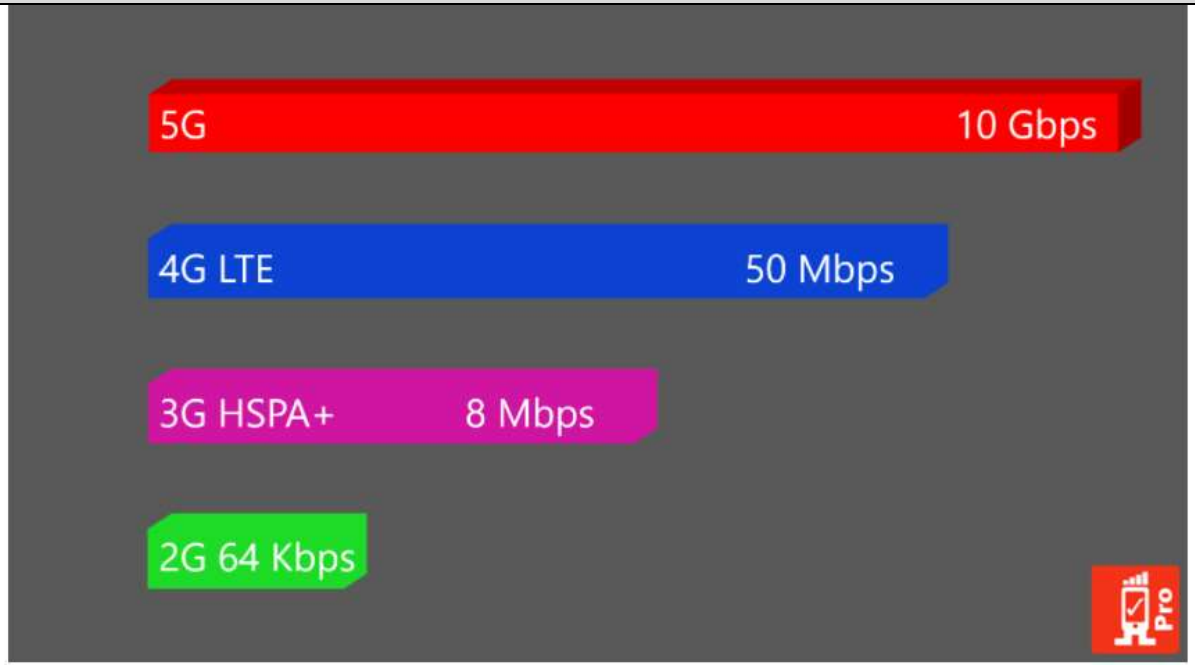
- maximum aggregated system bandwidth: at least 100 MHz, up to 1GHz in higher frequency bands (above 6GHz)
- mobility: up to 500km/h in rural eMBB

- Add support of NR DL 256QAM for frequency range 2 (FR2)

https://www.etsi.org/technologies/mobile/5g

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

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https://rantcell.com/comparison-of-2g-3g-4g-5g.html

Further, AIDA64 reports confirm that the Accused Samsung '590 Products include one or more processors to connect to an external display apparatus, access the Internet, and receive digital information (*e.g.*, via MMS protocol over cellular network and/or via email or phone call):

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

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		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

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For example, the following screenshots show exemplary Accused Samsung '590 Products using a cellular communication chip to transmit and receive digital video information via MMS and similar functionality also applies to transmitting and receiving digital video via Internet or home network:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) – WiFi off	Video Information Receiving Device (Samsung Galaxy A54 5G) – WiFi off



Video Information Transmitting Device (Samsung Galaxy A54 5G) – WiFi off	Video Information Receiving Device (Samsung Galaxy S23 Ultra) – WiFi off

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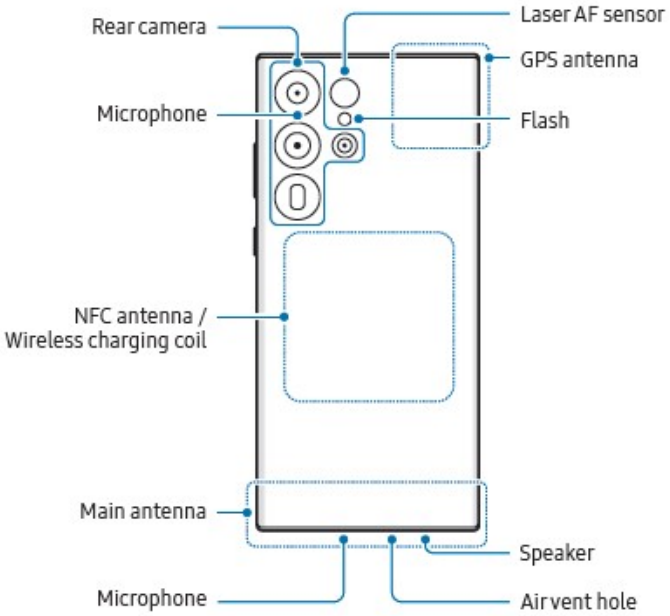
Video Information Transmitting Device (Samsung Galaxt ZFold 4) – WiFi off	Video Information Receiving Device (Samsung Galaxy ZFlip 4) – WiFi off

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Video Information Transmitting Device (Samsung Galaxy ZFlip 4) – WiFi off	Video Information Receiving Device (Samsung Galaxt ZFold 4) – WiFi off

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	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a cellular chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00083184/. **Doctrine of Equivalents:** To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a second radio communication circuit, each

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	of these products include software, hardware, or a combination of the two that perform the equivalent functions of connecting by radio to the external display apparatus, accessing to an internet or a home network, and receiving digital information. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, they use an integrated Bluetooth/Wi-Fi chipset and/or cellular communication chipset to perform these functions by using wireless transmissions. The performance of this function achieves substantially the same result, for example, connecting to an external display apparatus, accessing to an internet or a home network, and receiving digital information.
[23.c] a third radio communication circuit capable of transmitting information using a third transmission frequency band;	Each of the Accused Samsung '590 Products includes a third radio communication circuit capable of transmitting information and using a third transmission frequency band. For example, each of the Accused Samsung '590 Products includes a NFC communication chip capable of transmitting information (*e.g.*, Samsung Pay and/or Samsung Wallet) and using a third transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

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	 Galaxy S23 Series User Guide at pg. 6 (Galaxy S23 Ultra device layout). **NFC and contactless payments** You can use your phone to read near field communications tags (NFC) that contain information about products. You can also use this feature to make payments and buy tickets for transportation or events after downloading the required apps. The device contains a built-in NFC antenna. Handle the device carefully to avoid damaging the NFC antenna.

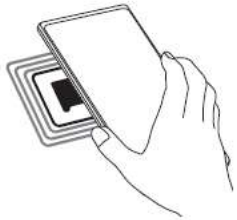
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Reading information from NFC tags

Use the NFC feature to read product information from NFC tags.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

2 Place the NFC antenna area on the back of your device near an NFC tag.
The information from the tag appears.



Ensure that the device's screen is turned on and unlocked. Otherwise, the device will not read NFC tags or receive data.

Making payments with the NFC feature

Before you can use the NFC feature to make payments, you must register for a mobile payment service. To register or get more information about services, contact your service provider.

1 On the Settings screen, tap **Connections** and tap the **NFC and contactless payments** switch to turn it on.

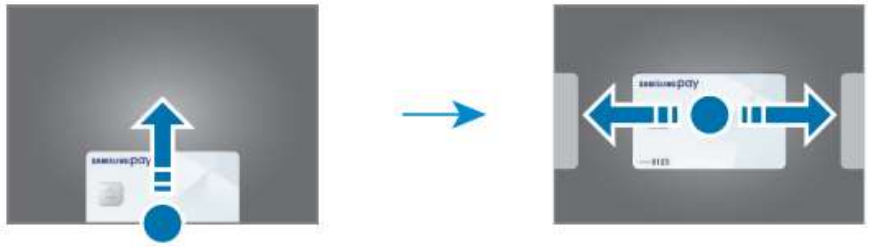
2 Touch the NFC antenna area on the back of your device to the NFC card reader.

To set the default payment app, open the Settings screen and tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment**, and then select an app.

- The payment services list may not include all available payment apps.
- If you update the payment app or install a new one, the payment services that you used before may not work properly. If that is the case, on the Settings screen, tap **Connections** → **NFC and contactless payments** → **Contactless payments** → **Payment** or **Others**, and then select another app instead of the updated or newly installed app. Or, deselect the selected app.

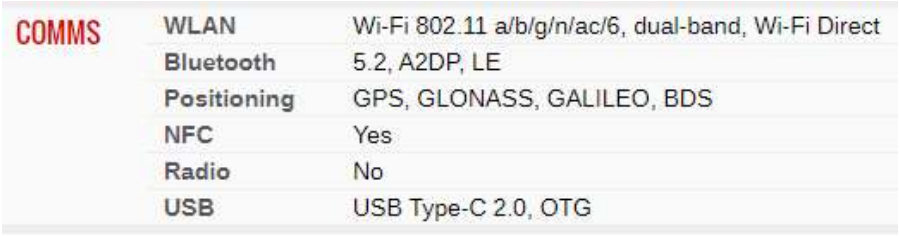
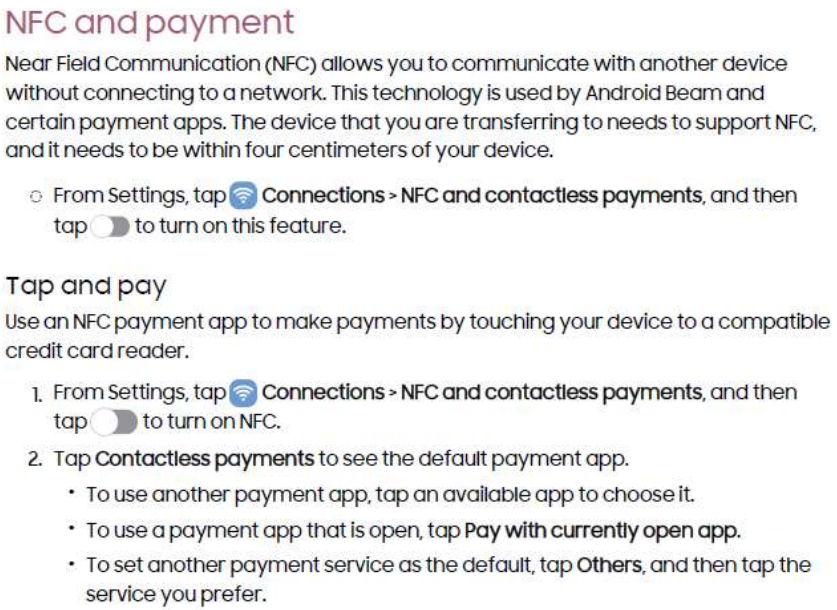
Galaxy S23 Series User Guide at pgs. 125-126.

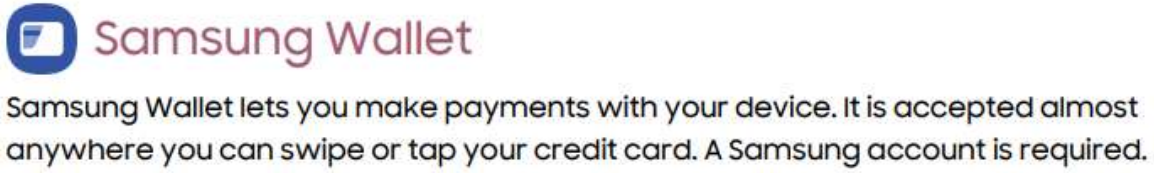
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	Setting up Samsung Pay When running this app for the first time or restarting it after performing a data reset, follow the on-screen instructions to complete the initial setup. 1 Open the **Samsung Pay** app. 2 Sign in to your Samsung account and read and agree to the terms and conditions. 3 Register your fingerprint and a PIN to use when making payments. This PIN will be used to verify various actions in Samsung Pay, such as making payments and unlocking the app. **Registering cards** Open the **Samsung Pay** app and follow the on-screen instructions to complete your card registration.

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	## Making payments 1 Drag a card image at the bottom of the screen upwards. Alternatively, open the **Samsung Pay** app. Then, on the cards list, swipe to the left or right and select a card to use.  2 Scan your fingerprint or enter the payment PIN you set. 3 Touch the back of your device to the card reader. When the card reader recognizes the card information, the payment will be processed. • Payments may not be processed depending on your network connection. • The verification method for payments may vary depending on the card reader. ### Cancelling payments You can cancel payments by visiting the place where you made them. On the cards list, swipe to the left or right to select the card you used. Follow the on-screen instructions to complete payment cancellation. Galaxy S23 Series User Guide at pgs. 94-95.

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Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

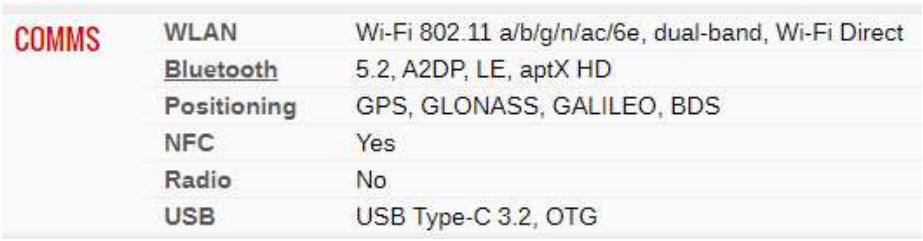
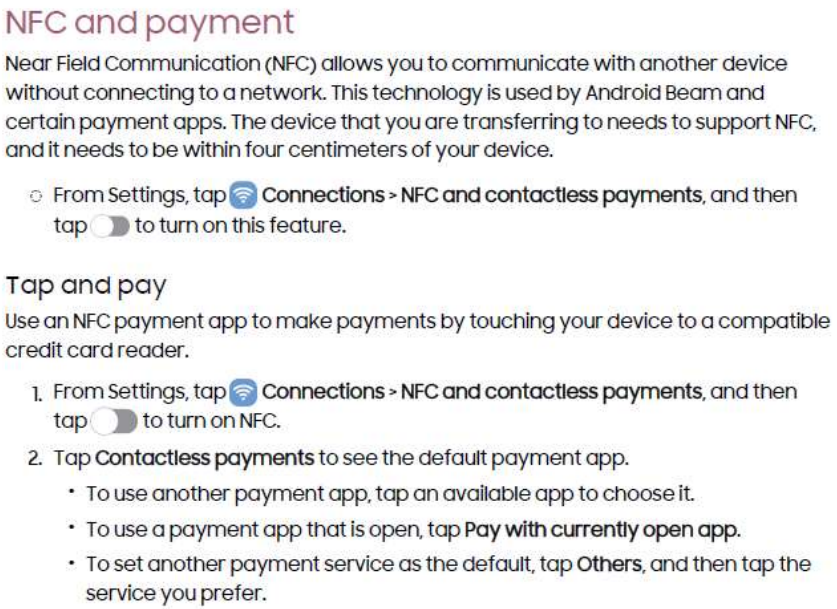
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	Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:**  Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

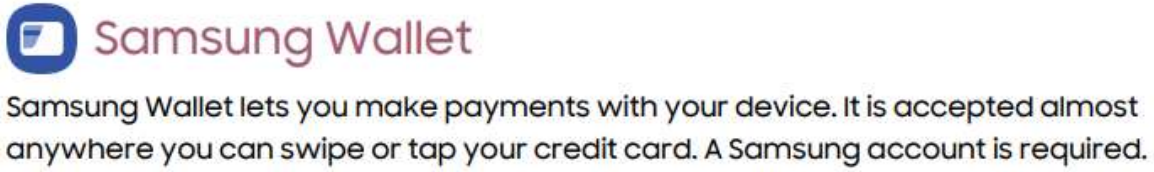
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	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

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Band & Mode	Operating Modes	Tx Frequency
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GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

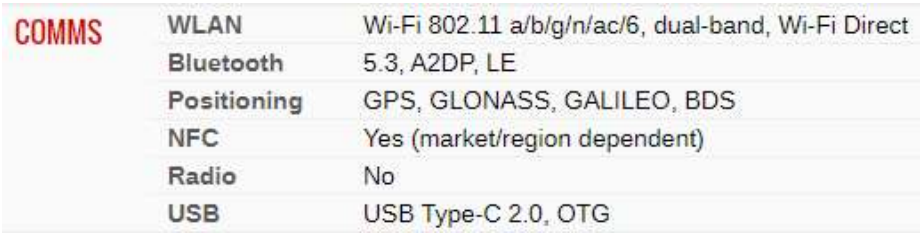
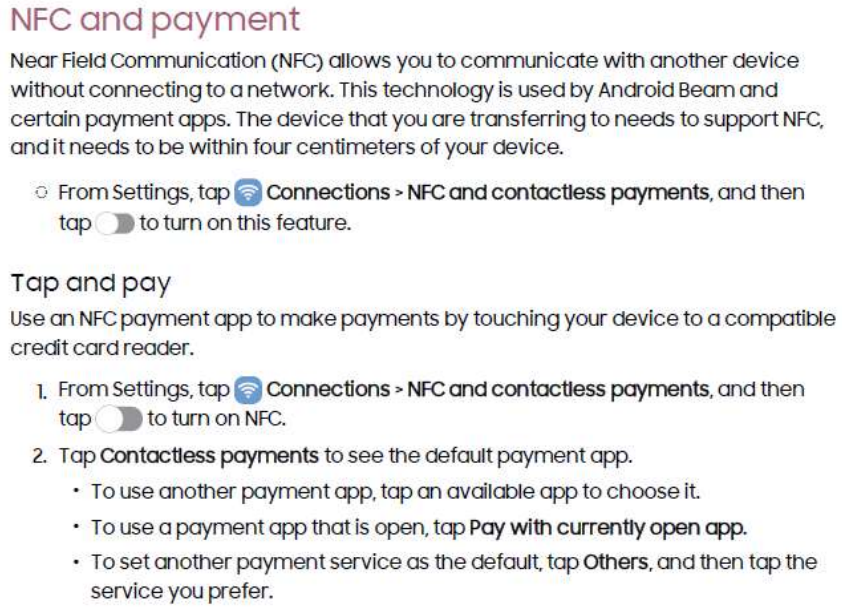
Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	ID/A3LSMF721U/6090552.pdf **Galaxy Z Fold4:**  Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php  Galaxy Z Flip4 and Fold4 User Guide at pg. 125.

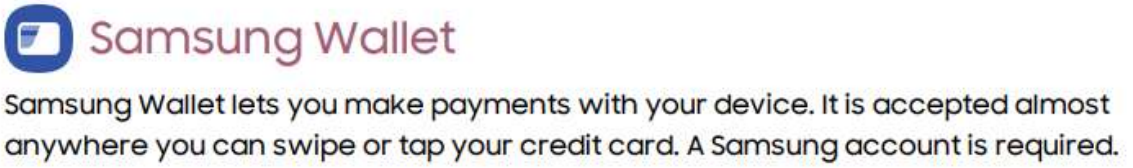
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4 and Fold4 User Guide at pg. 76.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

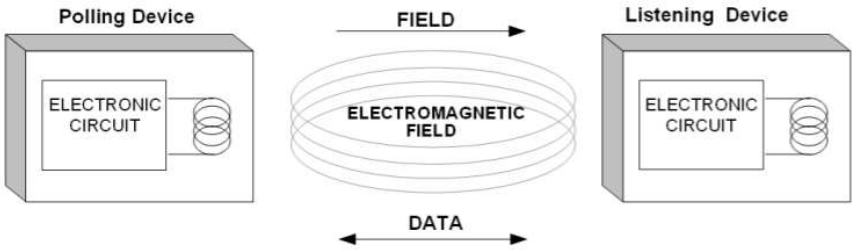
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:**  Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.  Galaxy A54 User Guide at pg. 105.

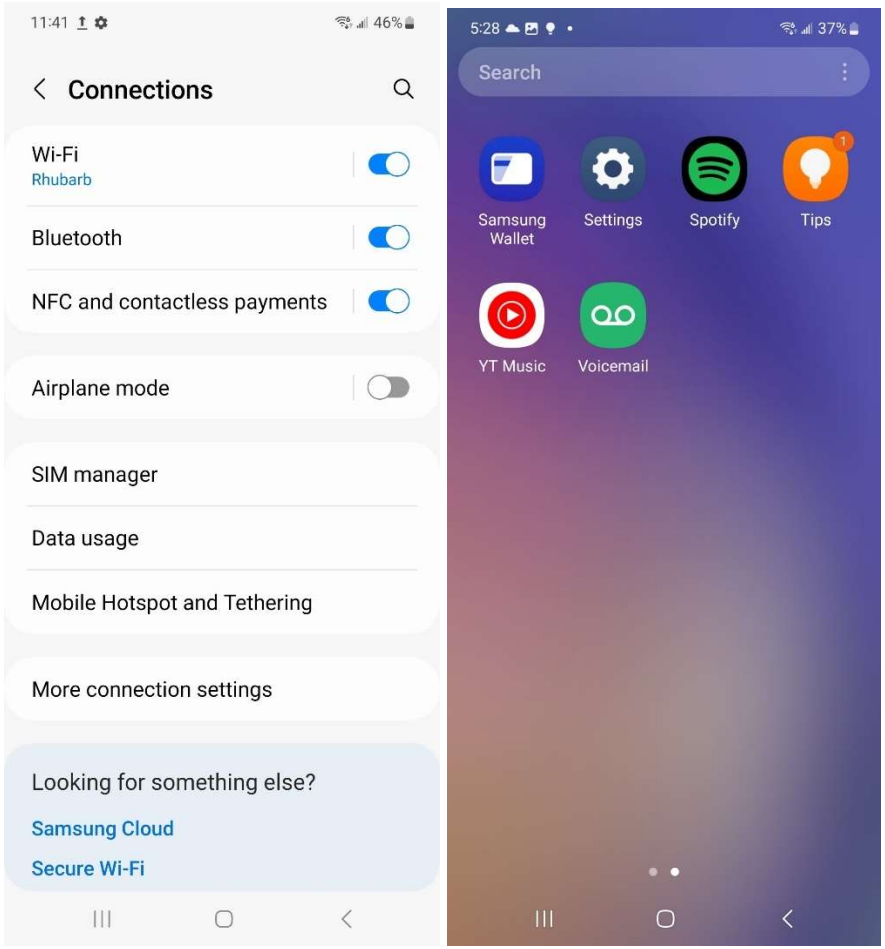
COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy A54 User Guide at pg. 57.

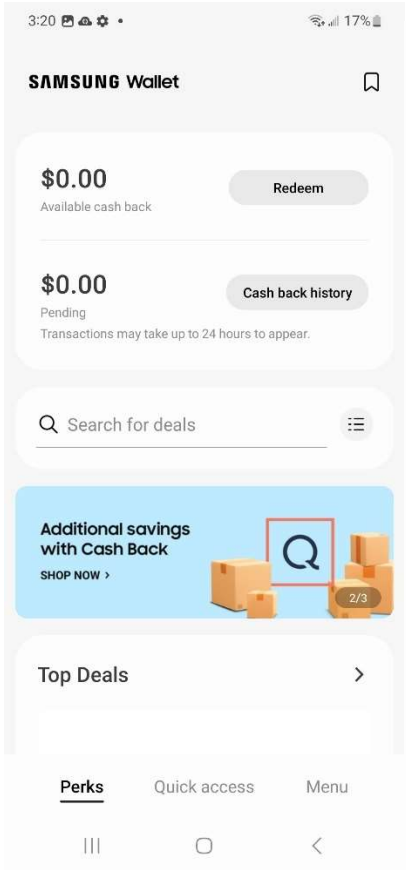
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

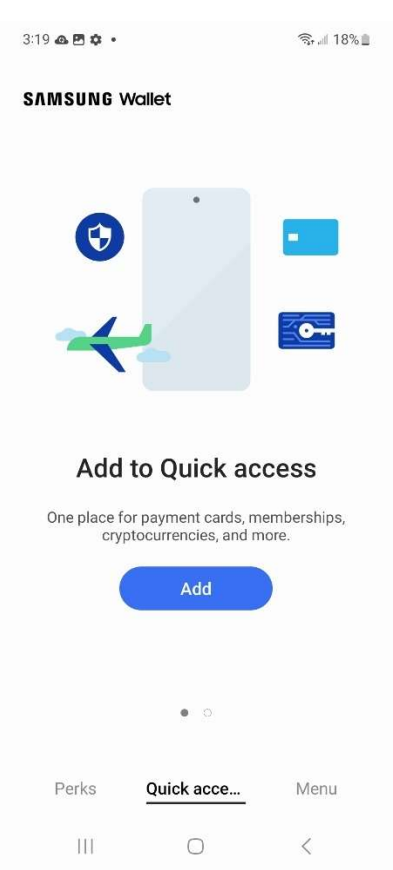
Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

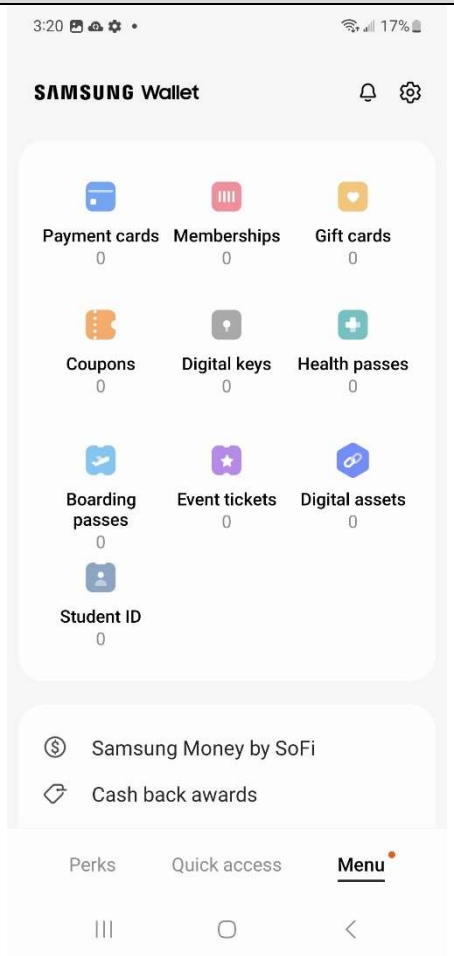
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf **NFC Frequency Bandwidth:** 3 Basics of Data Transmission with NFC Like the RFID Standards 14443 and FeliCa NFC uses an inductive coupling. Similar to the transformer principle, the magnetic near-field of two conductor coils is used to couple the polling device (initiator) and listening device (target).  *Figure 1: Polling device (initiator) and listening device (target) configuration [15]* The operating frequency is 13.56 MHz, and a bitrate of 106 kbit/s (partly also 212 kbit/s and 424 kbit/s) is used. Modulation schemes are amplitude on/off keying (OOK) with different modulation depth (100 % or 10 %) and BPSK. *See* https://cdn.rohde-schwarz.com/pws/dl_downloads/dl_application/application_notes/1ma182/1MA182_5E_NFC_WHITE_PAPER.pdf For example, the following screenshots show exemplary Accused Samsung '590 Products using a NFC communication chip to transmit information by using Samsung Pay and/or Samsung Wallet applications:

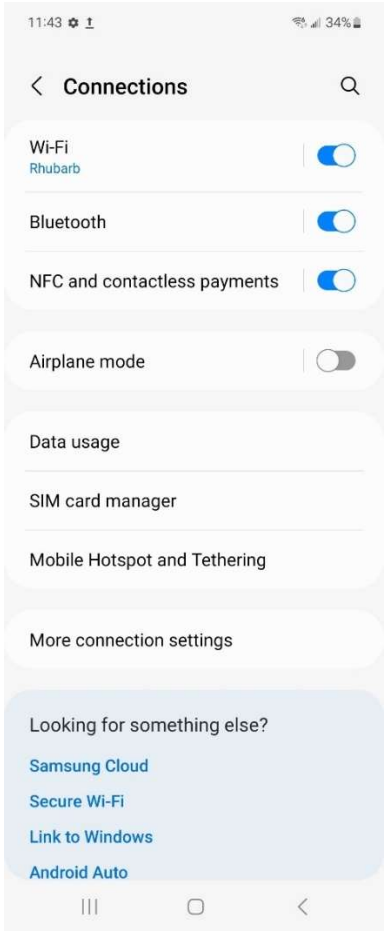
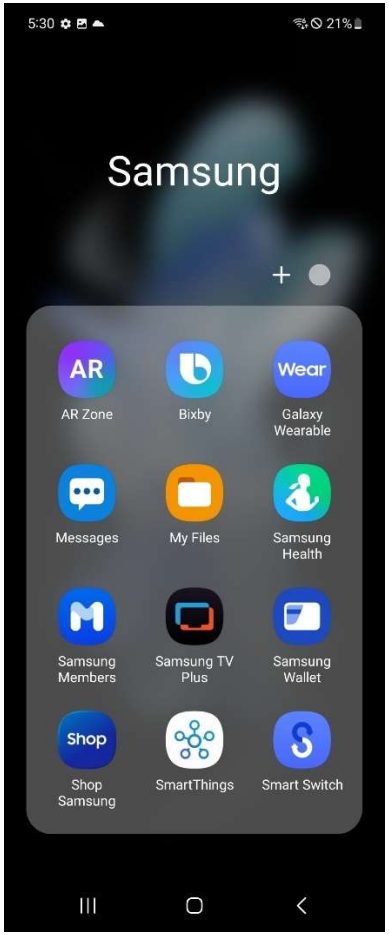
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G: 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

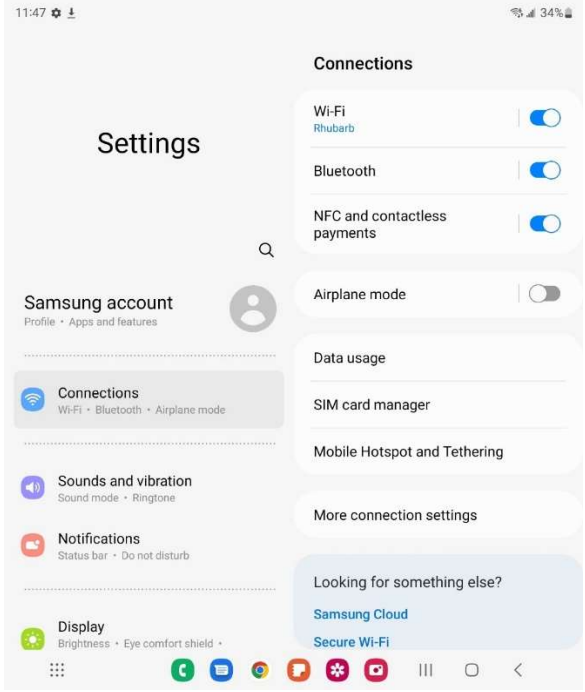


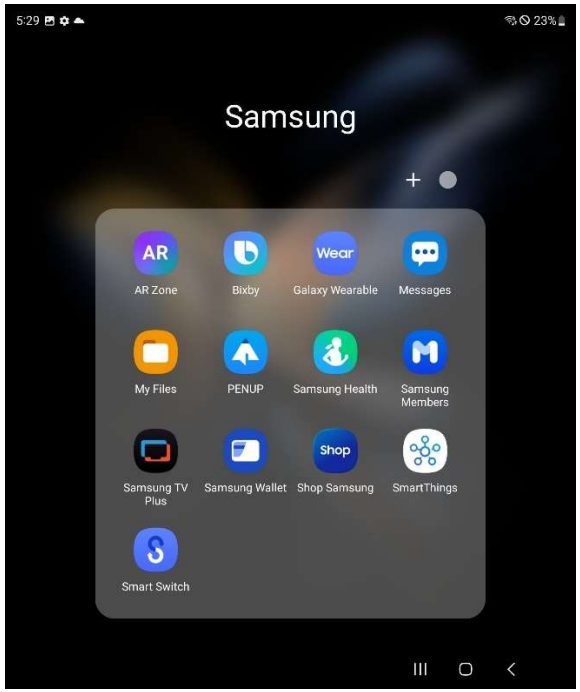




U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy ZFlip 4:   Samsung Galaxy ZFold 4:

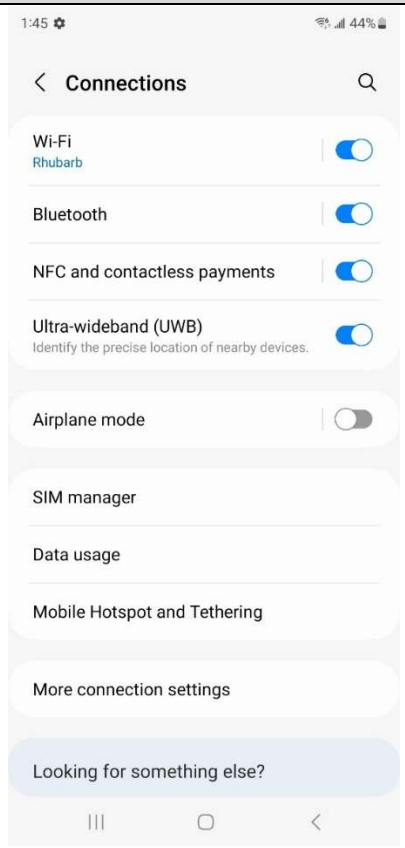
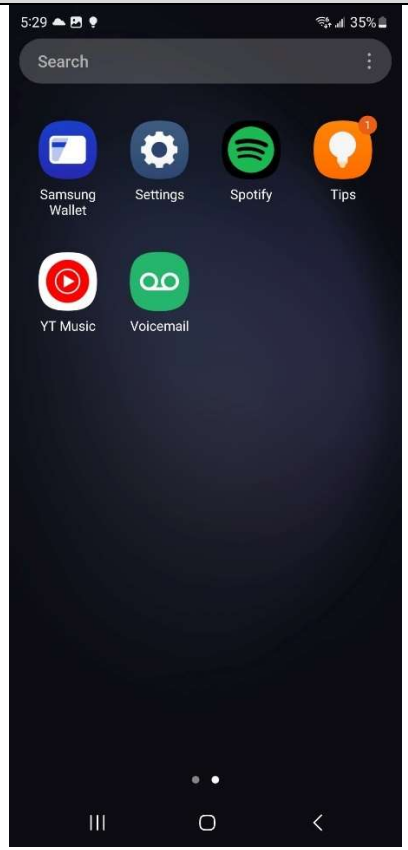
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



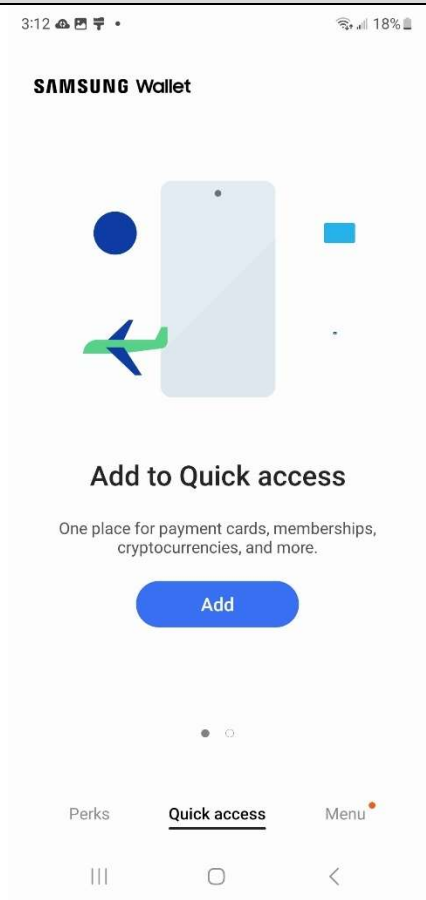


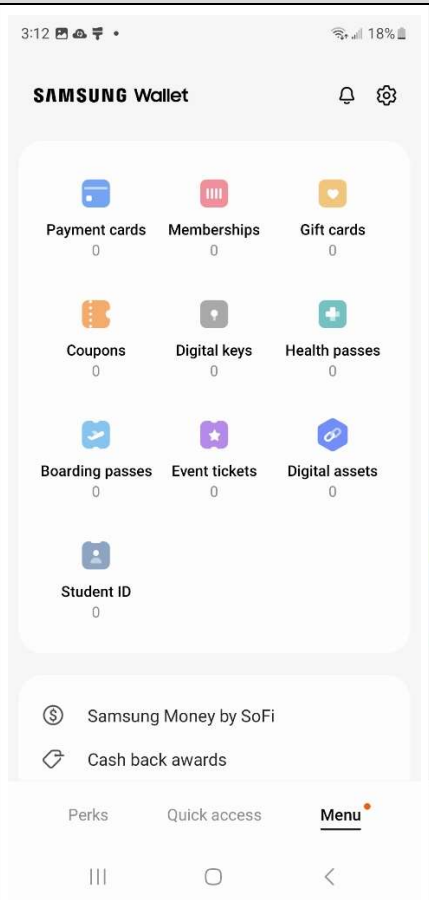
Samsung Galaxy S23 Ultra:

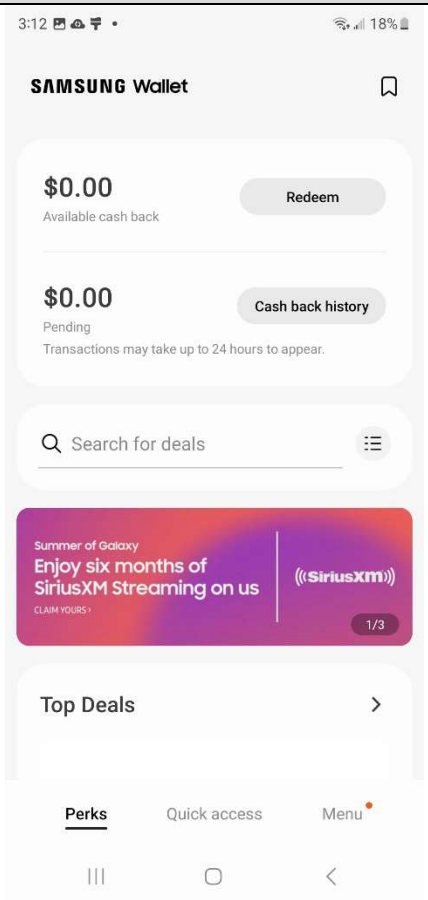
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement







See also Appendix 8 showing that the remaining Accused Samsung '590 Products include a NFC communication chip and operate in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00089063/.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
[23.d] a fourth radio communication circuit capable of transmitting information using a fourth transmission frequency band;	The Accused Samsung '590 Products include a fourth radio communication circuit capable of transmitting information and using a fourth transmission frequency band. **First Infringement Theory**: For example, each of the Accused Samsung '590 Products includes a Bluetooth communication chip capable of transmitting information and using a fourth transmission frequency band. **Galaxy S23 Ultra:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power	
				[dBm]	[mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.2, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes
	Radio	No
	USB	USB Type-C 2.0, OTG

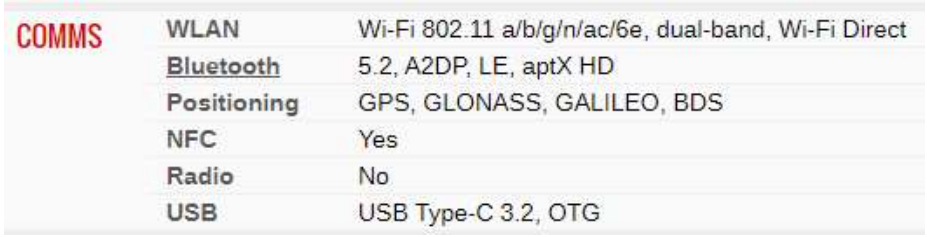
Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct
	Bluetooth	5.3, A2DP, LE
	Positioning	GPS, GLONASS, GALILEO, BDS
	NFC	Yes (market/region dependent)
	Radio	No
	USB	USB Type-C 2.0, OTG

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

and fading.

Two modulation modes are defined. A mandatory mode, called Basic Rate, uses a shaped, binary FM modulation to minimize transceiver complexity. An optional mode, called Enhanced Data Rate, uses PSK modulation and has two variants: π/4-DQPSK and 8DPSK. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate, 2 Mb/s for Enhanced Data Rate using π/4-DQPSK and 3 Mb/s for Enhanced Data Rate using 8DPSK.

Bluetooth

2 FREQUENCY BANDS AND CHANNEL ARRANGEMENT

The Bluetooth system operates in the 2.4 GHz ISM band. This frequency band is 2400 - 2483.5 MHz.

Regulatory Range	RF Channels
2.400-2.4835 GHz	f=2402+k MHz, k=0,…,78

Table 2.1: Operating frequency bands

RF channels are spaced 1 MHz and are ordered in channel number k as shown in Table 2.1.

Bluetooth devices are classified into three power classes based on their highest output power capabilities.

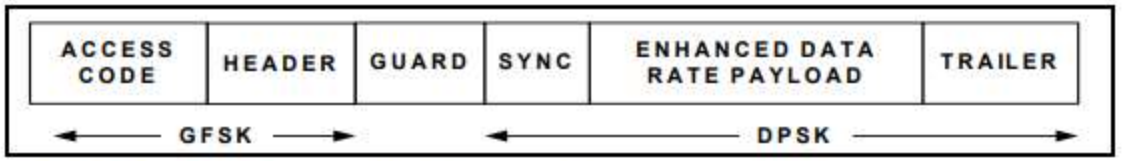
Power Class	Maximum Output Power (Pmax)	Nominal Output Power	Minimum Output Power[1]	Power Control
1	100 mW (20 dBm)	N/A	1 mW (0 dBm)	Pmin<+4 dBm to Pmax Optional: Pmin[2] to Pmax
2	2.5 mW (4 dBm)	1 mW (0 dBm)	0.25 mW (-6 dBm)	Optional: Pmin[2] to Pmax
3	1 mW (0 dBm)	N/A	N/A	Optional: Pmin[2] to Pmax

Table 3.1: Power classes

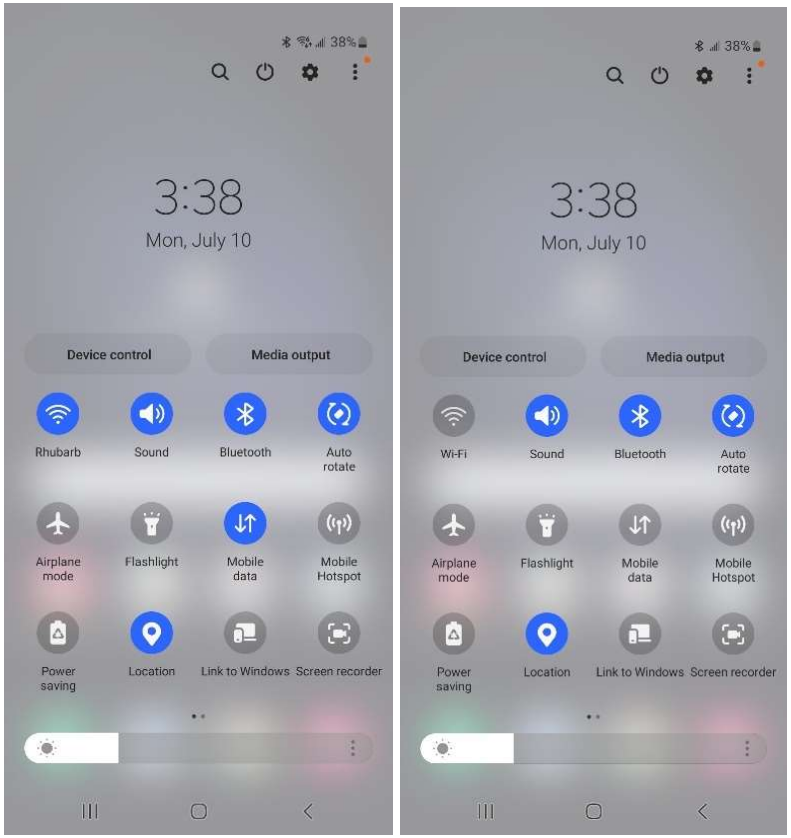
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3.1 BASIC RATE **3.1.1 Modulation Characteristics** The Modulation is GFSK (Gaussian Frequency Shift Keying) with a bandwidth-bit period product BT=0.5. The Modulation index shall be between 0.28 and 0.35. A binary one shall be represented by a positive frequency deviation, and a binary zero shall be represented by a negative frequency deviation. The symbol timing shall be less than ±20 ppm.

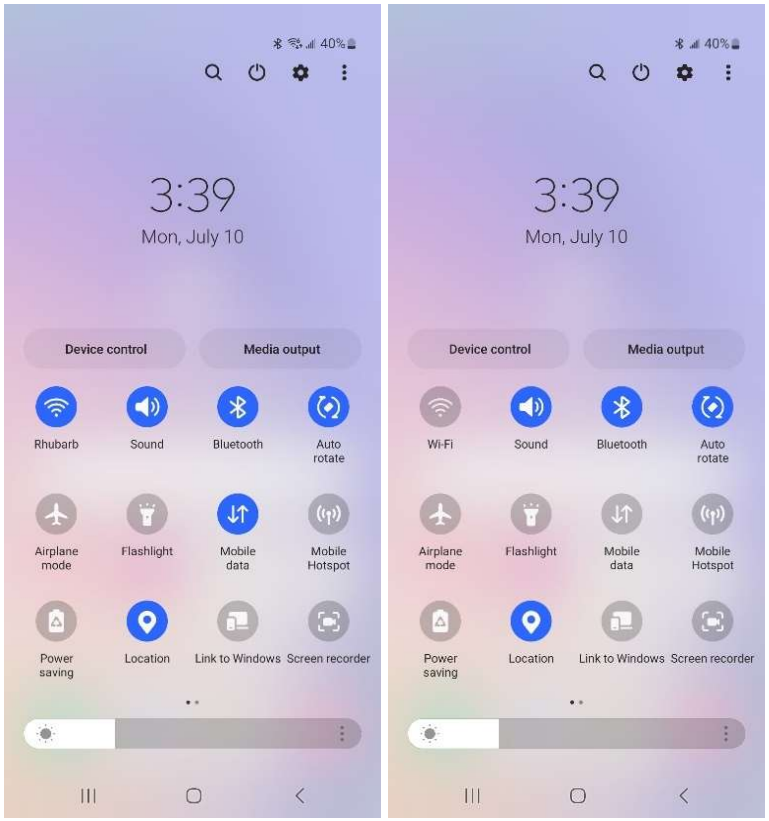
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	3.2.1 Modulation Characteristics During access code and packet header transmission the Basic Rate GFSK modulation mode shall be used. During the transmission of the synchronization sequence, payload, and trailer sequence a PSK type of modulation with a data rate of 2 Mb/s or optionally 3 Mb/s shall be used. The following subsections specify the PSK modulation for this transmission. ***3.2.1.1 Modulation Method Overview*** The PSK modulation format defined for the 2 Mb/s transmission shall be π/4 rotated differential encoded quaternary phase shift keying (π/4-DQPSK). The PSK modulation format defined for the 3 Mb/s transmission shall be differential encoded 8-ary phase shift keying (8DPSK). The modulation shall employ square-root raised cosine pulse shaping to generate the equivalent lowpass information-bearing signal v(t). The output of the transmitter shall be a bandpass signal that can be represented as $$S(t) = Re\left[v(t)e^{j2\pi F_c t}\right] \quad \text{(EQ 1)}$$ with F_c denoting the carrier frequency. ***3.2.1.2 Differential Phase Encoding*** For the M-ary modulation, the binary data stream $\{b_n\}$, n=1,2,3, ...N, shall be mapped onto a corresponding sequence {Sk}, k=1,2, ...N/$\log_2$(M) of complex valued signal points. M=4 applies for 2 Mb/s and M=8 applies for 3 Mb/s. Gray coding shall be applied as shown in Table 3.4 and Table 3.5. In the event that the length of the binary data stream N is not an integer multiple of log2(M), the last symbol of the sequence $\{S_k\}$ shall be formed by appending data zeros to the appropriate length. The signal points S_k shall be defined by: $$S_k = S_{k-1}e^{j\varphi_k} \qquad k = 1, 2, ..N/\log_2(M) \quad \text{(EQ 2)}$$ $$S_0 = e^{j\phi} \qquad \text{with } \phi \in [0, 2\pi) \quad \text{(EQ 3)}$$ Receiver:

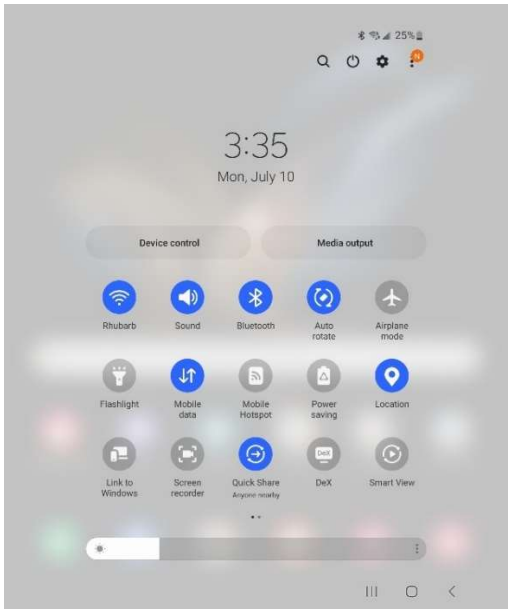
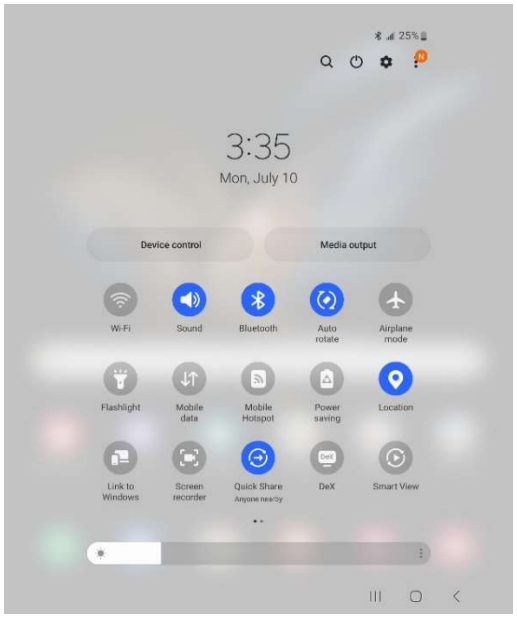
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	4.2.1 Actual Sensitivity Level The actual sensitivity level shall be defined as the input level for which a raw bit error rate (BER) of 0.01% is met. The requirement for a Bluetooth π/4-DQPSK and 8DPSK Enhanced Data Rate receiver shall be an actual sensitivity level of –70 dBm or better. The receiver shall achieve the –70 dBm sensitivity level with any Bluetooth transmitter compliant to the Enhanced Data Rate transmitter specification as defined in Section 3.2. **4.2.6 Reference Signal Definition** A 2 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = π/4-DQPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB A 3 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = 8DPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 1, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/

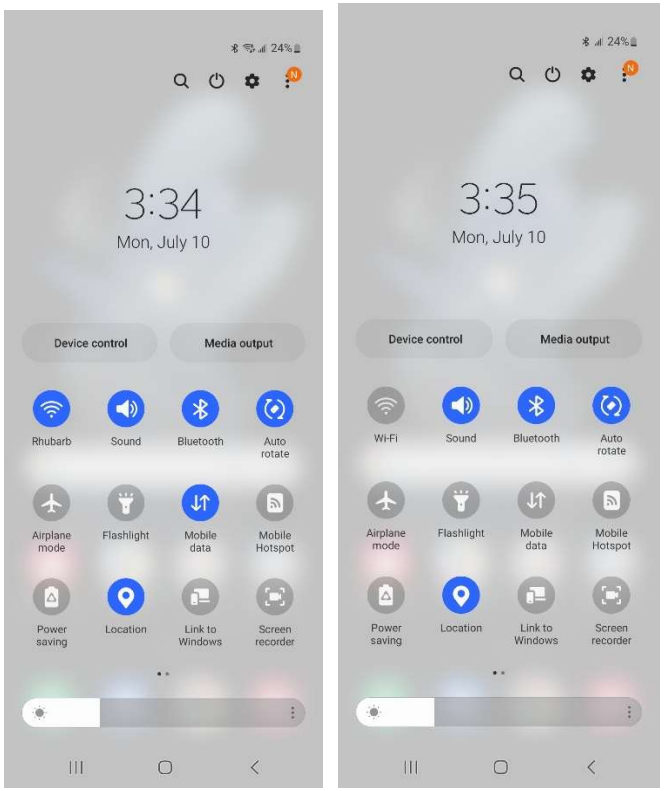
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Data is transmitted over the air in packets. Two modes are defined: a mandatory mode called Basic Rate and an optional mode called Enhanced Data Rate. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate. Enhanced Data Rate has a primary modulation mode that provides a gross air data rate of 2 Mb/s, and a secondary modulation mode that provides a gross air data rate of 3 Mb/s. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 354, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ The general Enhanced Data Rate packet format is shown in Figure 1.3. Each packet consists of 6 entities: the access code, the header, the guard period, the synchronization sequence, the Enhanced Data Rate payload and the trailer. The access code and header use the same modulation mode as for Basic Rate packets while the synchronization sequence, the Enhanced Data Rate payload and the trailer use the Enhanced Data Rate modulation mode. The guard time allows for the transition between the modulation modes.  *Figure 1.3: Standard Enhanced Data Rate packet format* *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 355, https://www.bluetooth.com/specifications/specs/core-specification-5-0/

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	6.5 PACKET TYPES The packets used on the piconet are related to the logical transports on which they are used. Four logical transports with distinct packet types are defined (see Section 4): • SCO logical transport • eSCO logical transport • ACL logical transport • CSB logical transport. To indicate the different packets on a logical transport, the 4-bit TYPE code is used. The packet types are divided into four segments. The first segment is reserved for control packets. All control packets occupy a single time slot. The second segment is reserved for packets occupying a single time slot. The third segment is reserved for packets occupying three time slots. The fourth segment is reserved for packets occupying five time slots. The slot occupancy is reflected in the segmentation and can directly be derived from the type code. Table 6.2 summarizes the packets defined for the SCO, eSCO, ACL, and CSB logical transport types; a dash means the value is reserved for future use. All packet types with a payload shall use GFSK modulation unless specified otherwise in the following sections. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 410, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ For example, the following screenshots show that in an exemplary Accused Samsung '590 Product that includes a Bluetooth chip, the controller is controlling assignment of connection to the Bluetooth chip:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)  User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	  User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:** For example, each of the Accused Samsung '590 Products includes a Wi-Fi communication chip capable of transmitting information and using a fourth transmission frequency band. **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e, tri-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO NFC: Yes Radio: No USB: USB Type-C 3.2, OTG Galaxy S23 Ultra technical specifications; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.

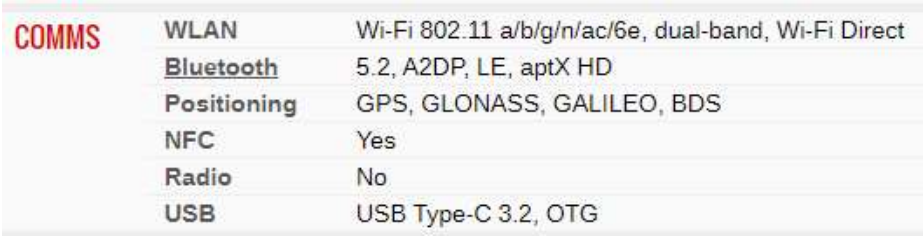
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n26	Voice/Data	816.5 - 846.5 MHz
NR Band n5	Voice/Data	826.5 - 846.5 MHz
NR Band n66	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2501.01 - 2685 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6515 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
U-NII-8	Voice/Data	6895 - 7115 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf **Galaxy Z Flip4:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.2, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes Radio: No USB: USB Type-C 2.0, OTG Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
NR Band n25 (PCS)	Voice/Data	1852.5 - 1912.5 MHz
NR Band n2 (PCS)	Voice/Data	1852.5 - 1907.5 MHz
NR Band n30	Voice/Data	2307.5 - 2312.5 MHz
NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
NR Band n77 DoD	Voice/Data	3455.01 - 3544.98 MHz
NR Band n77	Voice/Data	3705 - 3975 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
NR Band n258	Data	24250 - 24450 MHz; 24750 - 25250 MHz
NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

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UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 14	Voice/Data	790.5 - 795.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
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LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 30	Voice/Data	2307.5 - 2312.5 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
LTE Band 38	Voice/Data	2572.5 - 2617.5 MHz
LTE Band 48	Voice/Data	3552.5 - 3697.5 MHz
NR Band n71	Voice/Data	665.5 - 695.5 MHz
NR Band n12	Voice/Data	701.5 - 713.5 MHz
NR Band n5 (Cell)	Voice/Data	826.5 - 846.5 MHz
NR Band n66 (AWS)	Voice/Data	1712.5 - 1777.5 MHz
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NR Band n7	Voice/Data	2502.5 - 2567.5 MHz
NR Band n41	Voice/Data	2506.02 - 2679.99 MHz
NR Band n38	Voice/Data	2575 - 2615 MHz
NR Band n48	Voice/Data	3555 - 3694.98 MHz
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NR Band n77	Voice/Data	3705 - 3975 MHz
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U-NII-1	Voice/Data	5180 - 5240 MHz
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U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
U-NII-4	Voice/Data	5845 - 5885 MHz
U-NII-5	Voice/Data	5935 - 6415 MHz
U-NII-6	Voice/Data	6435 - 6525 MHz
U-NII-7	Voice/Data	6535 - 6875 MHz
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NR Band n260	Data	37000 - 40000 MHz
NR Band n261	Data	27500 - 28350 MHz
UWB	Data	6489.6 - 7987.2 MHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	(A) WIFI/BT Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02. This device supports channel 1-13 for 2.4 GHZ WLAN. However, because channel 12/13 targets are not higher than that of channels 1-11, default channels for SAR testing are determined per FCC KDB 248227 D01v02r02. Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A, U-NII-2C, and U-NII-4 WIFI, only 2.4 GHz WIFI, 2.4 GHz Bluetooth, and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01. This device supports IEEE 802.11ax with the following features: a) Up to 160 MHz Bandwidth only for 5/6 GHz b) Up to 20 MHz Bandwidth only for 2.4 GHz c) 2 Tx antenna output d) Up to 1024 QAM is supported e) TDWR and Band gap channels are supported for 5/6 GHz f) MU-MIMO UL Operations are not supported Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf **Galaxy A54 5G:** COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct Bluetooth: 5.3, A2DP, LE Positioning: GPS, GLONASS, GALILEO, BDS NFC: Yes (market/region dependent) Radio: No USB: USB Type-C 2.0, OTG Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

Wi-Fi Frequency Bandwidth:

IEEE 802.11 Wi-Fi protocol summary

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ax	2.4 or 5GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	2.4 Gbps[1]
802.11ac wave2	5 GHz	20, 40, 80, 160MHz	Multi User (MU-MIMO)	1.73 Gbps[2]
802.11ac wave1	5 GHz	20, 40, 80MHz	Single User (SU-MIMO)	866.7 Mbps[2]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[3]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps

[1] 2 Spatial streams with 1024-QAM modulation.
[2] 2 Spatial streams with 256-QAM modulation.
[3] 3 Spatial streams with 64-QAM modulation.

See https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html

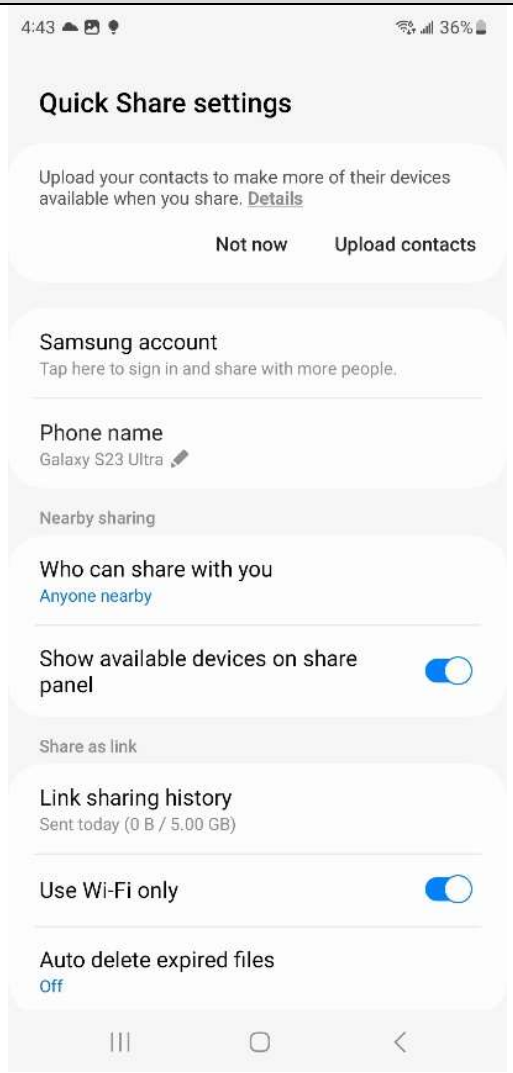
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

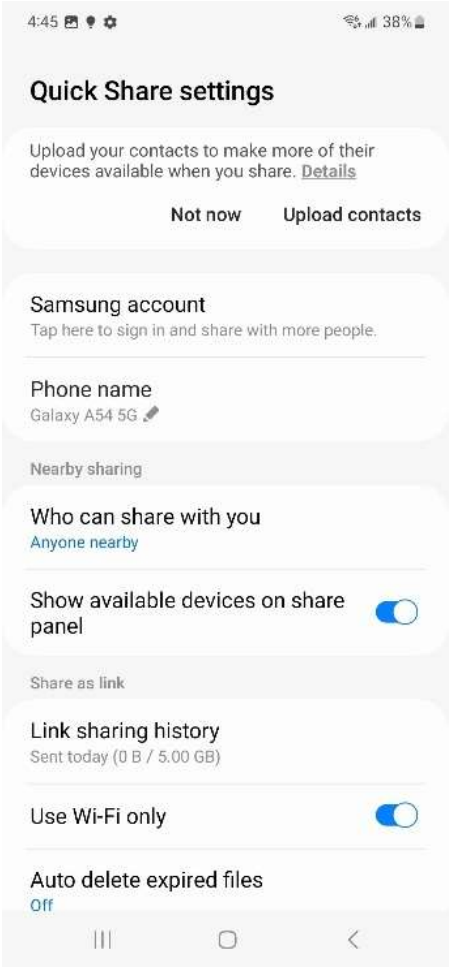
	802.11 (Legacy)	802.11b (Legacy)	802.11a (Legacy)	802.11g (Legacy)	802.11n (HT)	802.11ac (VHT)	802.11ax (HE)
Year Ratified	1997	1999	1999	2003	2009	2014	2019 (Expected)
Operating Band	2.4 GHz/IR	2.4 GHz	5 GHz	2.4 GHz	2.4/5 GHz	5 GHz	2.4/5 GHz
Channel BW	20 MHz	20 MHz	20 MHz	20 MHz	20/40 MHz	20/40/80/160 MHz	20/40/80/160 MHz
Peak PHY Rate	2 Mbps	11 Mbps	54 Mbps	54 Mbps	600 Mbps	6.8 Gbps	10 Gbps
Link Spectral Efficiency	0.1 bps/Hz	0.55 bps/Hz	2.7 bps/Hz	2.7 bps/Hz	15 bps/Hz	42.5 bps/Hz	62.5 bps/Hz
Max # SU Streams	1	1	1	1	4	8	8
Max # MU Streams	NA	NA	NA	NA	NA	4 (DL only)	8 (UL & DL)
Modulation	DSSS, FHSS	DSSS, CCK	OFDM	OFDM	OFDM	OFDM	OFDM, OFDMA
Max Constellation / Code Rate	DQPSK	CCK	64-QAM, 3/4	64-QAM, 3/4	64-QAM, 5/6	256-QAM, 5/6	1024-QAM, 5/6
Max # OFDM tones	NA	NA	64	64	128	512	2048
Subcarrier Spacing	NA	NA	312.5 kHz	312.5 kHz	312.5 kHz	312.5 kHz	78.125 kHz

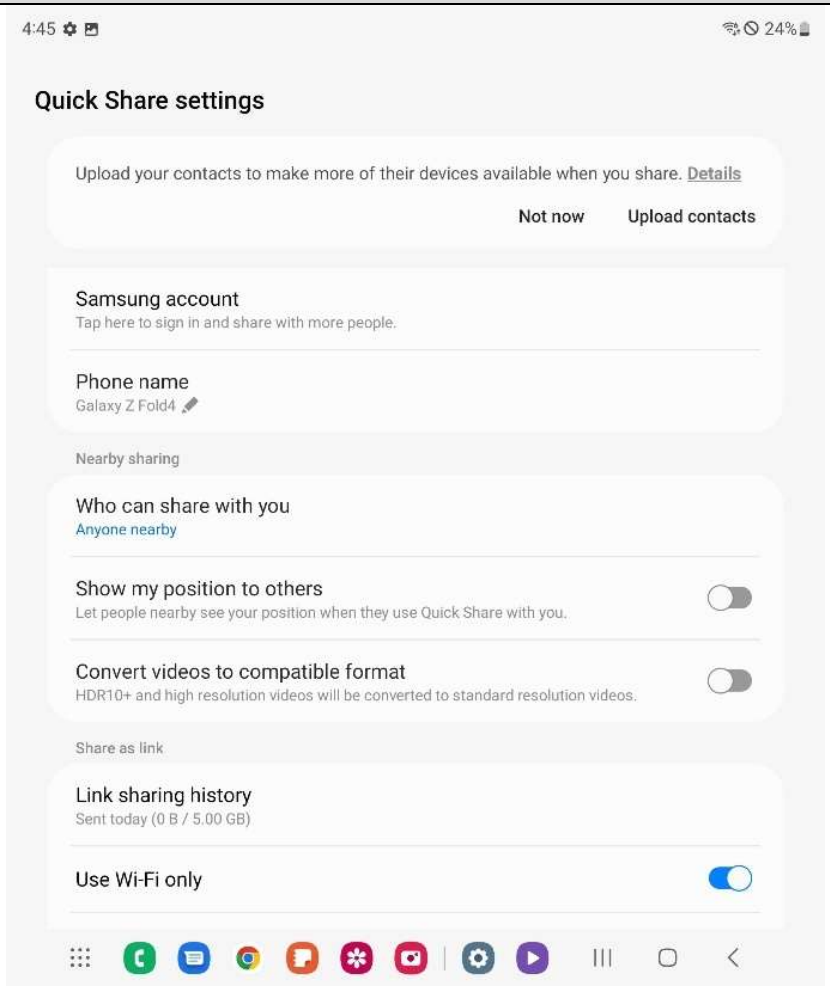
See https://www.standardsuniversity.org/e-magazine/march-2018-volume-8-issue-1-5g-802-11/how-well-positioned-is-ieee-802-11ax-to-meet-the-imt-2020-performance-requirements/

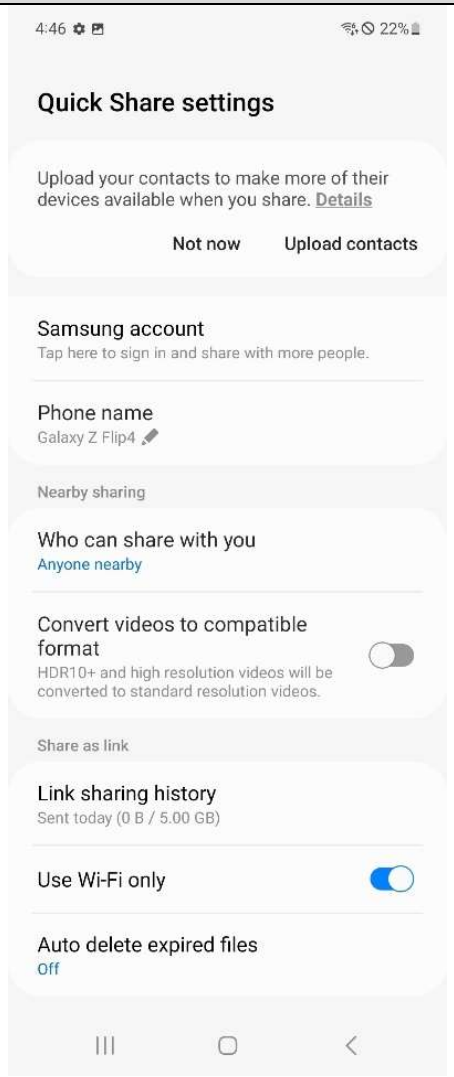
For example, the following screenshots show that in an exemplary Accused Samsung '590 Product that includes a Wi-Fi chip, the controller is controlling assignment of connection to the Wi-Fi chip:

Samsung Galaxy 23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

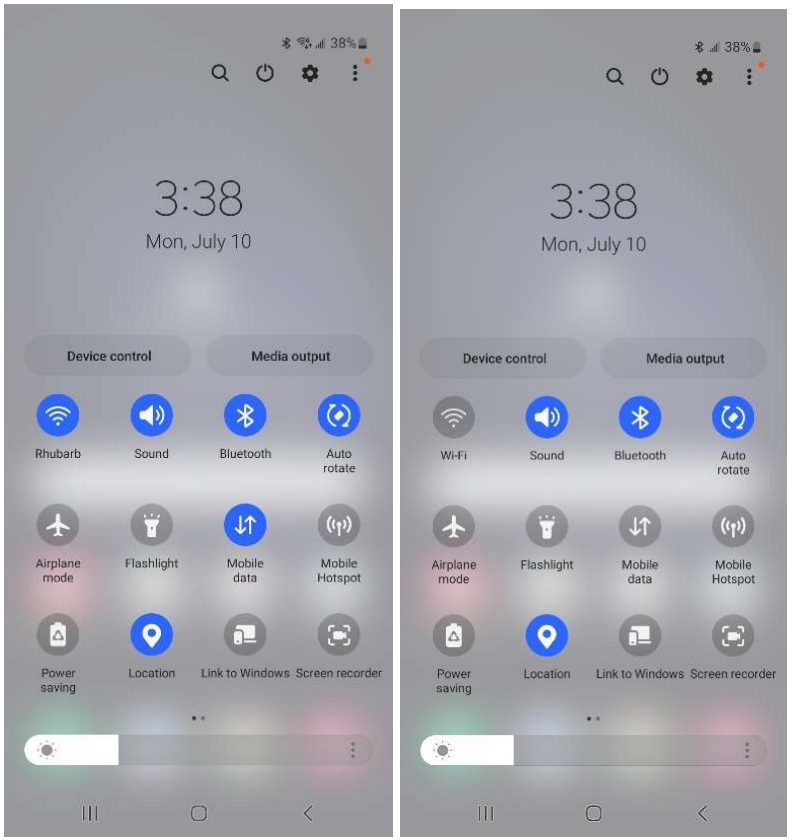
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

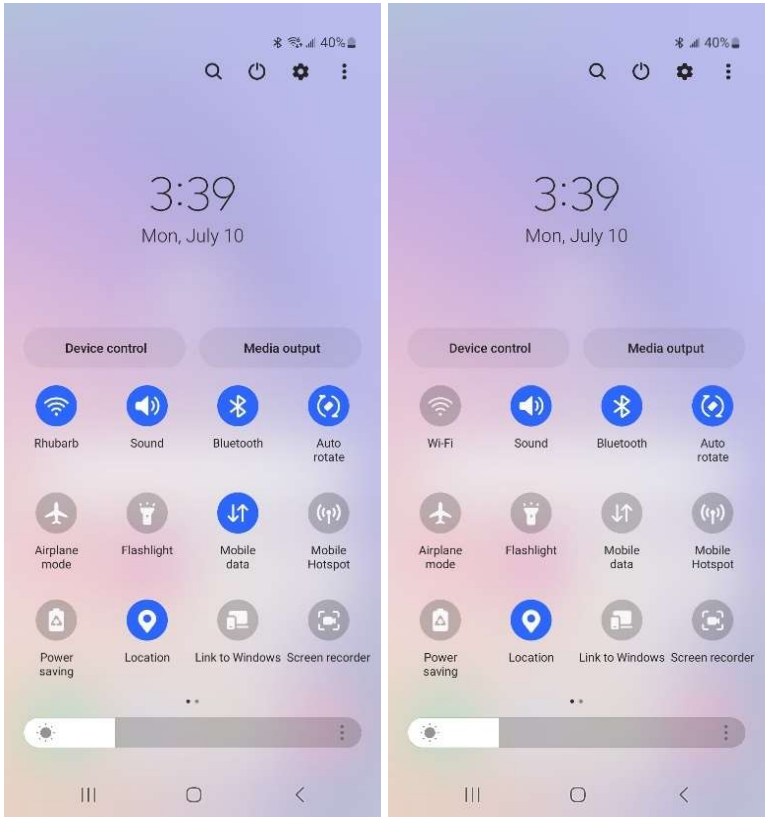
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy Z Flip4:**

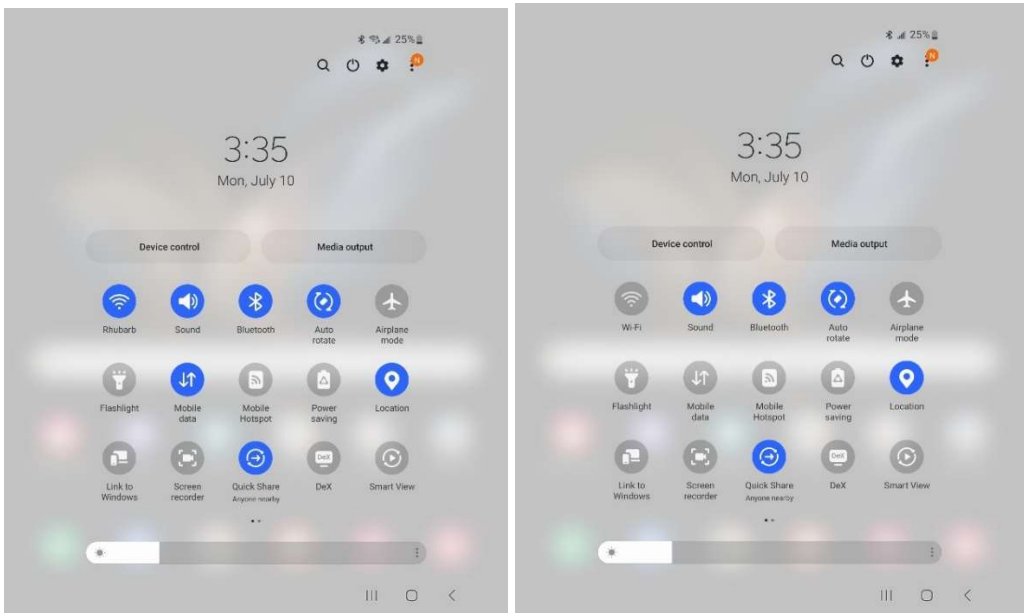
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

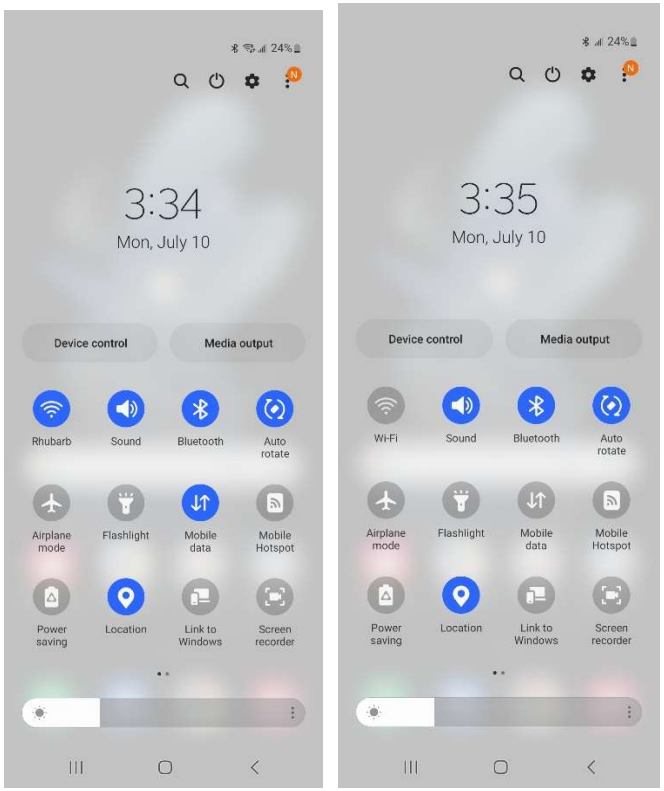
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)



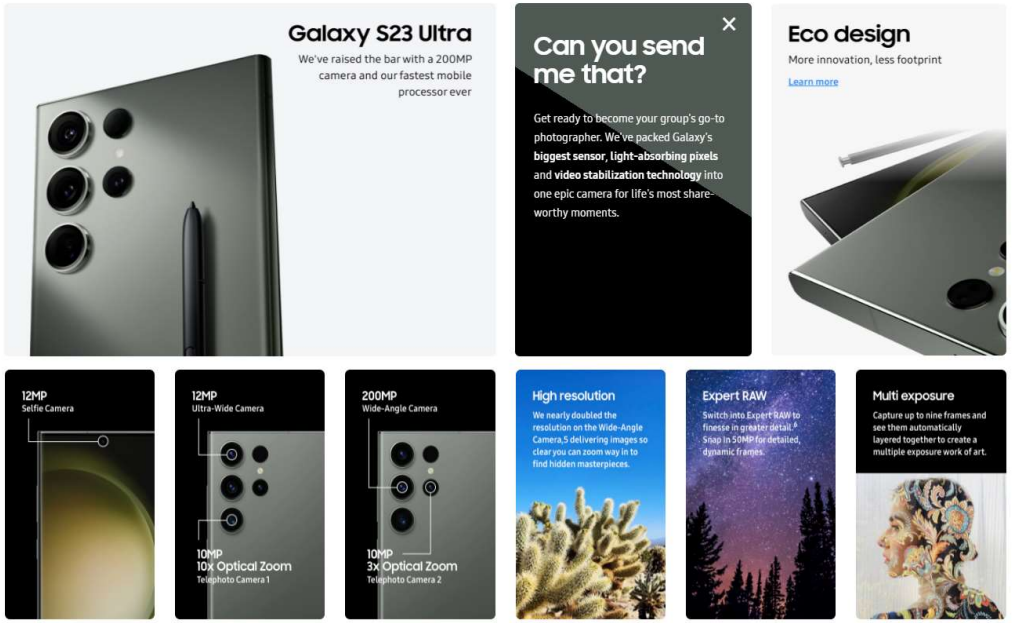
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4) 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)  *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a Bluetooth or Wifi chipset. *See* https://www.samsung.com/us/support/answer/ANS00087283/.
[23.e] an imaging circuit capable of receiving video	Each of the Accused Samsung '590 Products includes an imaging circuit capable of receiving video information and still picture information via an optical system.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
information and still picture information via an optical system;	For example, each of the Accused Samsung '590 Products include a chipset that works in conjunction with a camera for receiving video information and still picture information from an optical system (*e.g.*, a camera that generates video and still pictures).



MAIN CAMERA	Quad	200 MP, f/1.7, 24mm (wide), 1/1.3", 0.6µm, multi-directional PDAF, Laser AF, OIS
		10 MP, f/4.9, 230mm (periscope telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 10x optical zoom
		10 MP, f/2.4, 70mm (telephoto), 1/3.52", 1.12µm, Dual Pixel PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55", 1.4µm, Dual Pixel PDAF, Super Steady video
	Features	LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/240fps, 1080p@960fps, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), Dual Pixel PDAF
	Features	Dual video call, Auto-HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



MAIN CAMERA	Triple	50 MP, f/1.8, 23mm (wide), 1.0µm, Dual Pixel PDAF, OIS
		10 MP, f/2.4, 66mm (telephoto), 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 123˚, 12mm (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	8K@24fps, 4K@60fps, 1080p@60/240fps (gyro-EIS), 720p@960fps (gyro-EIS), HDR10+
SELFIE CAMERA	Single	4 MP, f/1.8, 26mm (wide), 2.0µm, under display
		Cover camera:
		10 MP, f/2.2, 24mm (wide), 1/3", 1.22µm
	Features	HDR
	Video	4K@30/60fps, 1080p@30/60fps, gyro-EIS

Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Dual	12 MP, f/1.8, 24mm (wide), 1/1.76", 1.8µm, Dual Pixel PDAF, OIS
		12 MP, f/2.2, 123° (ultrawide), 1.12µm
	Features	LED flash, HDR, panorama
	Video	4K@30/60fps, 1080p@60/240fps, 720p@960fps, HDR10+
SELFIE CAMERA	Single	10 MP, f/2.4, 26mm (wide), 1.22µm
	Features	HDR
	Video	4K@30fps

Galaxy Z Flip4 technical specifications; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

MAIN CAMERA	Triple	50 MP, f/1.8, (wide), 1/1.56", 1.0µm, PDAF, OIS
		12 MP, f/2.2, 123° (ultrawide), 1.12µm
		5 MP, f/2.4, (macro)
	Features	LED flash, panorama, HDR
	Video	4K@30fps, 1080p@30/60fps, 720p@480fps
SELFIE CAMERA	Single	32 MP, f/2.2, 26mm (wide), 1/2.8", 0.8µm
	Video	4K@30fps, 1080p@30/60fps

Samsung Galaxy A54 5G technical specifications; Galaxy A54 5G, 128GB (Unlocked) Phones - SM-A546UZKBXAA | Samsung US; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.



Processor

Qualcomm Snapdragon 8 Gen2 Mobile Platform for Galaxy

PLATFORM	OS	Android 13, One UI 5.1
	Chipset	Qualcomm SM8550-AC Snapdragon 8 Gen 2 (4 nm)
	CPU	Octa-core (1x3.36 GHz Cortex-X3 & 2x2.8 GHz Cortex-A715 & 2x2.8 GHz Cortex-A710 & 3x2.0 GHz Cortex-A510)
	GPU	Adreno 740

Galaxy S23 Ultra technical specifications; https://www.samsung.com/us/smartphones/galaxy-s23-ultra/buy/galaxy-s23-ultra-512gb-verizon-sm-s918uzgfvzw/?modelCode=SM-S918UZGFXAU; https://www.gsmarena.com/samsung_galaxy_s23_ultra-12024.php.



Processor

Snapdragon 8+ Gen 1
Up to 3.2GHz

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

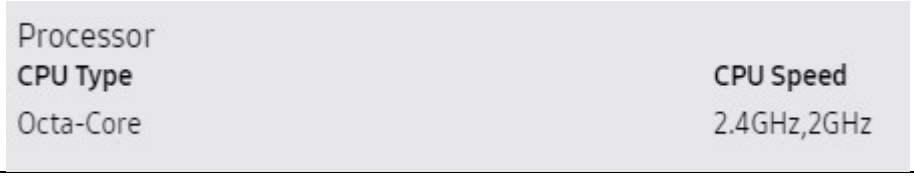
PLATFORM		
	OS	Android 12L, upgradable to Android 13, One UI 5.1
	Chipset	Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm)
	CPU	Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510)
	GPU	Adreno 730

Galaxy Z Fold4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-fold4/buy/galaxy-z-fold4-512gb-att-sm-f936uzeeatt/; https://www.gsmarena.com/samsung_galaxy_z_fold4-11737.php.

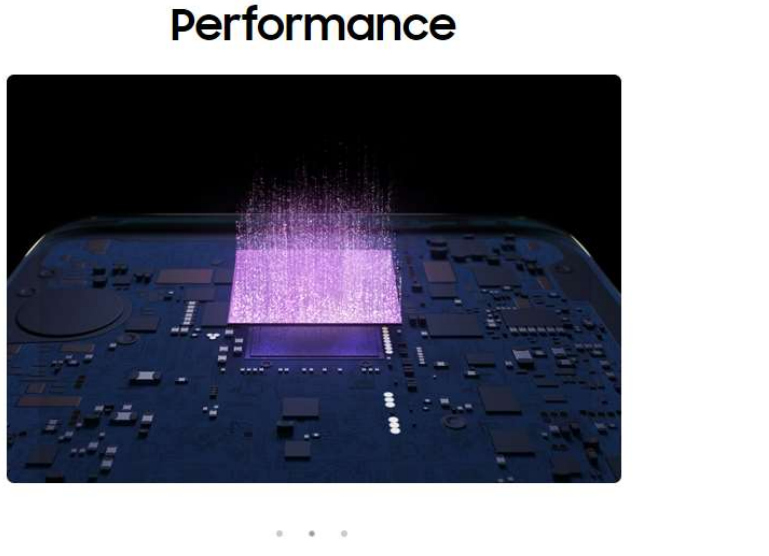


PLATFORM		
	OS	Android 12, upgradable to Android 13, One UI 5.1
	Chipset	Qualcomm SM8475 Snapdragon 8+ Gen 1 (4 nm)
	CPU	Octa-core (1x3.19 GHz Cortex-X2 & 3x2.75 GHz Cortex-A710 & 4x1.80 GHz Cortex-A510)
	GPU	Adreno 730

Galaxy Z Flip4 technical specifications; https://www.samsung.com/us/smartphones/galaxy-z-flip4/buy/galaxy-z-flip4-256gb-t-mobile-sm-f721uzdexau/; https://www.gsmarena.com/samsung_galaxy_z_flip4-11538.php.



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Galaxy A54 5G technical specifications; https://www.samsung.com/us/mobile/phones/galaxy-a/galaxy-a54-5g-128gb-verizon-sm-a546vzkbvzw/; https://www.gsmarena.com/samsung_galaxy_a54-12070.php.

In addition, the AIDA64 Reports show that each of the Accused Samsung '590 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (*e.g.*, CPU, ISP, or DSP) processes video.

Product	AIDA 64 Report- Camera

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
	Galaxy S23 Ultra	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 6.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 3.30 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 2.20 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported	
	Galaxy Z Fold4	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.40 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
		Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.30 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.74 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Galaxy Z Flip4	<< Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 5.00 mm Focus Modes: infinity, auto, macro, continuous-video, continuous-picture Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 10.0 MP (3648 × 2736) Focal Length: 3.17 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported << Rear-Facing Camera >> Resolution: 12 MP (4000 × 3000) Focal Length: 1.70 mm Focus Modes: fixed, infinity Video Stabilization: Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Not Supported
	Galaxy A54 5G	<< Rear-Facing Camera >> Resolution: 12 MP (4080 × 3060) Focal Length: 5.54 mm Focus Modes: infinity, auto, continuous-video, continuous-picture Video Stabilization: Not Supported Zoom: Supported Auto Exposure Locking: Supported Auto White Balance Locking: Supported Flash: Supported << Front-Facing Camera >> Resolution: 8.0 MP (3264 × 2448) Focal Length: 3.72 mm

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

<< Rear-Facing Camera >>
Resolution: 12 MP (4000 × 3000)
Focal Length: 1.74 mm
Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

<< Front-Facing Camera >>
Resolution: 5.7 MP (2880 × 1980)
Focal Length: 3.72 mm
Focus Modes: fixed, infinity
Video Stabilization: Not Supported
Zoom: Supported
Auto Exposure Locking: Supported
Auto White Balance Locking: Supported
Flash: Not Supported

The AIDA64 Reports and tech specs show that the Accused Samsung '590 Products contain one or more processors.

Product	AIDA 64 Report- Processor
Galaxy S23 Ultra	SoC Model: Qualcomm Snapdragon 8 Gen 2 (SM8550) Core Architecture: 3x ARM Cortex-A510 @ 2016 MHz

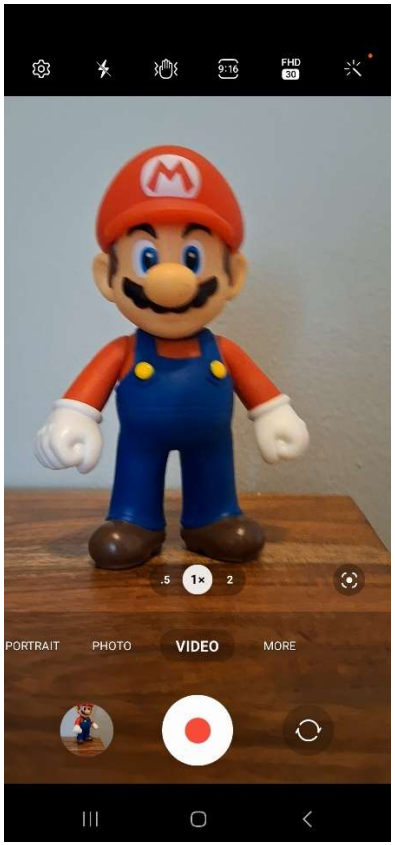
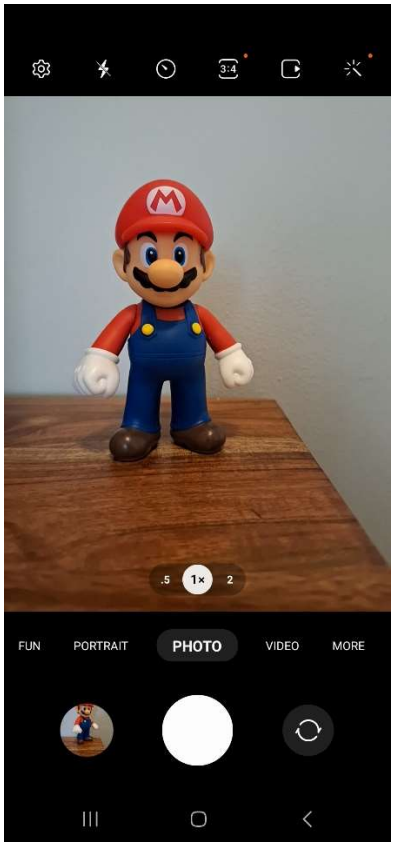
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
		2x ARM Cortex-A715 @ 2803 MHz 2x ARM Cortex-A710 @ 2803 MHz ARM Cortex-X3 @ 3360 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r1p0 CPU Cores: 8 CPU Clock Range: 307 - 3360 MHz
	Galaxy Z Fold4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy Z Flip4	SoC Model: Qualcomm Snapdragon 8+ Gen 1 (SM8475) Core Architecture: 4x ARM Cortex-A510 @ 2016 MHz 3x ARM Cortex-A710 @ 2745 MHz ARM Cortex-X2 @ 3187 MHz Manufacturing Process: 4 nm Instruction Set: 64-bit ARMv9-A CPU Revision: r2p0 CPU Cores: 8 CPU Clock Range: 300 - 3187 MHz
	Galaxy A54 5G	Core Architecture: 4x ARM Cortex-A55 @ 2002 MHz 4x ARM Cortex-A78 @ 2400 MHz Instruction Set: 64-bit ARMv8-A CPU Revision: r1p1 CPU Cores: 8 CPU Clock Range: 533 - 2400 MHz

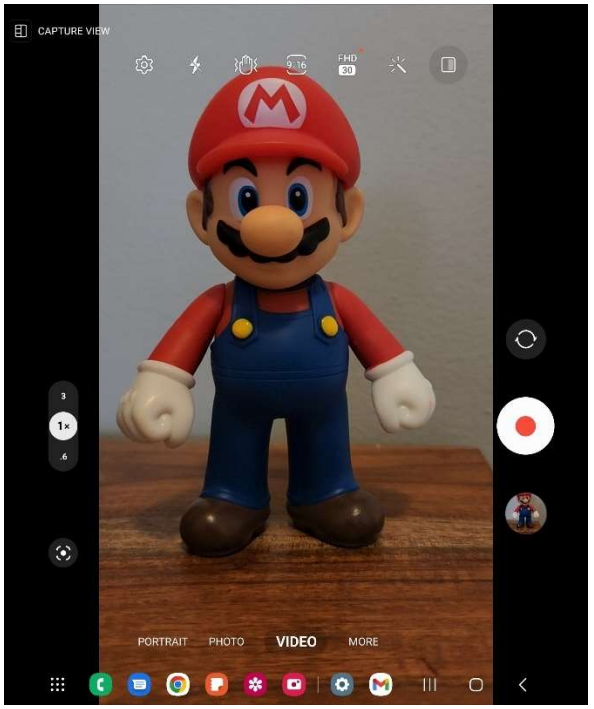
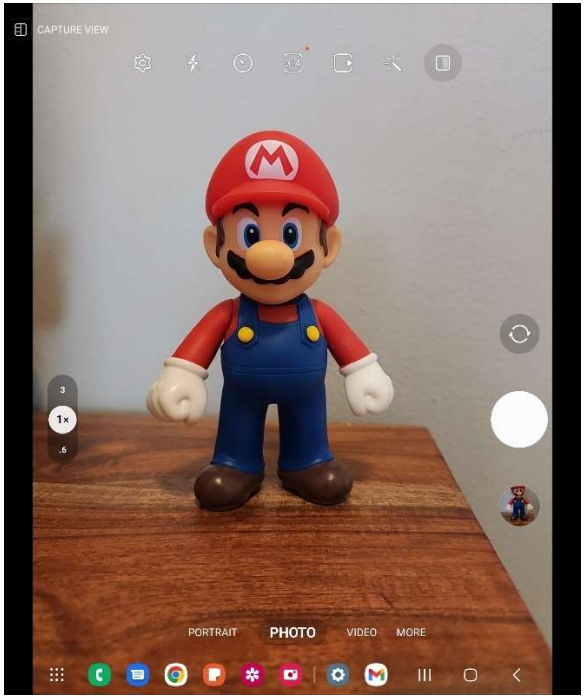
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show exemplary Accused Samsung '590 Products recording video and taking video and still pictures:

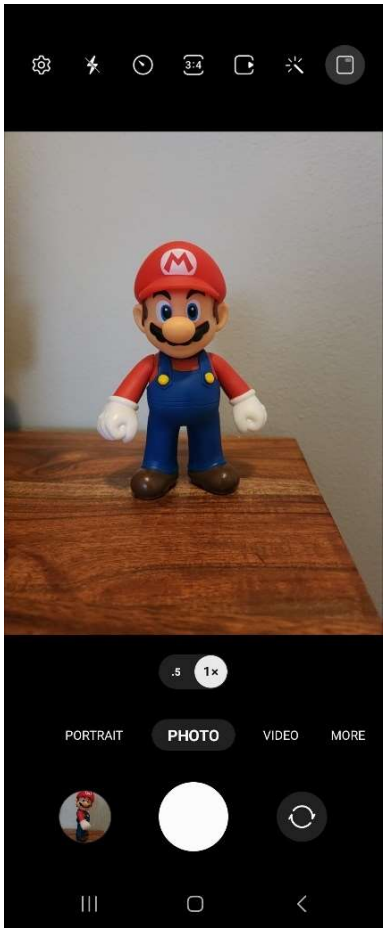
Camera Recording Video (Samsung Galaxy S23 Ultra)	Camera Taking Still Picture (Samsung Galaxy S23 Ultra)





U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy A54 G)	Camera Taking Still Picture (Samsung Galaxy A54G)
		

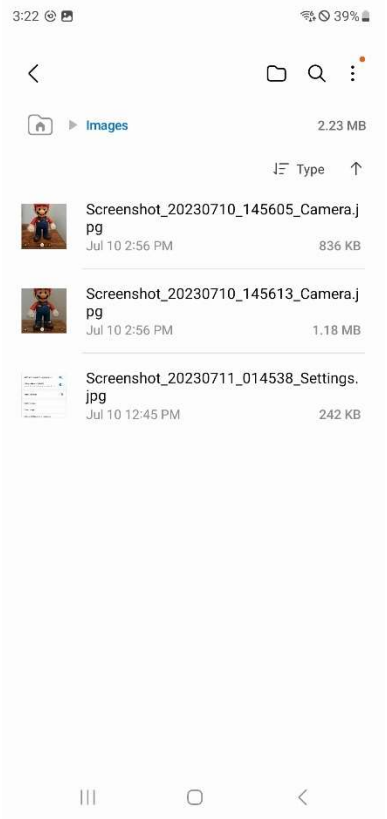
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy Z Fold4)	Camera Taking Still Picture (Samsung Galaxy Z Fold4)
		

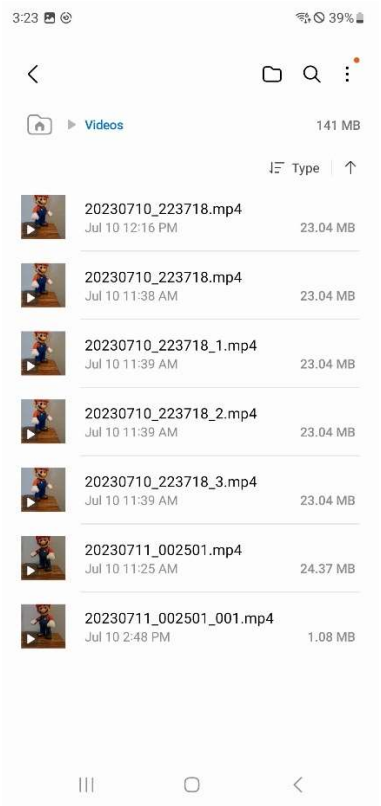
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Camera Recording Video (Samsung Galaxy Z Flip4)	Camera Taking Still Picture (Samsung Galaxy Z Flip4)
		
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include front and back cameras for recording video and still pictures. *See*	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS00089063/; *see also* https://www.samsung.com/us/support/answer/ANS00079026/.
[23.f] a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;	Each of the Accused Samsung '590 Products includes a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method. For example, each of the Accused Samsung '590 Products includes a compression circuit compressing the still picture information via at least the JPEG standard compression scheme and the video information via at least the MPEG-4 compression scheme. For example, the following screenshots show exemplary Accused Samsung '590 Products using a compression circuit compressing the still picture information via at least the JPEG standard compression scheme and the video information via at least the MPEG-4 compression scheme:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

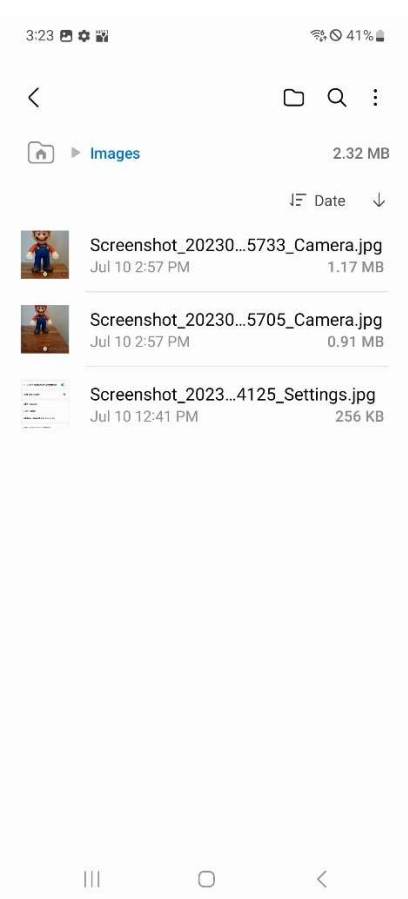
Still picture information using a ".jpg" file extension (Samsung Galaxy S23 Ultra)	Video information using a ".mp4" file extension (Samsung Galaxy S23 Ultra)

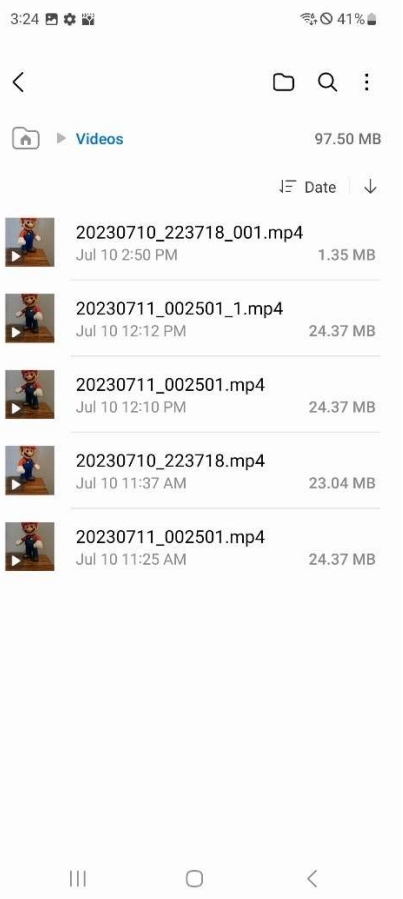


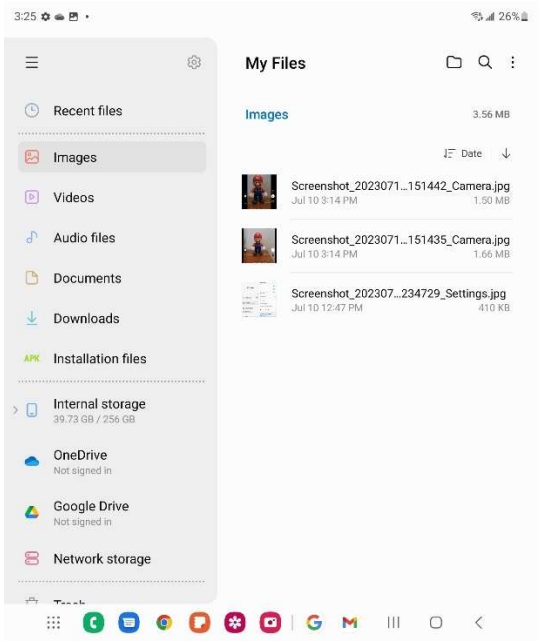
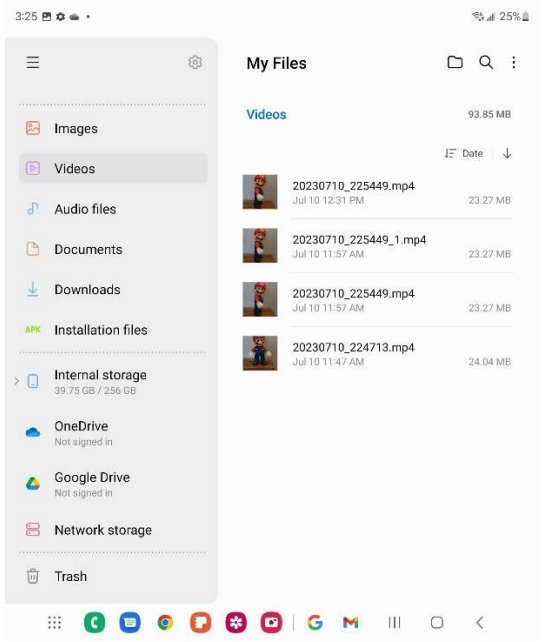


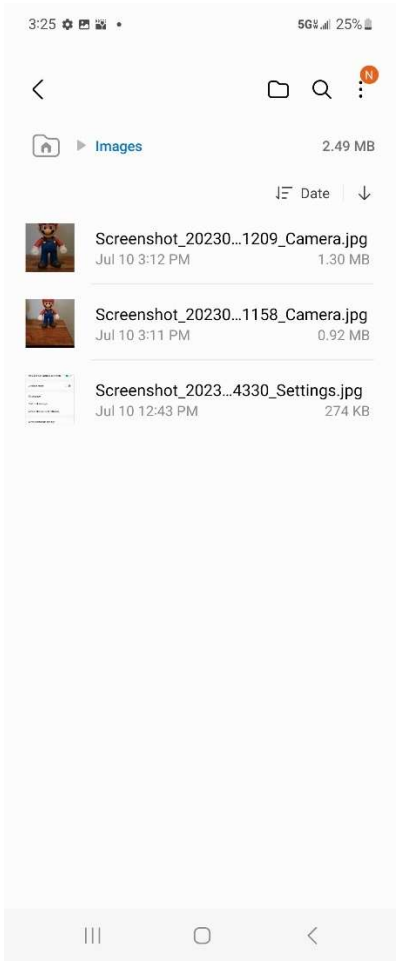
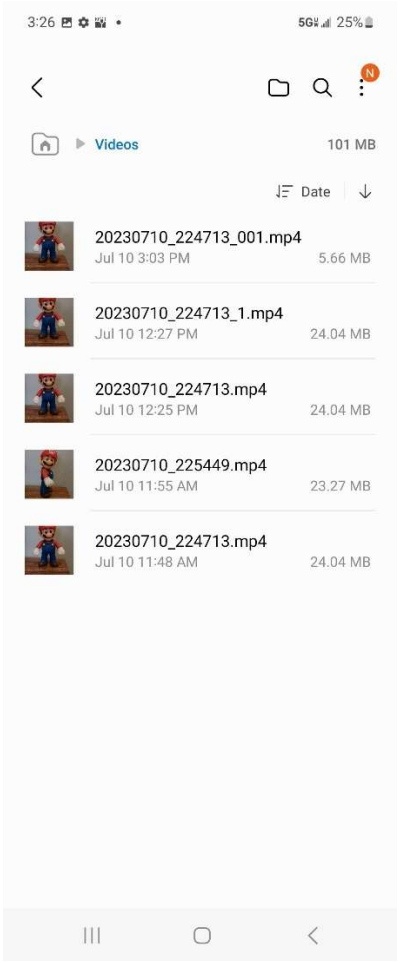
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Still picture information using a ".jpg" file extension (Samsung Galaxy A54 5G)	Video information using a ".mp4" file extension (Samsung Galaxy A54 5G)

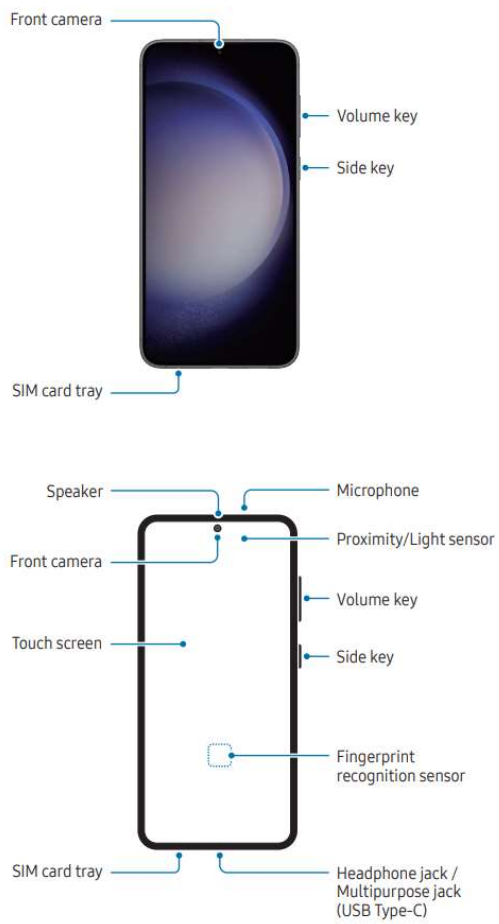




U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Still picture information using a ".jpg" file extension (Samsung Galaxy ZFlip 4)	Video information using a ".mp4" file extension (Samsung Galaxy ZFlip 4)
		

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Still picture information using a ".jpg" file extension (Samsung Galaxy ZFold 4)	Video information using a ".mp4" file extension (Samsung Galaxy ZFold 4)
		

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products include similar compressions circuit.
[23.g] a microphone receiving audio information corresponding to the video information received via the imaging circuit;	Each of the Accused Samsung '590 Products include a microphone receiving audio information corresponding to the video information received via the imaging circuit. *See*, for example: **Galaxy S23 Ultra:**

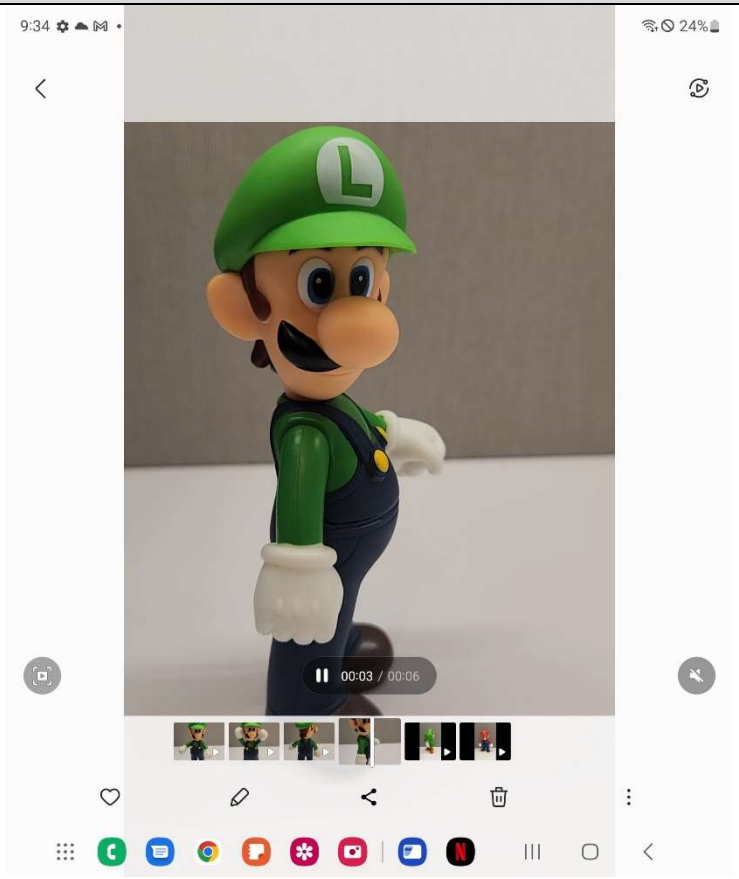
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	▶ Galaxy S23+, Galaxy S23:  Galaxy S23 Ultra User Guide at pg. 7.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show exemplary an Accused Samsung '590 Product using a microphone receiving audio information corresponding to the video information received via the imaging circuit: Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Ultra:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	
[23.h] an accumulation circuit capable of accumulating video information received by the imaging circuit and audio information received by the	Each of the Accused Samsung '590 Products that include an accumulation circuit capable of accumulating video information received by the imaging circuit and audio information received by the microphone, wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio.

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td>microphone, wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio;</td><td>For example, each of the Accused Samsung '590 Products include a processor together with local storage that comprise an accumulation circuit capable of accumulating video information received by the imaging circuit and audio information received by the microphone, wherein the Bluetooth communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio.

Further, in each of the Accused Samsung '590 Products, the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio.

For example, the following screenshots show an exemplary Accused Samsung '590 Product using a Bluetooth communication chip to transmit saved video information:
<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

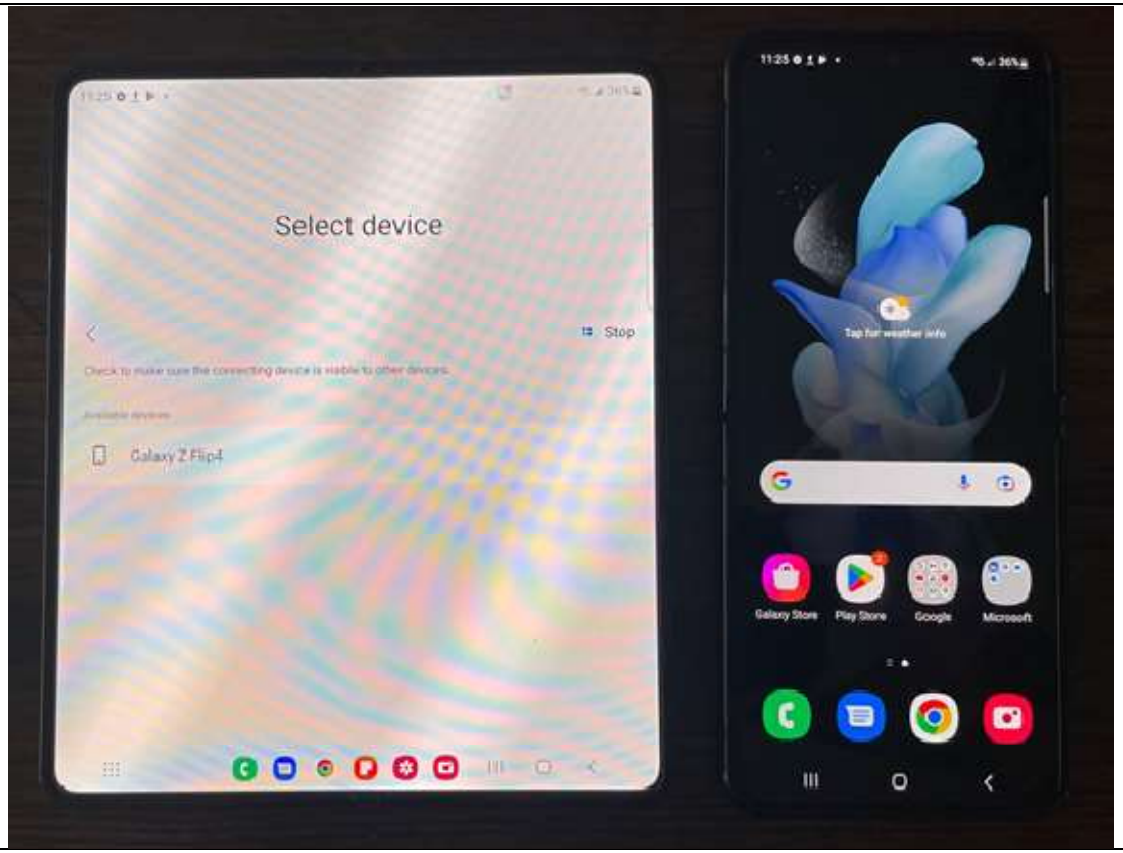


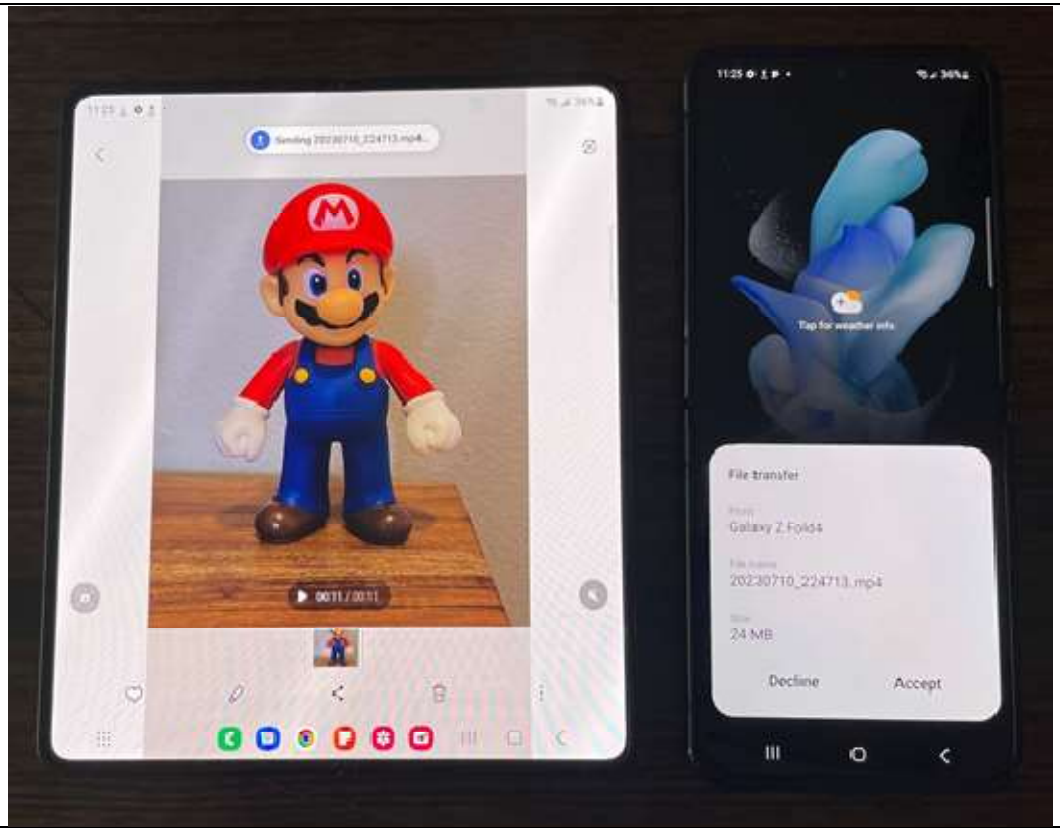
Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft

	 Tap for weather info File transfer Galaxy Z Fold4 20230710_224713.mp4 24 MB Decline Accept	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



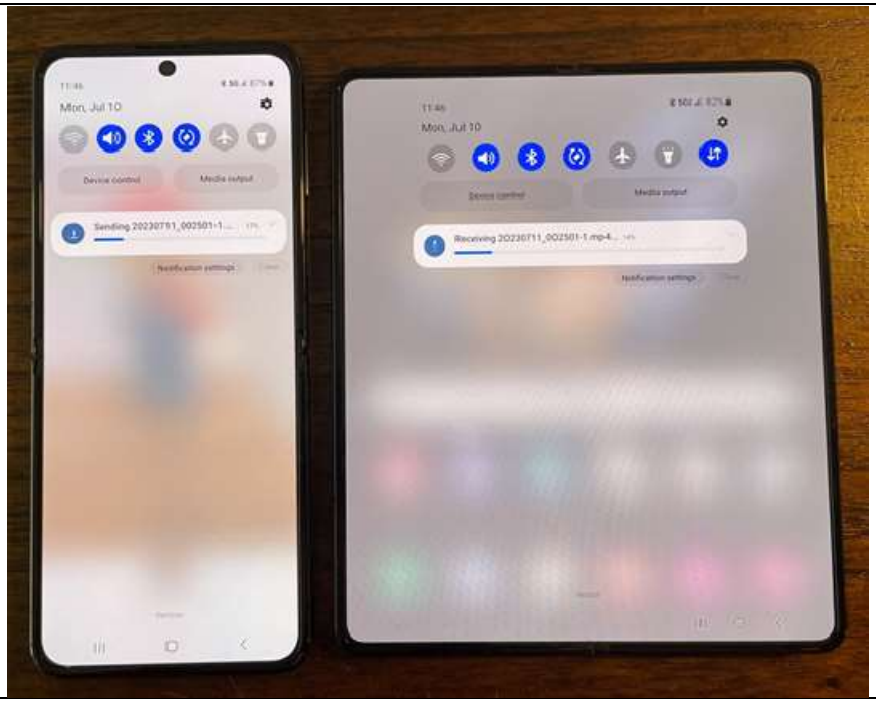
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 Galaxy Store Microsoft 23.2 MB Decline Accept	

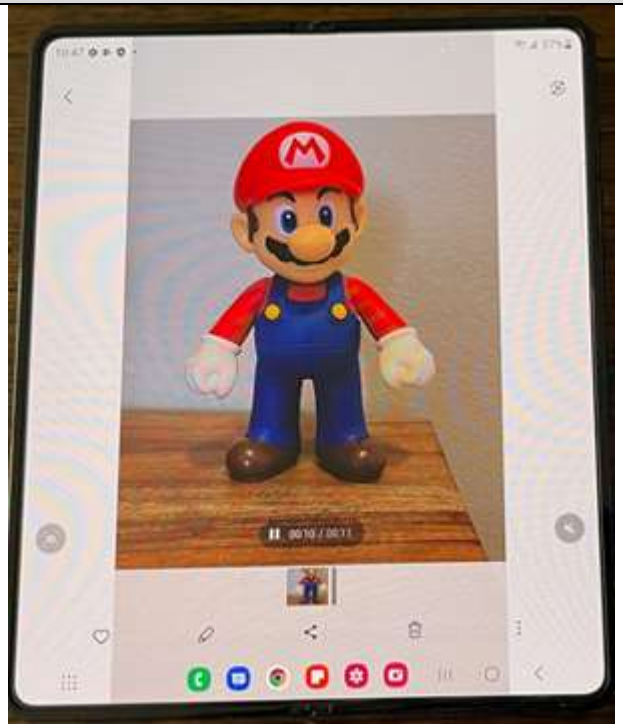

Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a similar accumulation circuit (e.g., memory). *See* https://www.samsung.com/us/support/answer/ANS00079026/.
[23.i] a display displaying the video information received by the first radio communication circuit and displaying information received by the	Each of the Accused Samsung '590 Products includes a display displaying the video information received by the first radio communication circuit and displaying information received by the second radio communication circuit via the internet or home network.

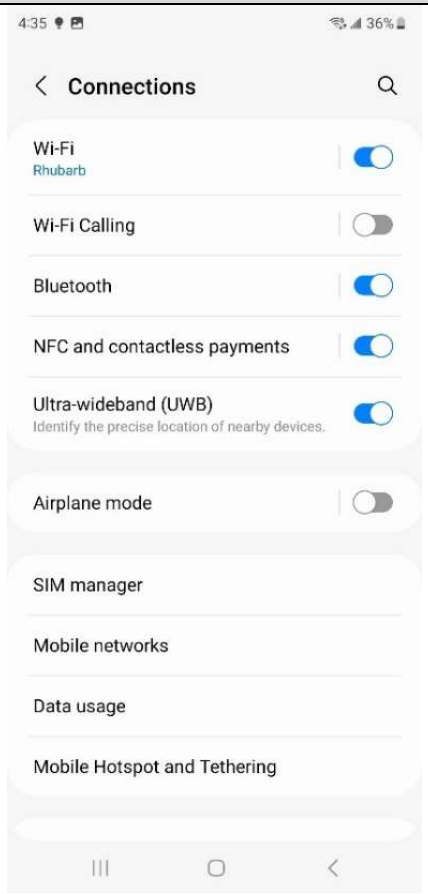
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
second radio communication circuit via the internet or home network;	For example, the display of each of the Accused Samsung '590 Products is capable of displaying the information received by the Bluetooth (e.g., via Bluetooth File Share as shown above), or cellular communication chip (*e.g.*, via email or MMS as shown above) by selecting the video via the camera or Gallery application. For example, the following screenshots show an exemplary Accused Samsung '590 Product using a display to play videos received via the Bluetooth communication chip: Samsung Galaxy S23 Ultra:

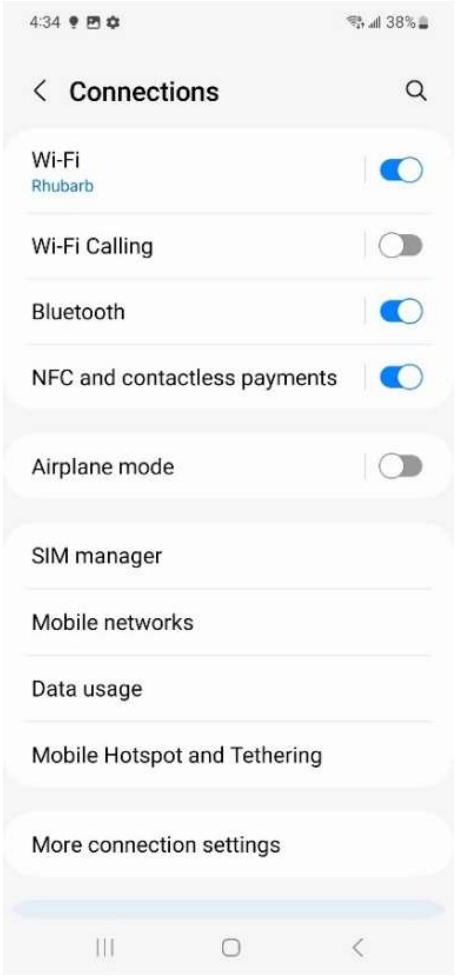
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Flip 4:

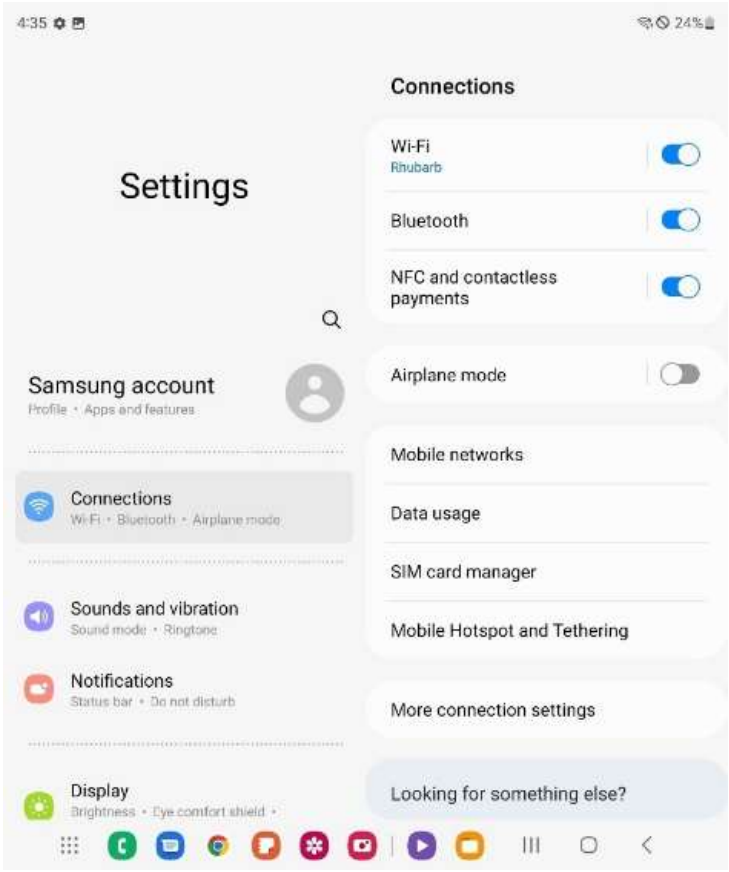
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy Z Fold 4:

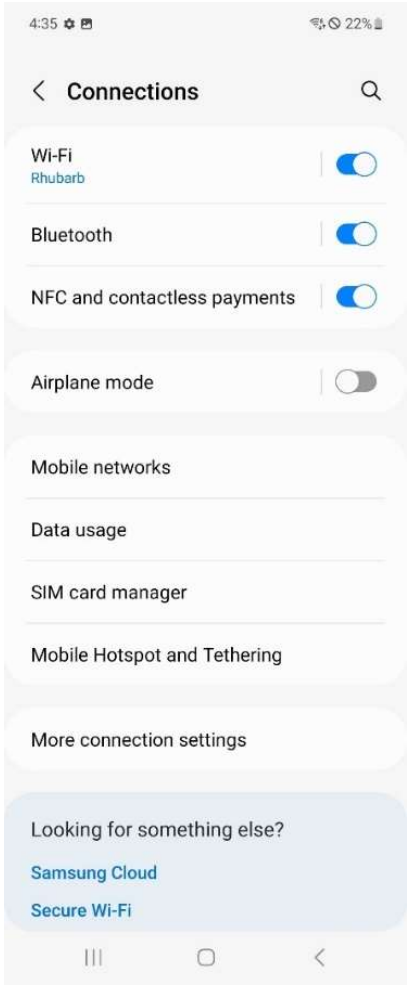
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Similarly, video received via cellular communication chip can also be displayed by selecting the video via the camera or Gallery application. *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products include a display for displaying video, and one or more processors (*e.g.*, a CPU, ISP, and/or DSP) with image and video processing capability.
[23.j] a controller controlling assignment of connection of each of the first, second, third, and fourth radio communication circuits,	The Accused Samsung '590 Products include a controller controlling assignment of connection of each of the first, second, third, and fourth radio communication circuits. **First Infringement Theory**:

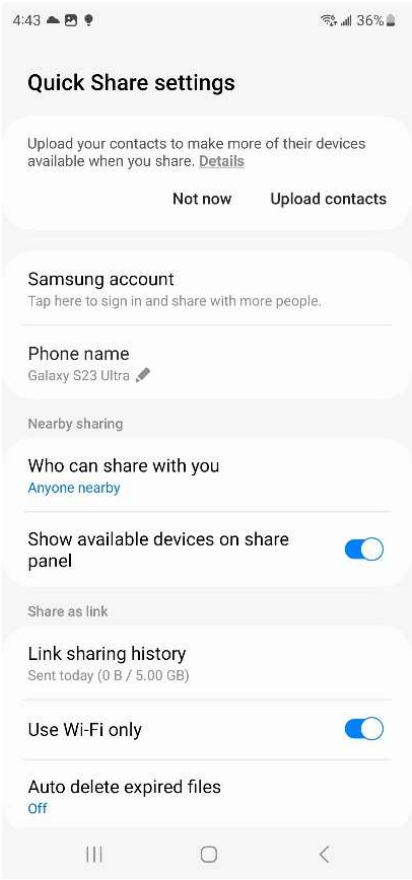
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an example of controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into "Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options. User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

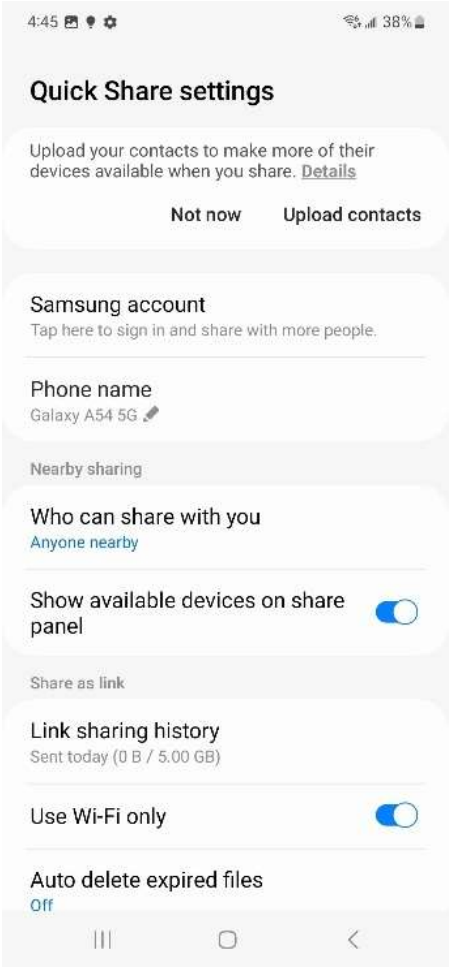
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

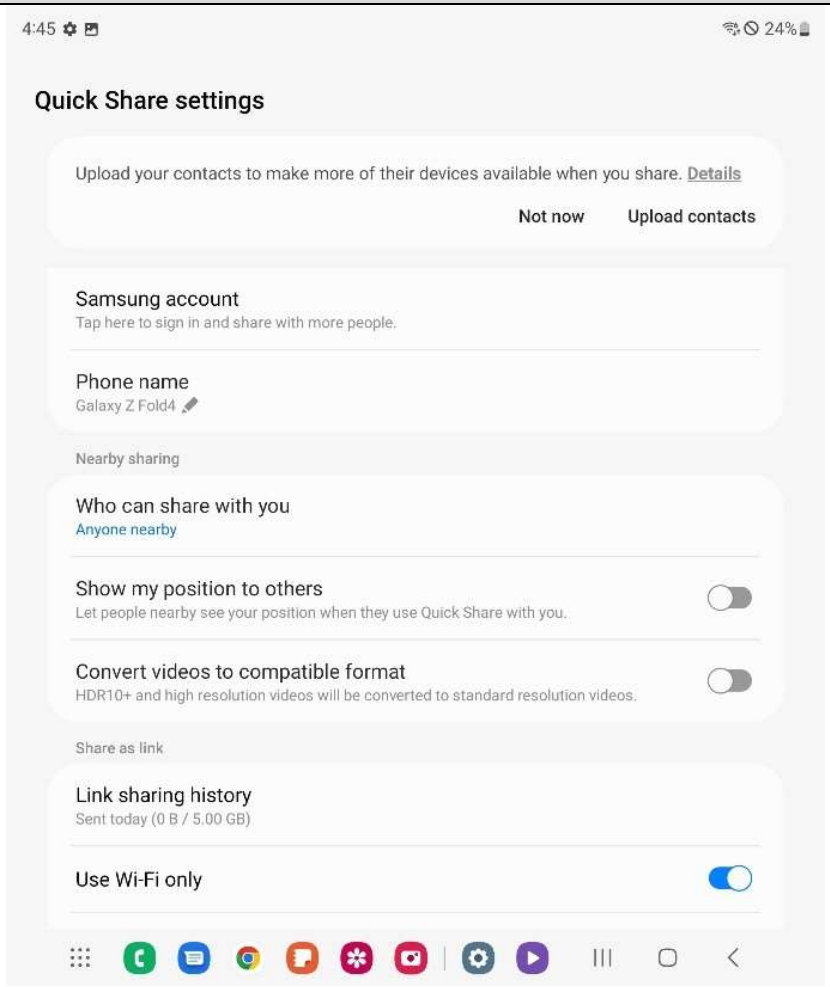
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

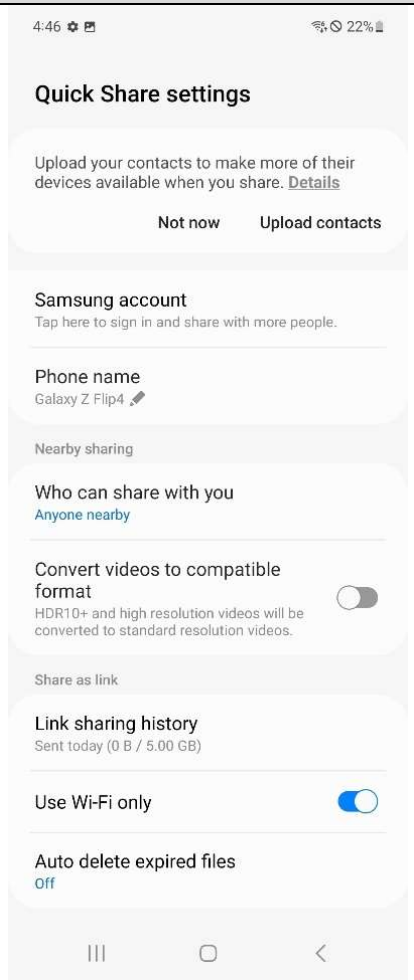
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	For example, the following screenshots show that in an exemplary Accused Samsung '590 Product that includes a Wi-Fi chip, the controller is controlling assignment of connection to the Wi-Fi chip: **Samsung Galaxy 23 Ultra:** 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy Z Fold4:**

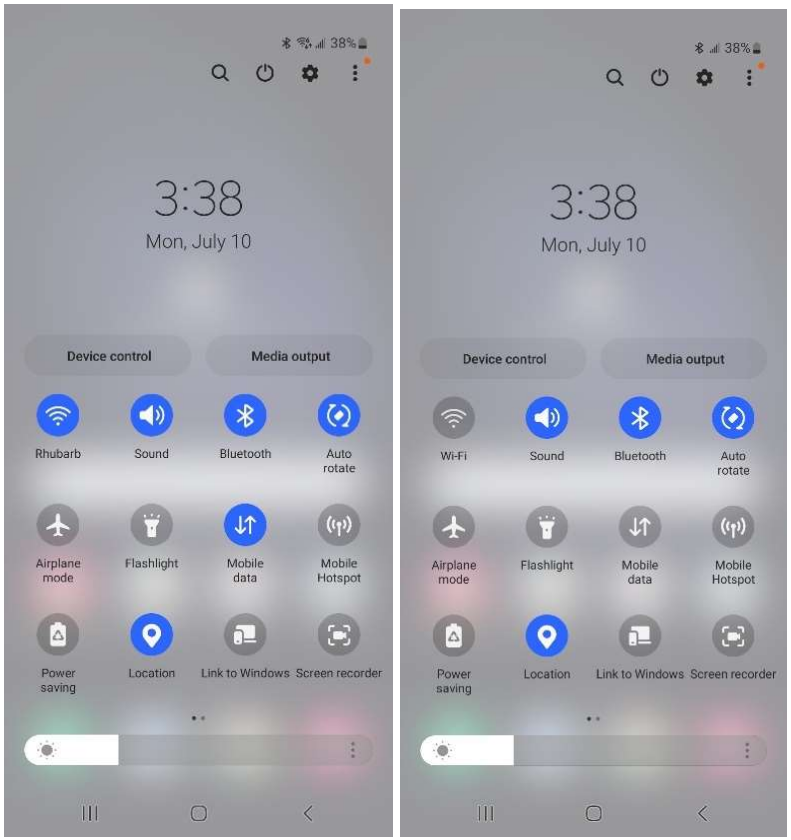
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy Z Flip4:**

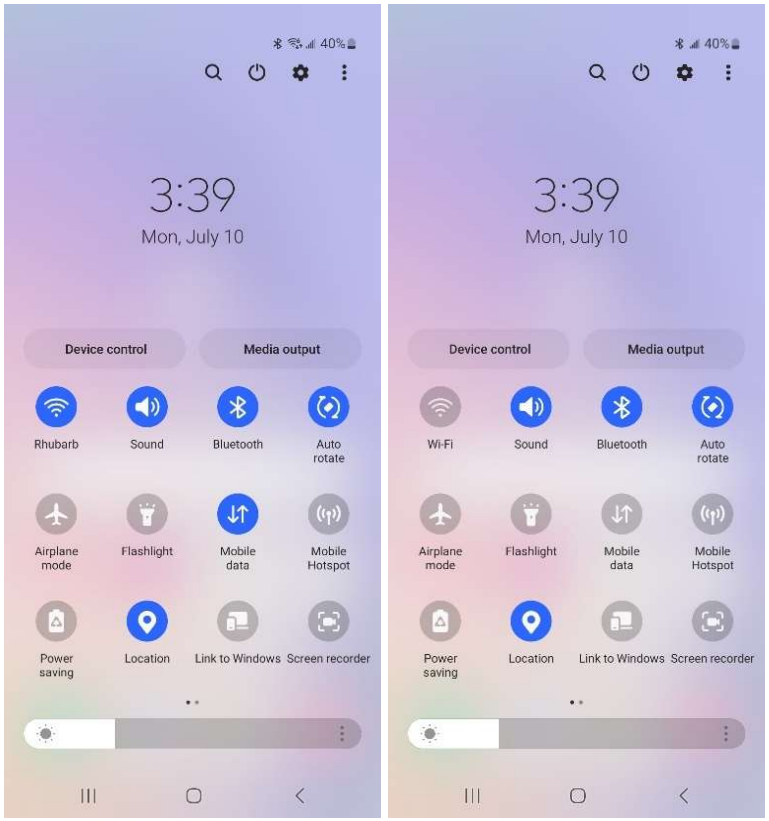
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

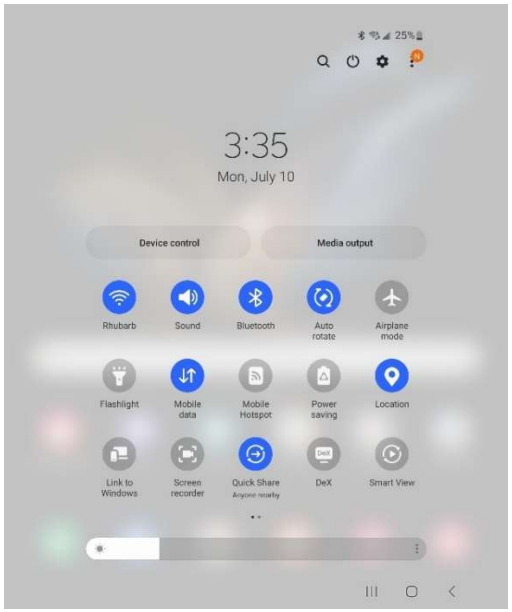
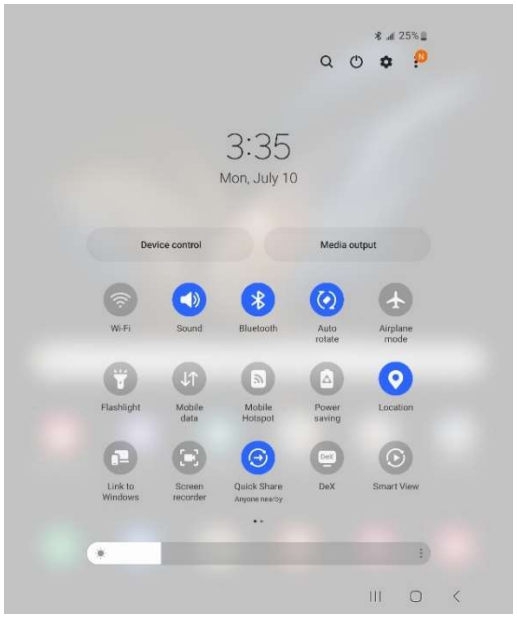


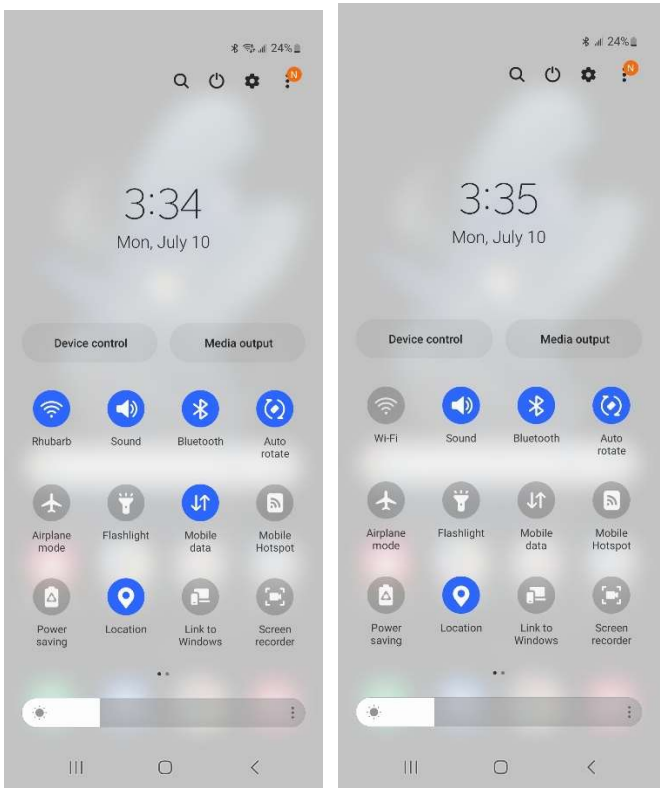
Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

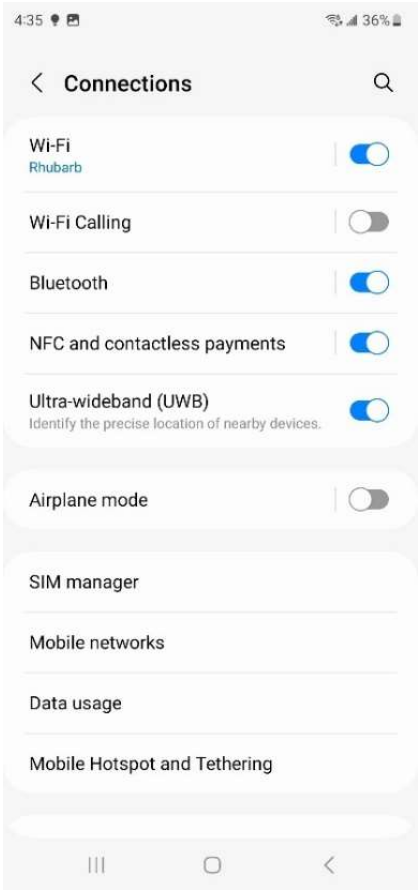
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

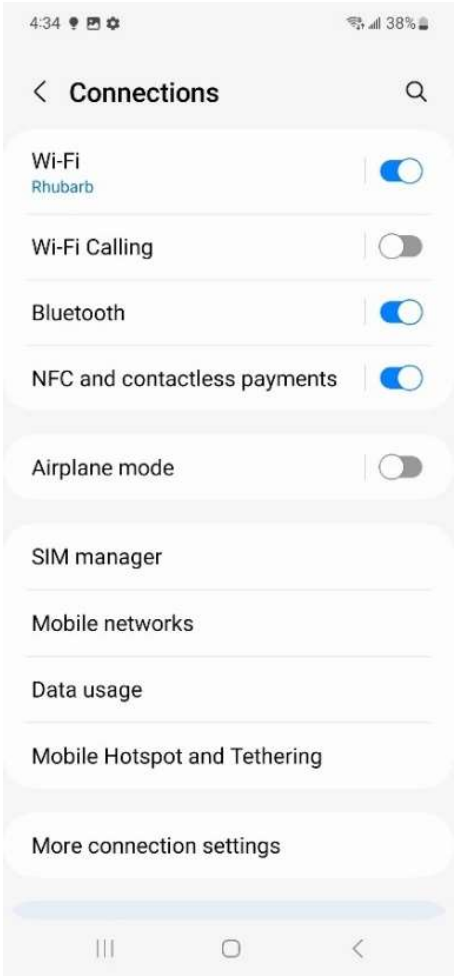
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

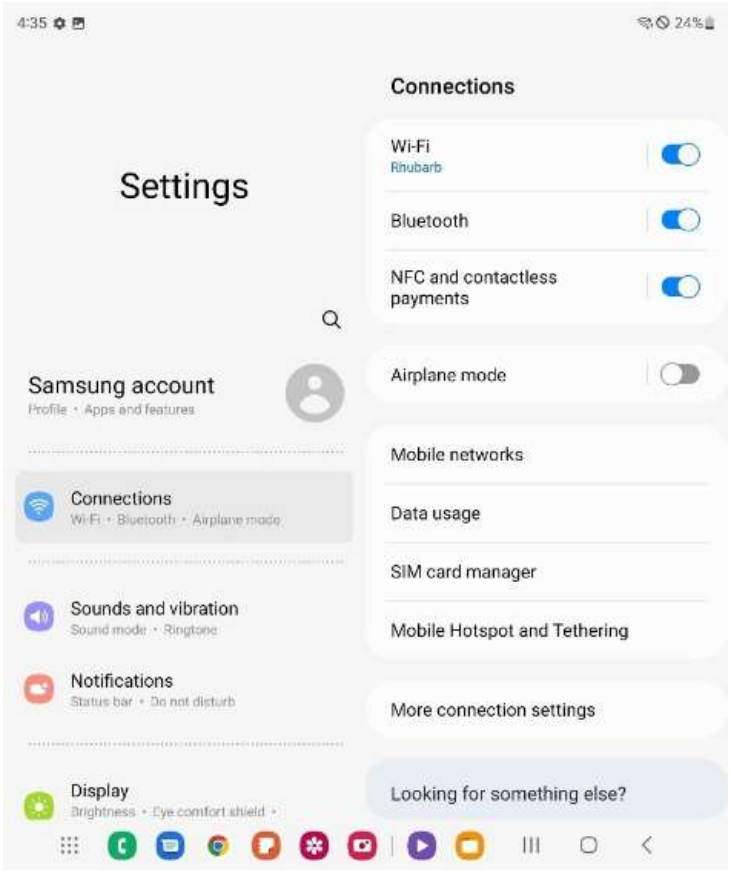
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

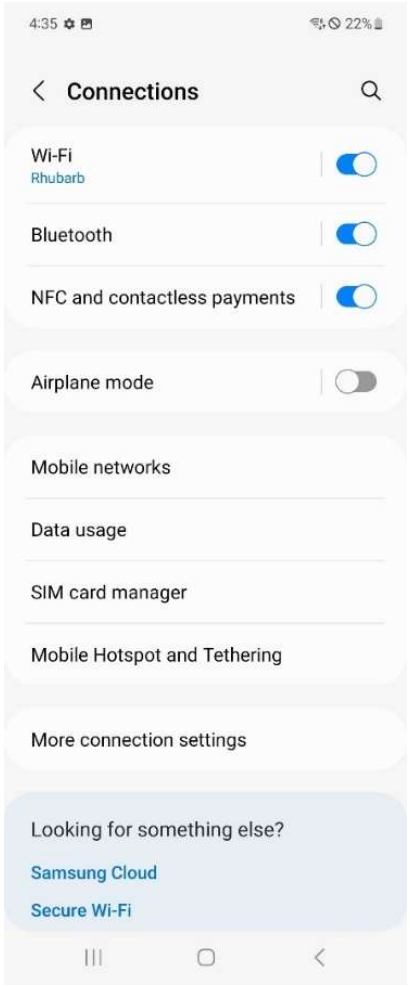
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	  User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 As an additional example of controller controlling assignment of connection of each of the Bluetooth, cellular, Wi-Fi, and NFC communication circuits, the Accused Samsung '590 Products include a chipset that executes source code to control assignment of connection when a user navigates into "Settings" and selects various settings within the "Wi-Fi," "Bluetooth," "cellular" and/or "NFC" menu options. User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

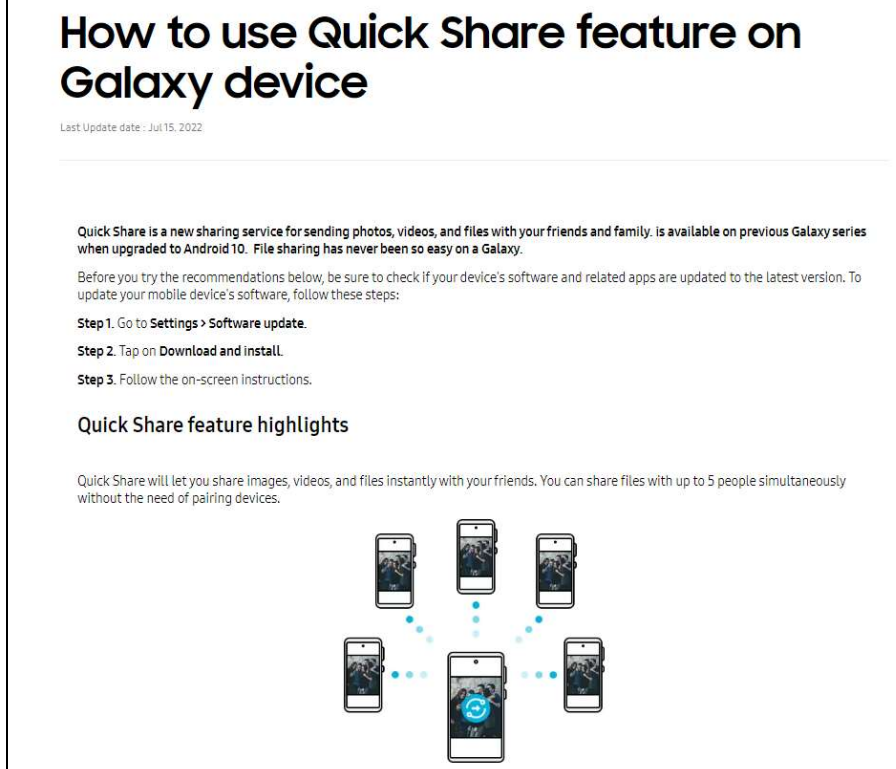
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	See also Appendix 8 showing that the remaining Accused Samsung '590 Products also include a chipset that controls the assignment of connection in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/.
[23.k] wherein the controller controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video information,	In each of the Accused Samsung '590 Products, the controller controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video. **First Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Wi-Fi and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the Wi-Fi communication circuit, the controller assigns a connection to the Wi-Fi communication circuit for transmitting the video by using Wi-Fi (e.g., Quick Share) to share files. For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share "Wi-Fi only" and then sending data through the Quick Share application. Also, "an indication" from a user to control assignment to the cellular communication chip is turning the cellular or Wi-Fi connection on/off from the quick menu. For example, "an indication" from a user to control assignment to the Wi-Fi communication chip is selecting Quick Share to transmit video from the options under the share menu.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

How to use Quick Share feature on Galaxy device

Last Update date : Jul 15, 2022

Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.

Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps:

Step 1. Go to **Settings > Software update**.

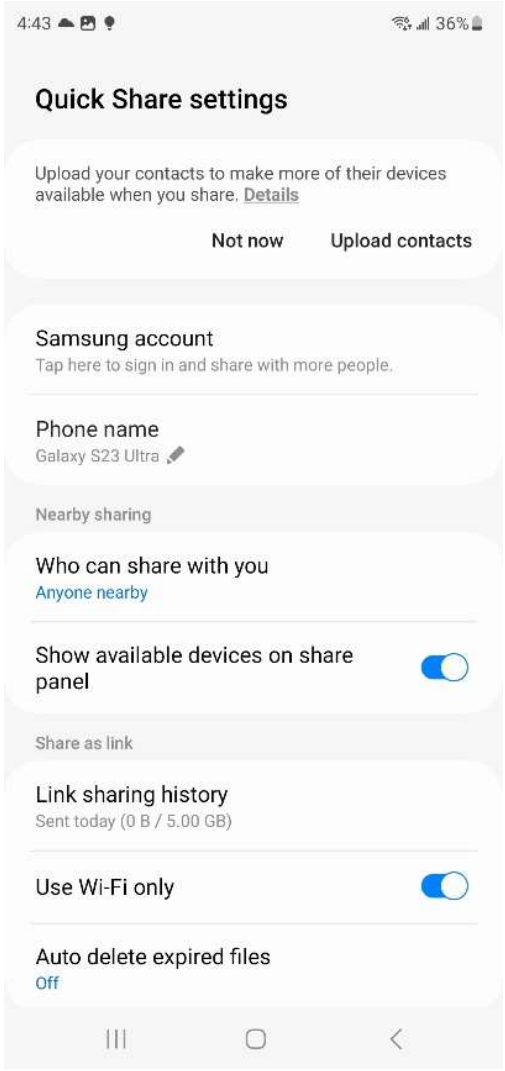
Step 2. Tap on **Download and install**.

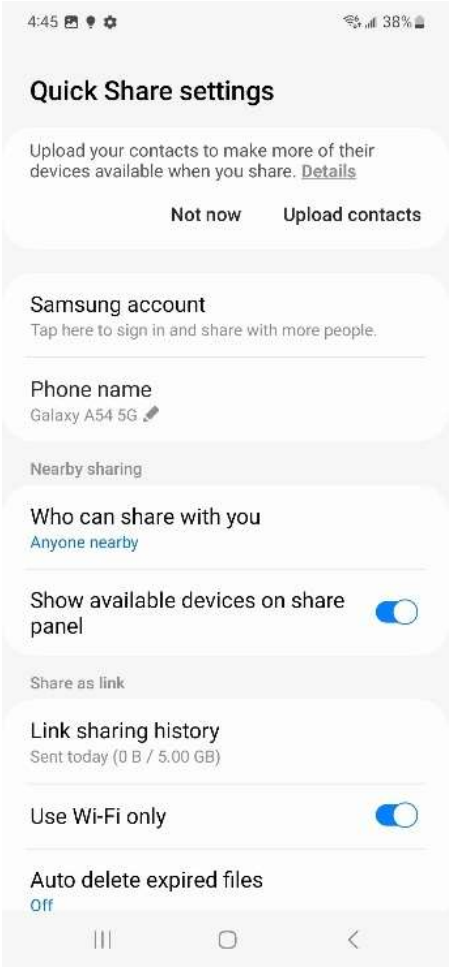
Step 3. Follow the on-screen instructions.

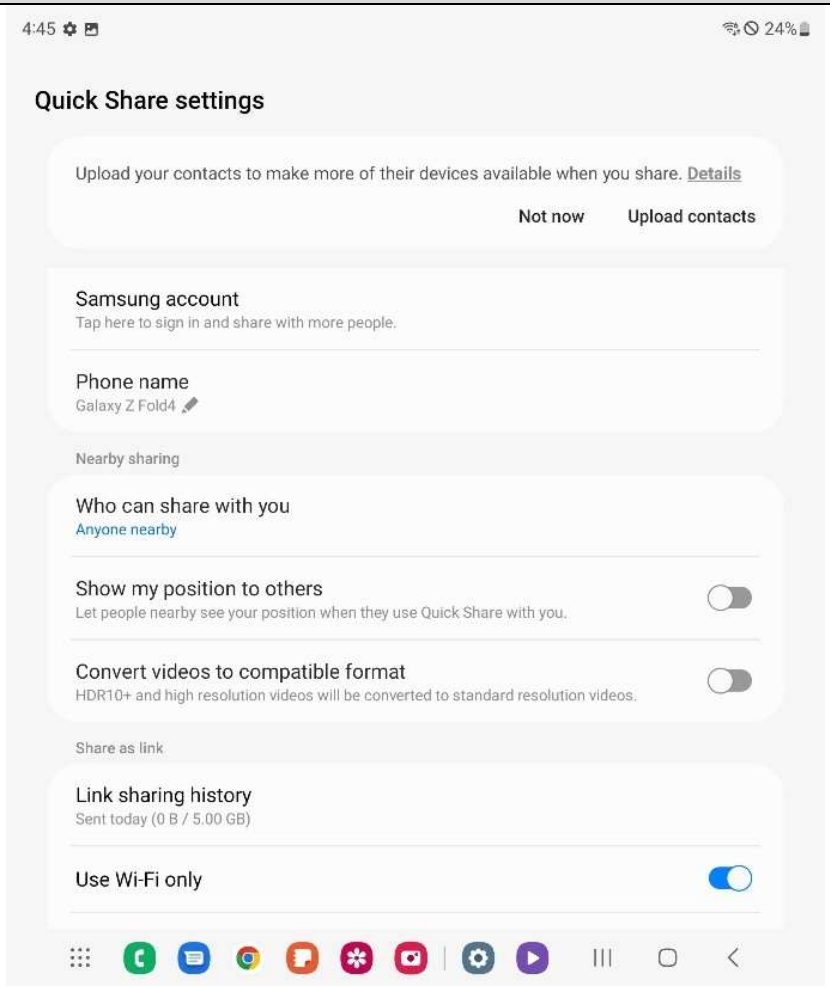
Quick Share feature highlights

Quick Share will let you share images, videos, and files instantly with your friends. You can share files with up to 5 people simultaneously without the need of pairing devices.

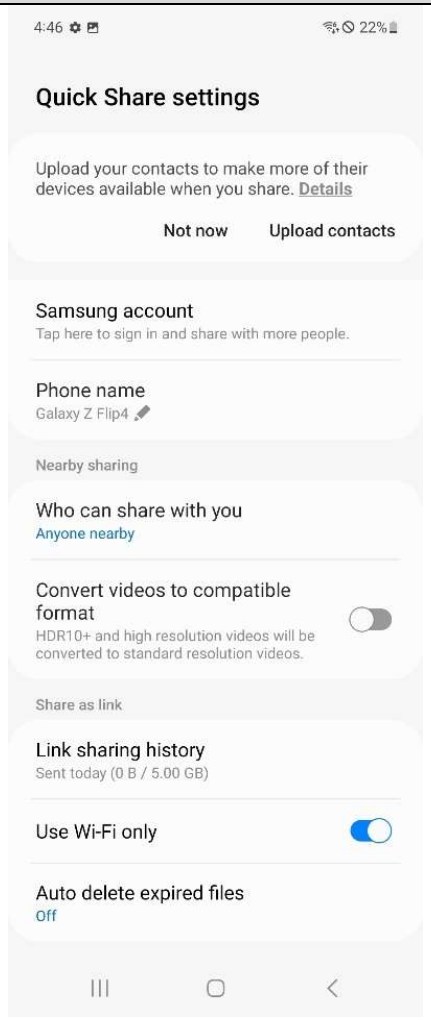
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Step 1. First, make sure the Quick Share feature is turned on for both phones. On the other device, open the notification panel, swipe downwards, and then tap **Quick Share** to activate it. It will be blue when it's activated. If the Quick Share icon does not appear in your Quick settings panel, you may need to add it. **Step 2**. Launch the **Gallery** app and select an image. Tap the **Share** button and select a device to transfer the image. Accept the file transfer request on the other device.  **Step 3**. If you're having trouble connecting to another device, swipe down from the top of your screen to open Quick Settings, and then touch and hold the **Quick Share** icon. Tap the **switch** next to "**Show my position to others**" to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled. The "Show my position to others" option is only available on select models. https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/ For example, the following screenshots show exemplary Accused Samsung '590 Products selecting Quick Share "Wi-Fi only" and then sending data through the Quick Share application:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy 23 Ultra: 

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Samsung Galaxy A54 5G:  **Samsung Galaxy ZFold 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Samsung Galaxy ZFlip 4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy S23 Ultra)	Video Information Receiving Device (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)



U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

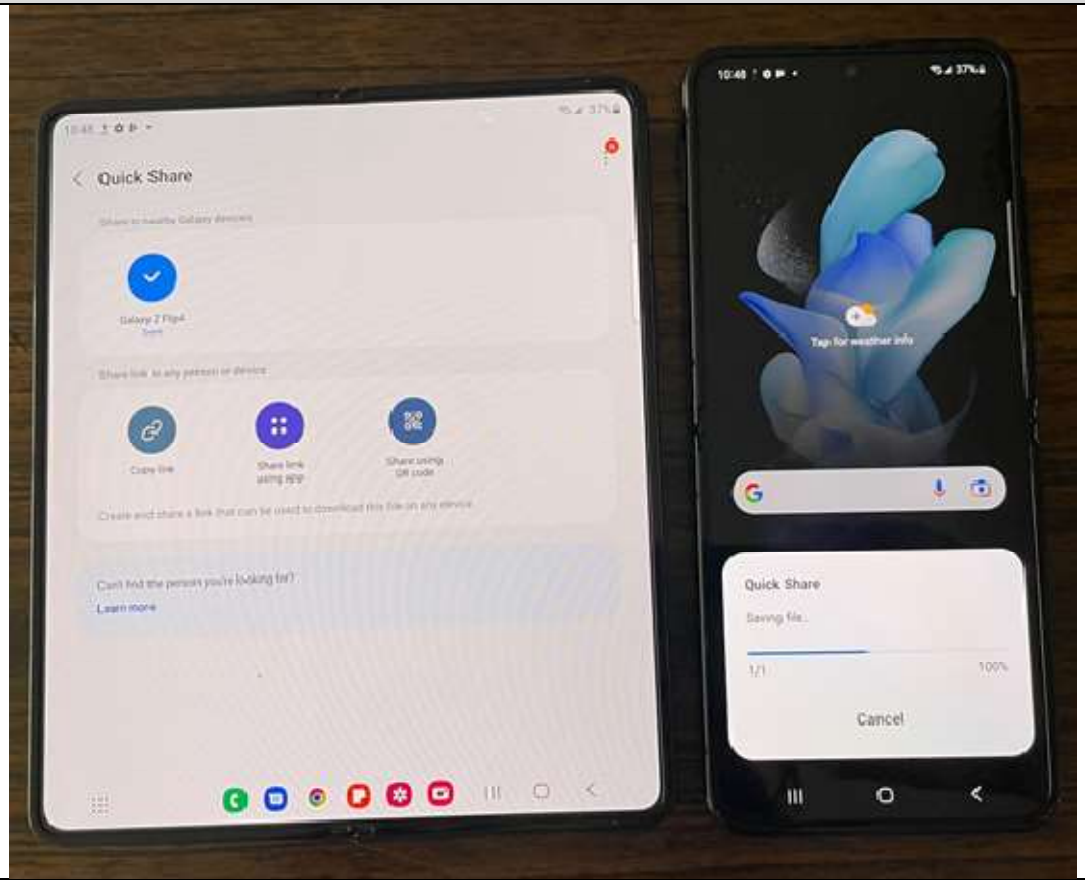
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement		
	Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)	

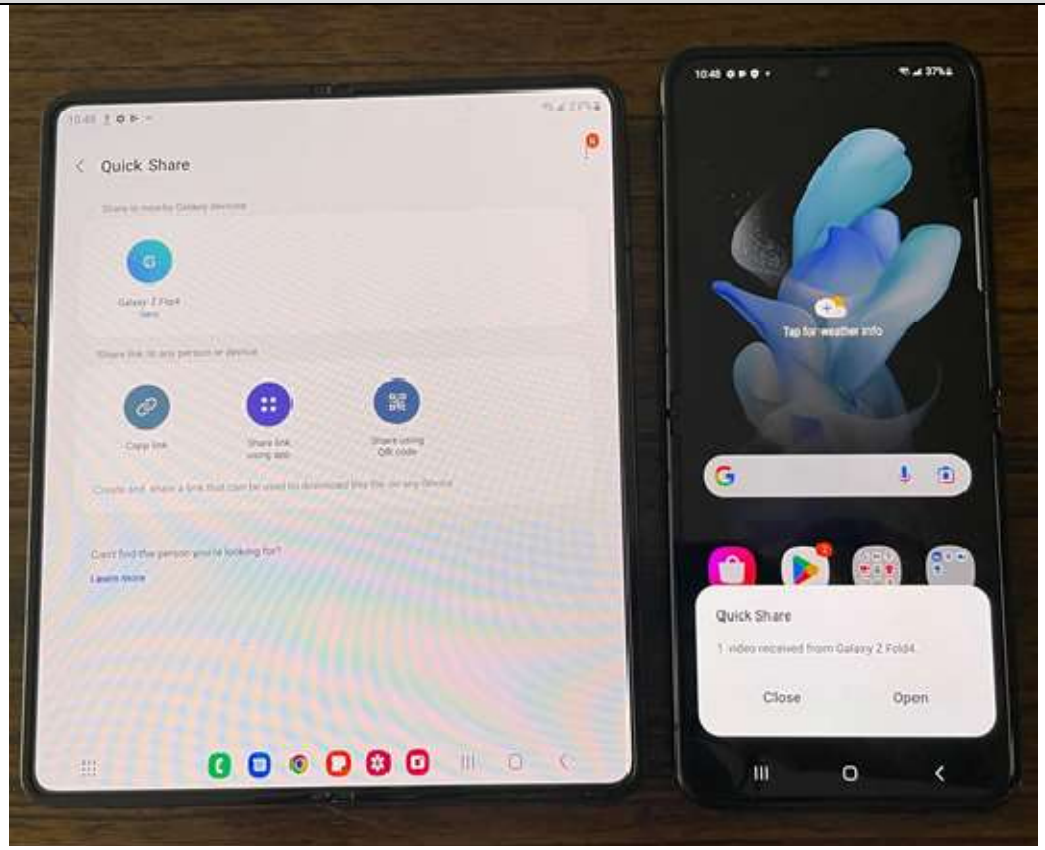

1 item
Galaxy Store
Play Store
Google
Microsoft

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

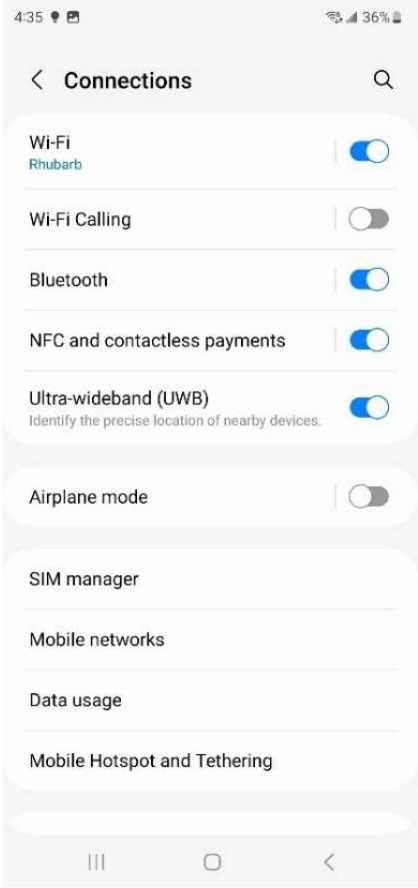
APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

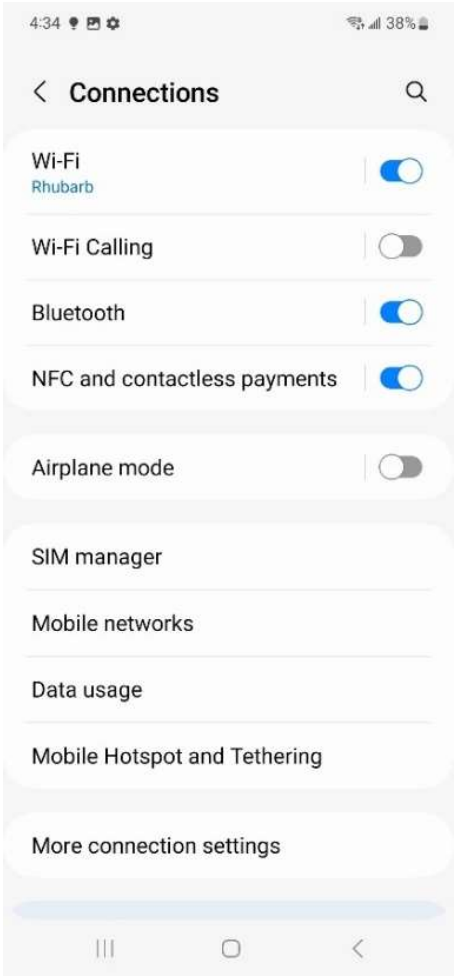
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

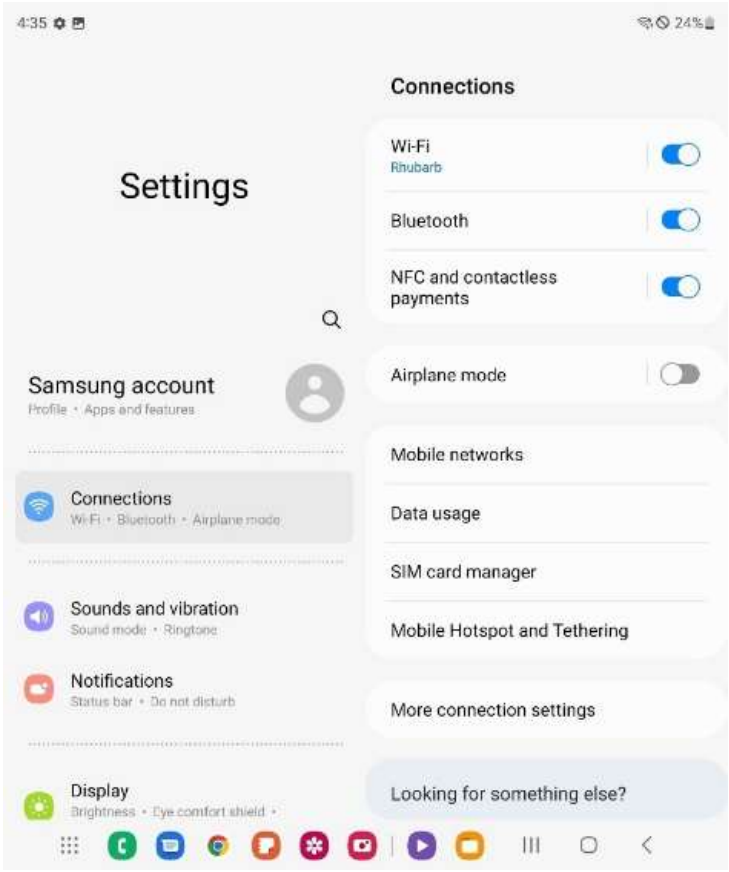
	 1 item Galaxy Store Clock Calendar Play Store Google Microsoft

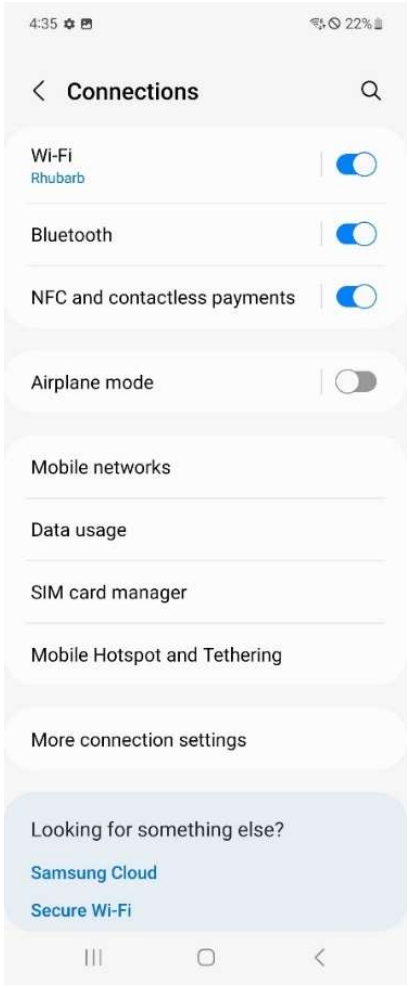
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 For example, the following screenshots show exemplary Accused Samsung '590 Products turning Wi-Fi on/off and cellular on/off (e.g., using the "Settings" and/or using quick menu options): User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

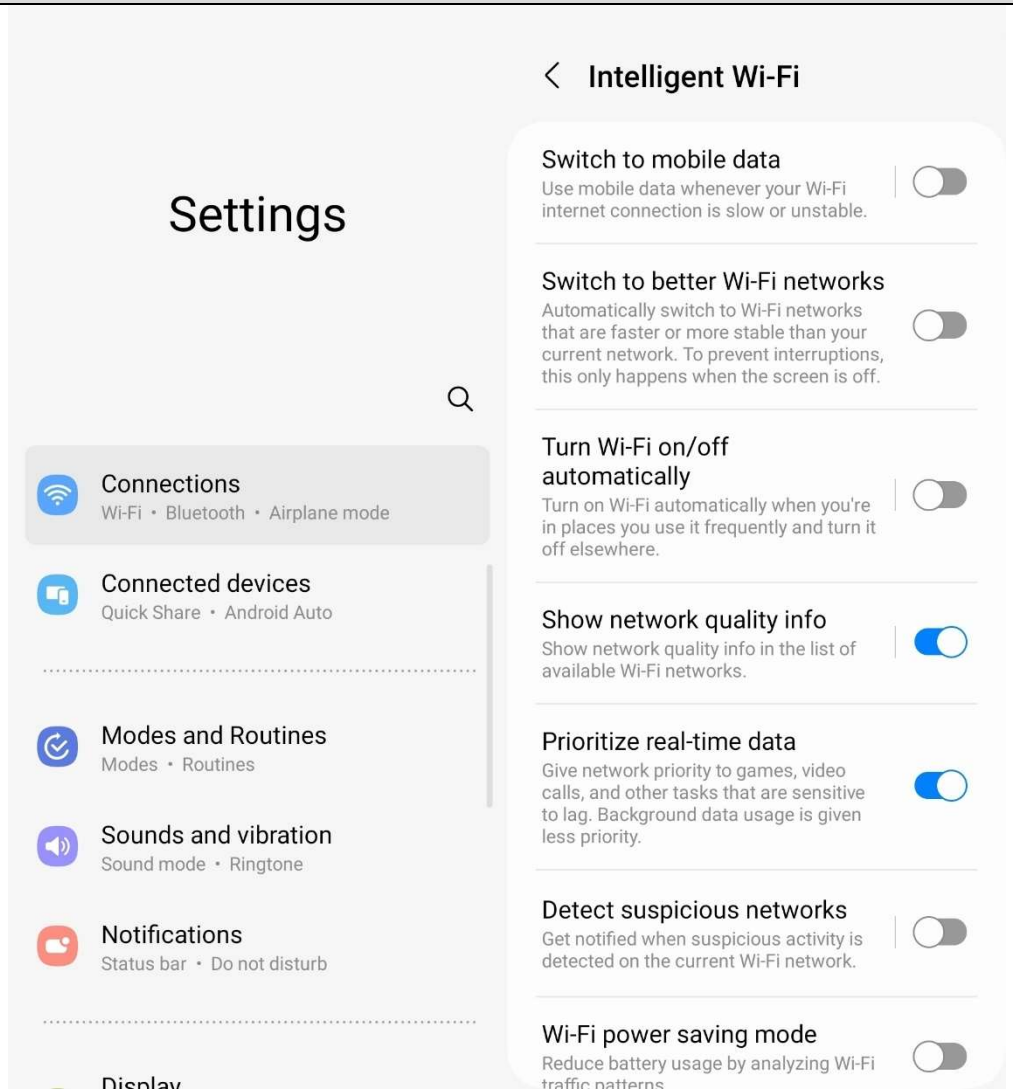
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example of "an indication" from a user to control assignment, the user can turn Wi-Fi on and turn cellular connection off to indicate that the user wants to use Wi-Fi for communications. As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Wi-Fi off to indicate that the user wants to use cellular connection for communications. Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Switch to mobile data," under the Intelligent Wi-Fi tab, so the user is indicating to assign a connection to the cellular communication chip when the Wi-Fi connection is unstable. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. • **Prioritize real-time data**: Give network priority to games, video calls, and other tasks that are sensitive to lag. • **Detect suspicious networks**: Get notified when suspicious activity is detected on the current Wi-Fi network. • **Wi-Fi power saving mode**: Enable Wi-Fi traffic analysis to reduce battery usage. • **Auto Hotspot connection**: Automatically connect to a Wi-Fi hotspot when detected. • **Intelligent Wi-Fi**: View the Intelligent Wi-Fi version. Galaxy Z Flip4 User Guide at pg. 122.

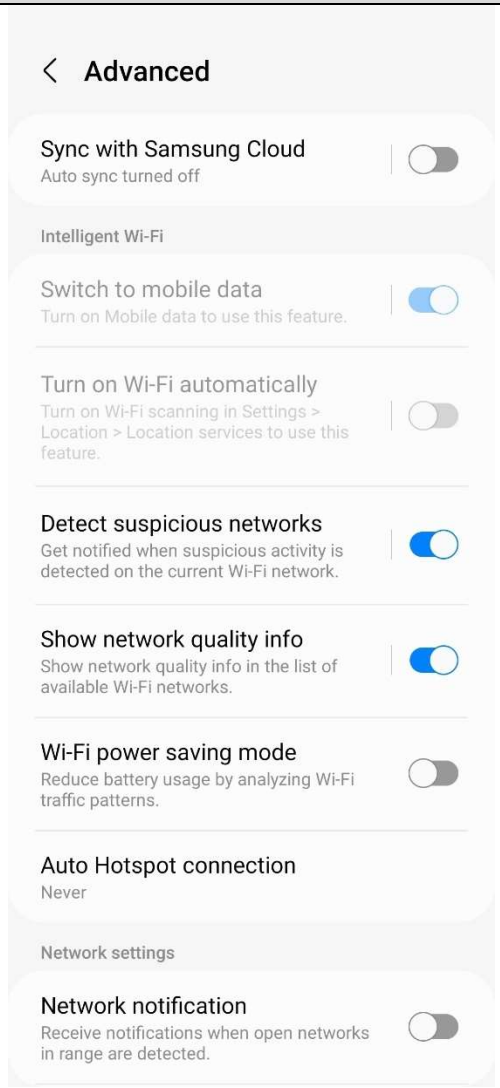
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. • **Prioritize real-time data**: Give network priority to games, video calls, and other tasks that are sensitive to lag. • **Detect suspicious networks**: Get notified when suspicious activity is detected on the current Wi-Fi network. • **Wi-Fi power saving mode**: Enable Wi-Fi traffic analysis to reduce battery usage. • **Auto Hotspot connection**: Automatically connect to a Wi-Fi hotspot when detected. • **Intelligent Wi-Fi**: View the Intelligent Wi-Fi version. Galaxy Z Flip4 User Guide at pg. 122.

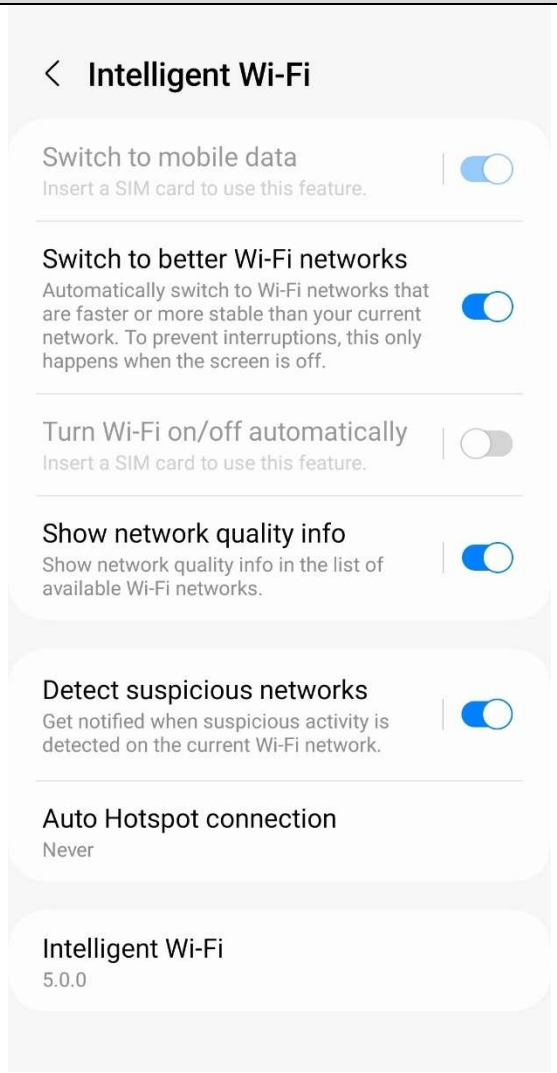
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G: Intelligent Wi-Fi settings You can configure connections to various types of Wi-Fi networks and hotspots, manage saved networks and look up your device's network addresses. Options may vary by service provider. 1. From Settings, tap **Connections** > **Wi-Fi**, and then tap to turn on Wi-Fi. 2. Tap **More options** > **Intelligent Wi-Fi** for the following options: • **Switch to mobile data**: When enabled, your device will switch to mobile data whenever the Wi-Fi connection is unstable. When the Wi-Fi signal is strong, it switches back to Wi-Fi. • **Switch to better Wi-Fi networks**: Automatically switch to faster or more stable Wi-Fi networks. • **Turn Wi-Fi on/off automatically**: Turn on Wi-Fi in frequently-used locations. • **Show network quality info**: Display network information (such as speed and stability) in the list of available Wi-Fi networks. Galaxy A54 G User Guide at pg. 101.

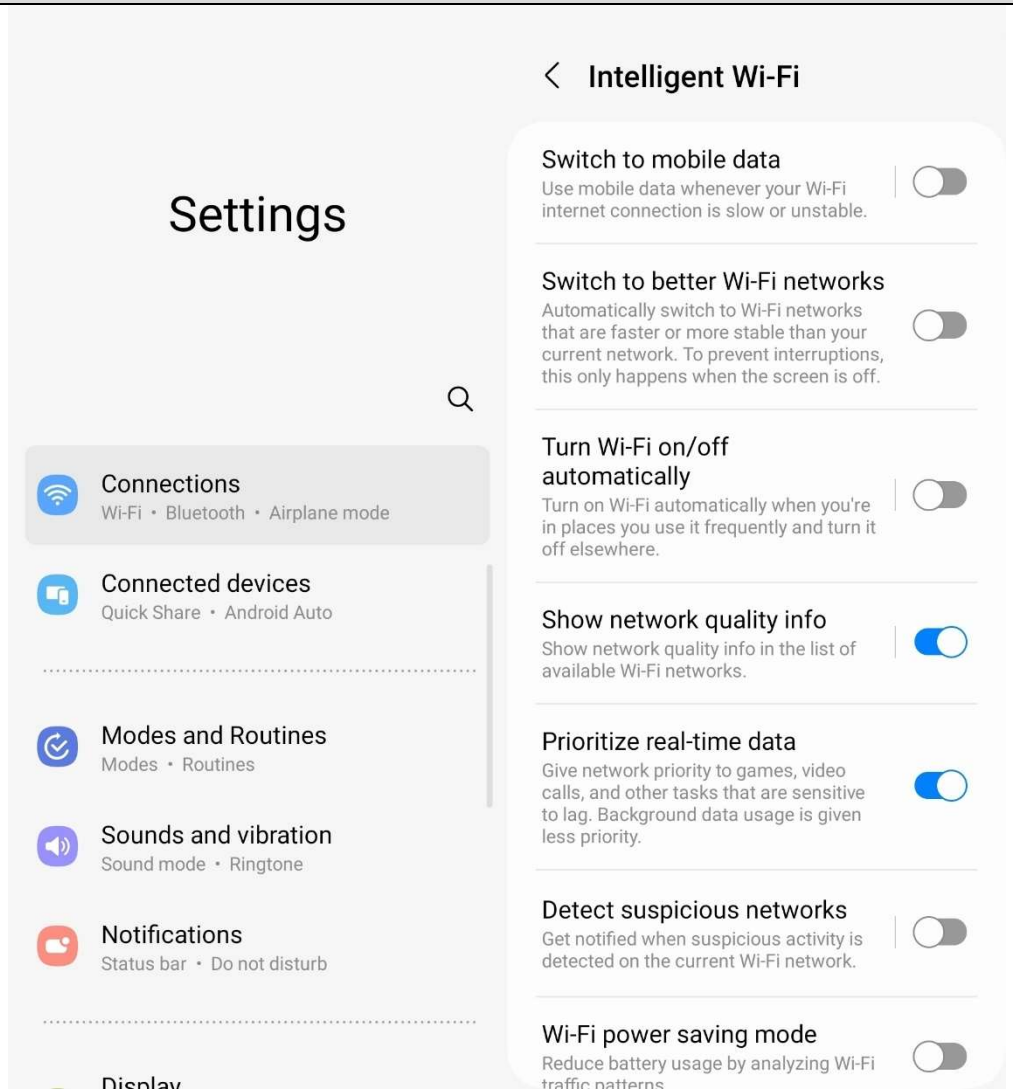
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



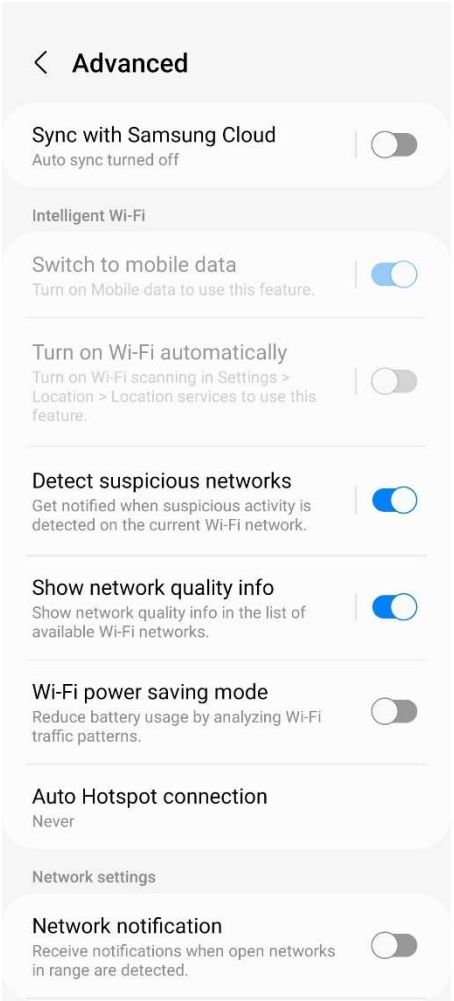
Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

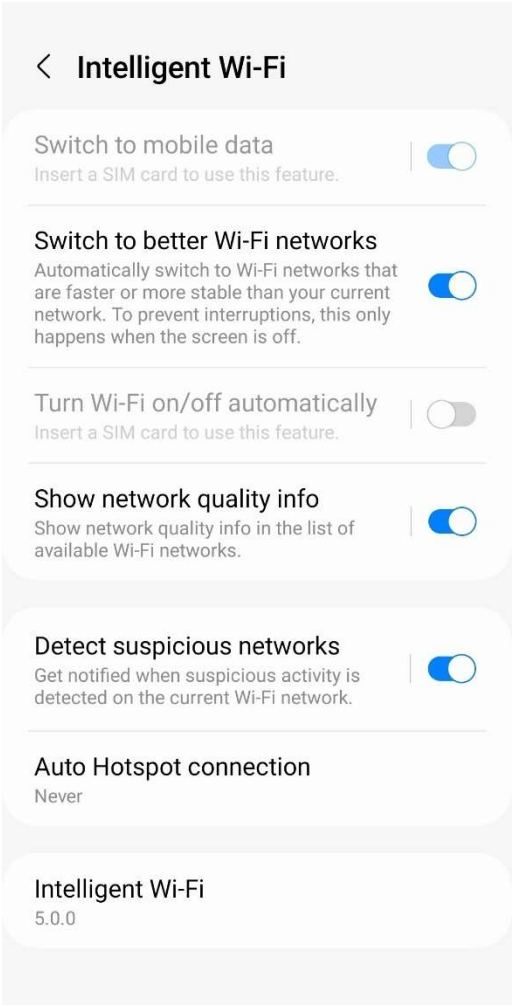
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting " Turn Wi-Fi on/off automatically," so the user is indicating to switch on Wi-Fi in frequently used areas. **Galaxy Z Fold4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

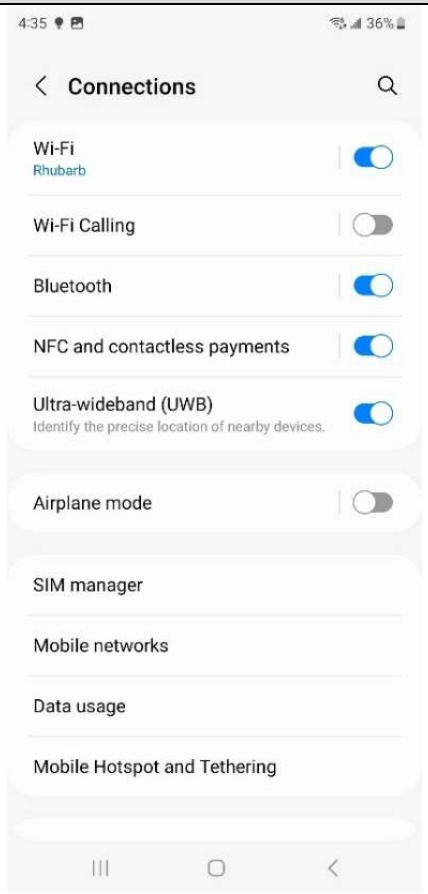


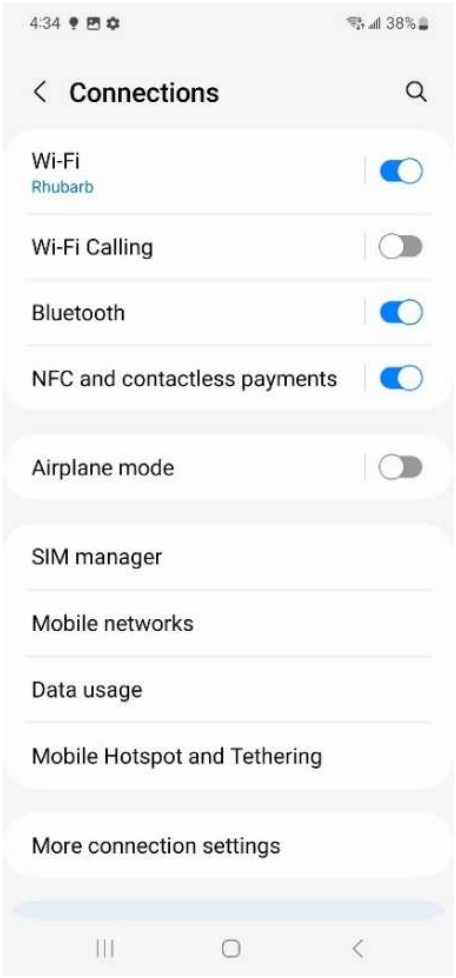
Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Flip4

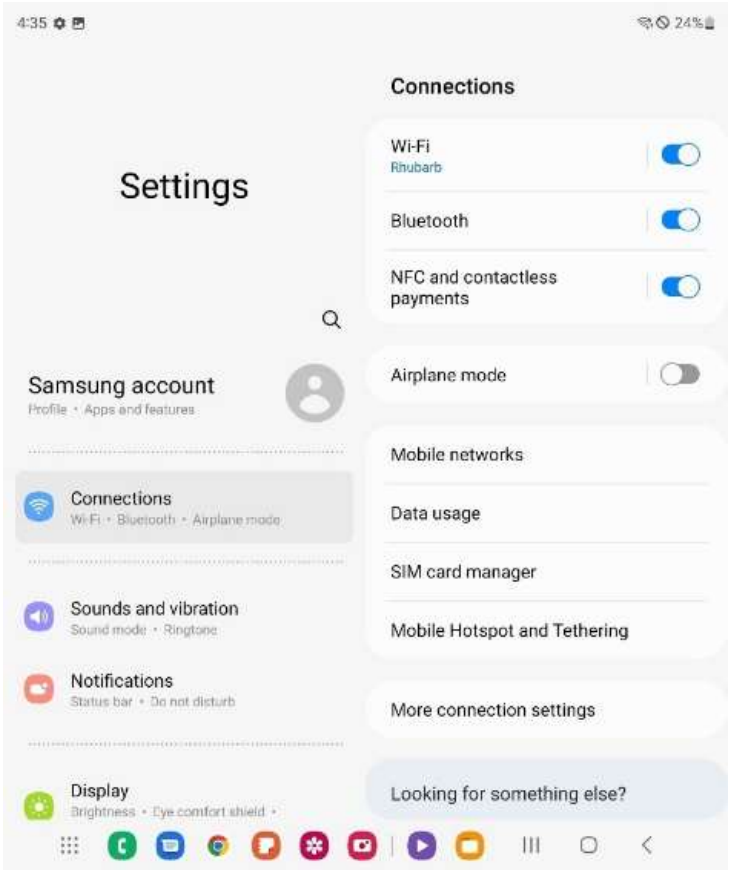
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy Z Flip4:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy Z Fold4

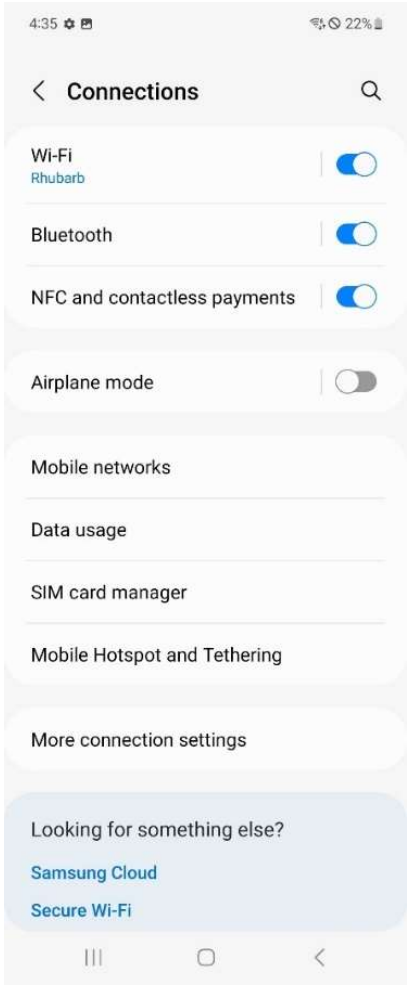
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Galaxy A54 G:  Screenshot showing the Intelligent Wi-Fi settings of Galaxy A54 G.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Moreover, a user can provide multiple types of indication by turning one or more of Bluetooth/Wi-Fi/cellular circuits on and off to indicate the connection preference of the user. As an additional example, "an indication" for the user to control assignment to the cellular communication chip is selecting "Avoid bad Wi-Fi connections," so the user is indicating to assign a connection to the cellular communication chip when there are bad Wi-Fi connections. **Second Infringement Theory:** For example, the controller (*e.g.*, CPU) of each of the Accused Samsung '590 Products controls assignment of connection of the Bluetooth and cellular communication chips in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the Bluetooth communication circuit, the controller assigns a connection to the Bluetooth communication circuit for transmitting the video by using Bluetooth to share files. For example, "an indication" from a user to control assignment to the Bluetooth communication chip is turning Bluetooth on/off, and "an indication" from a user to control assignment to the cellular communication chip is turning the cellular connection on/off from the quick menu. For example, the following screenshots show exemplary Accused Samsung '590 Products turning Bluetooth on/off and cellular on/off: User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy S23 Ultra)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy A54 5G)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFold 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 User indication to turn cellular/Wi-Fi/Bluetooth/NFC On or Off (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>As an additional example of "an indication" from a user to control assignment, the user can turn Bluetooth on and turn cellular connection off to indicate that the user wants to use Bluetooth for communications.

As an additional example of "an indication" from a user to control assignment, the user can turn cellular connection on and turn Bluetooth off to indicate that the user wants to use cellular connection for communications.

Further, the user can provide an indication to transmit video information using the Bluetooth communication circuit by selecting "Bluetooth" share, and the controller then assigns a connection to the Bluetooth communication circuit for transmitting the video.

<table><tr><td>Video Information Transmitting Device (Samsung Galaxy S23 Ultra)</td><td>Video Information Receiving Device (Samsung Galaxy A54 5G)</td></tr></table></td></tr>
</table>

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G)	Video Information Receiving Device (Samsung Galaxy S23 Ultra)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

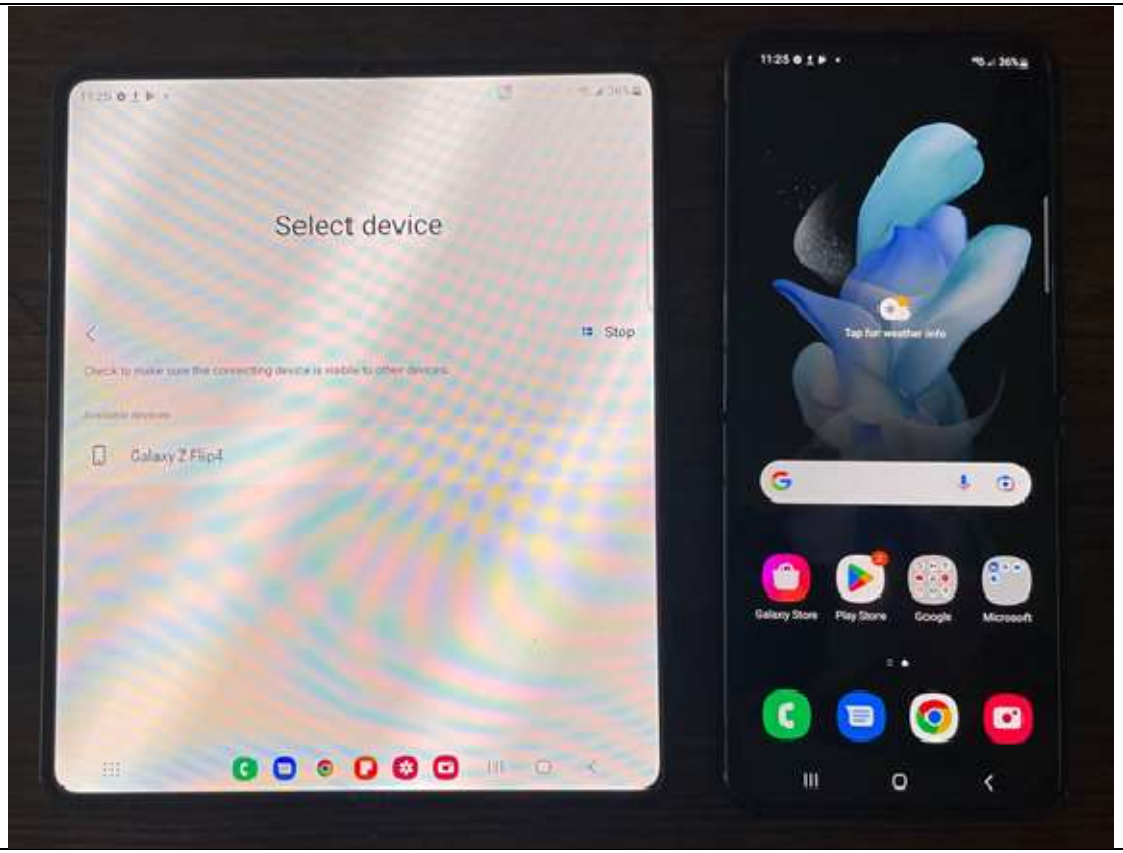
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

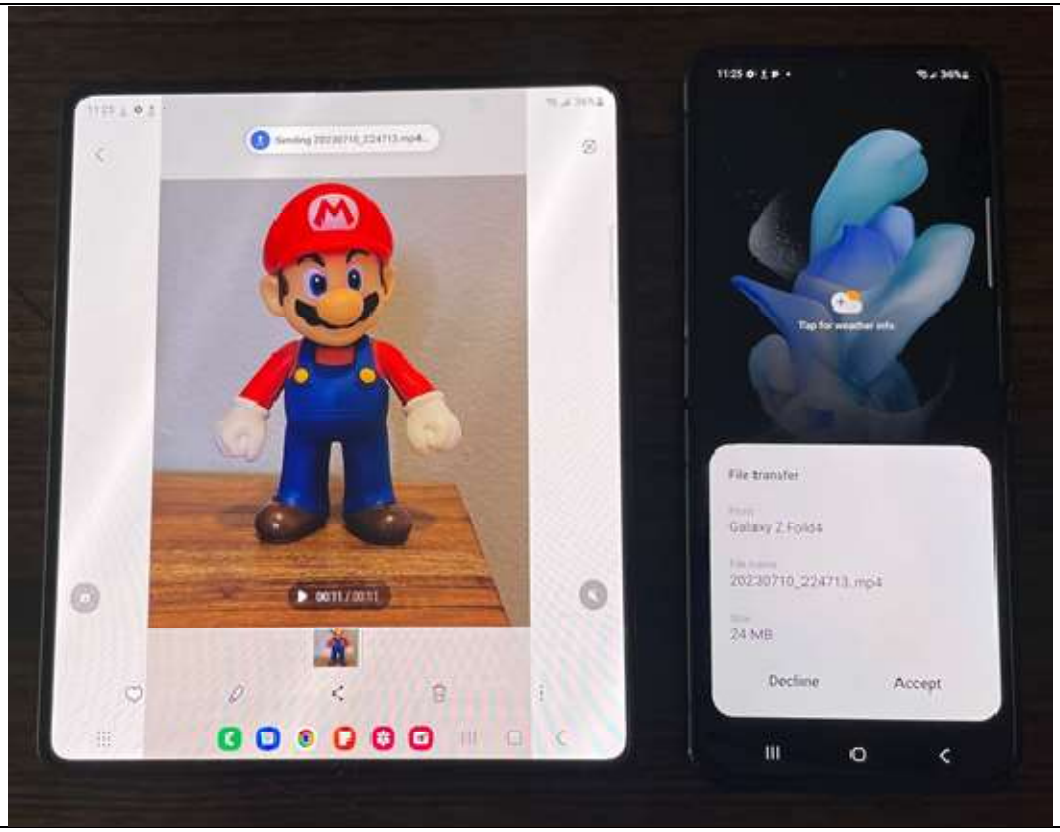


Video Information Transmitting Device (Samsung Galaxy ZFold 4)	Video Information Receiving Device (Samsung Galaxy ZFlip 4)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

		 Select device Stop Galaxy Z Flip4 Tap for weather info Galaxy Store Play Store Google Microsoft

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



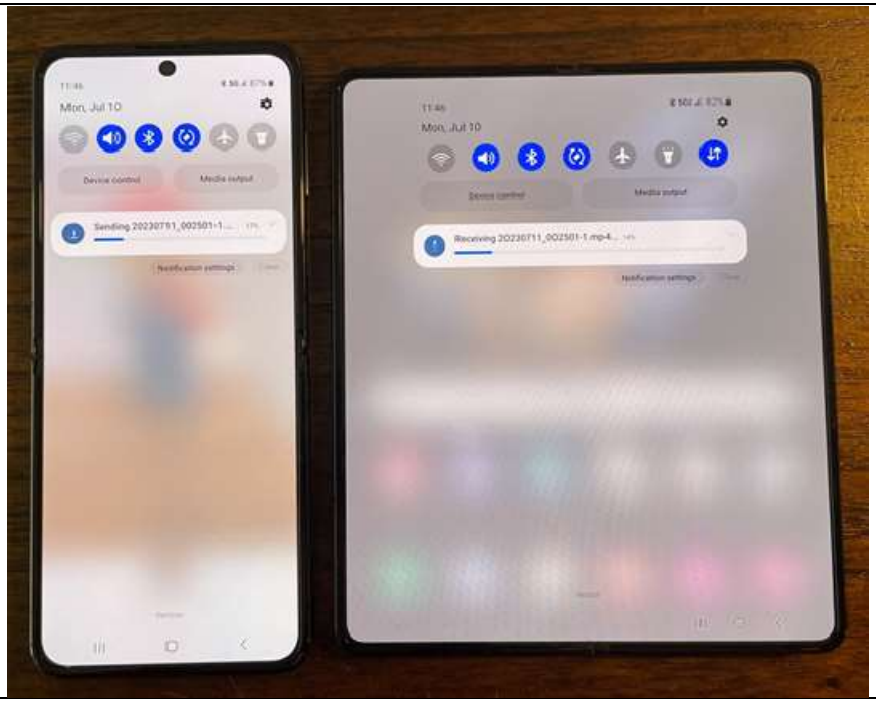
Video Information Transmitting Device (Samsung Galaxy ZFlip 4)	Video Information Receiving Device (Samsung Galaxy ZFold 4)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

	 Galaxy Store Microsoft 23.2 MB Decline Accept	


Mon, Jul 10
Device control
Media output
Mon, Jul 10
Device control
Media output

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls assignment of connection in response to a user selecting options via the touch interface (display) in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.
[23.l] wherein the controller controls each of the first and second radio communication circuit so that the first radio	In each of the Accused Samsung '590 Products, the controller controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously, and	information and the second radio communication circuit connects to the internet or the home network simultaneously. **First Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control the transmission of video information via the Wi-Fi communication chip (e.g., Quick Share) and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:** **1.7 Simultaneous Transmission Capabilities** According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

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Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

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60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

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59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

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56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios						
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR)	+	(DTS Ant.1	or	DTS Ant.2)		
	2	WWAN (2G/3G/LTE/NR)	+	DTS MIMO				
	3	WWAN (2G/3G/LTE/NR)	+	(UNII Ant.1	or	UNII Ant.2)		
	4	WWAN (2G/3G/LTE/NR)	+	UNII MIMO				
	5	WWAN (2G/3G/LTE/NR)	+	BT				
	6	WWAN (2G/3G/LTE/NR)	+	BT	+	(UNII Ant.1	or	UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR)	+	BT	+	UNII MIMO		
	8	ENDC (LTE + NR)	+	(DTS Ant.1	or	DTS Ant.2)		
	9	ENDC (LTE + NR)	+	DTS MIMO				
	10	ENDC (LTE + NR)	+	(UNII Ant.1	or	UNII Ant.2)		
	11	ENDC (LTE + NR)	+	UNII MIMO				
	12	ENDC (LTE + NR)	+	BT				
	13	ENDC (LTE + NR)	+	BT	+	(UNII Ant.1	or	UNII Ant.2)
	14	ENDC (LTE + NR)	+	BT	+	UNII MIMO		
Phablet-10g	15	Scenatios item (1-14)	+	NFC				

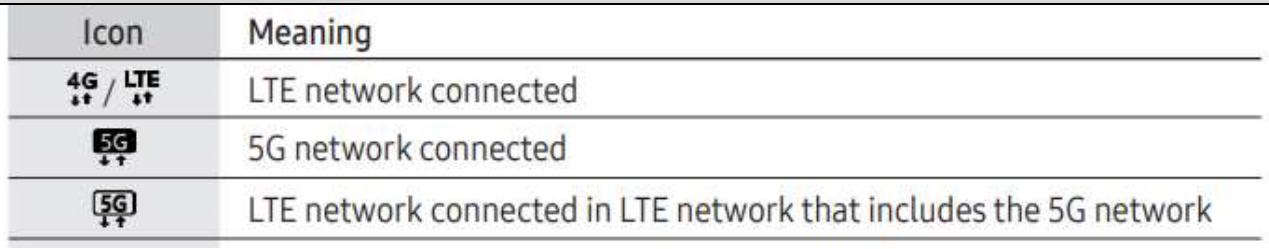
Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network

Galaxy S23 Ultra User Guide, pg. 30.

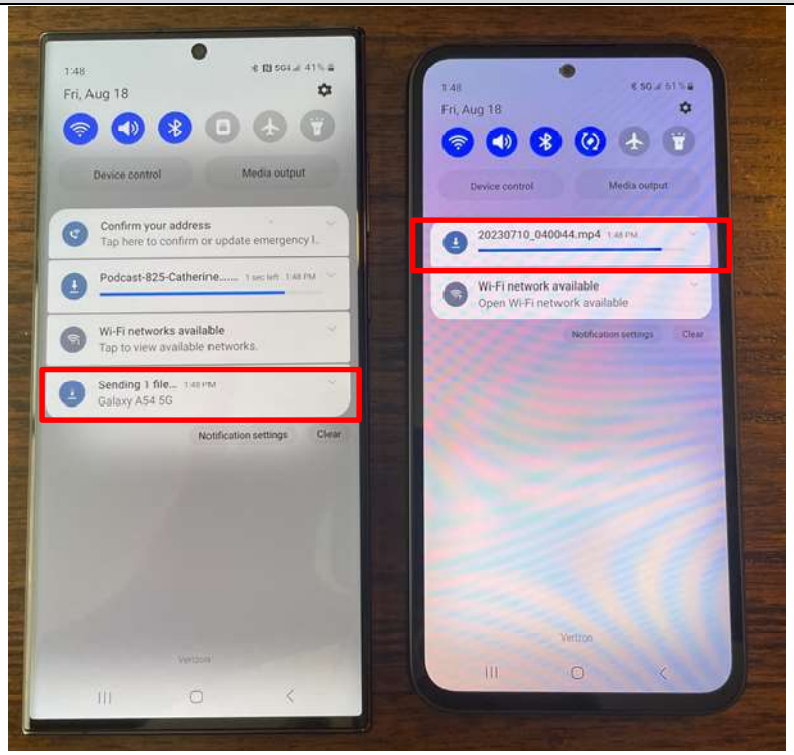
In addition, the Wi-Fi communication chip is used to transmit video information via "Quick Share" while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content over cellular network as Wi-Fi router is switched off indicating that data services are being provides simultaneously over cellular network. For example, the Accused Samsung '590 Products transmit video information over Quick Share while simultaneously connecting to the Internet over cellular network to send or receive emails/MMS, receive a stream of video, doing a video call and/or other services that require cellular data:

First theory:

Video Information Transmitting Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

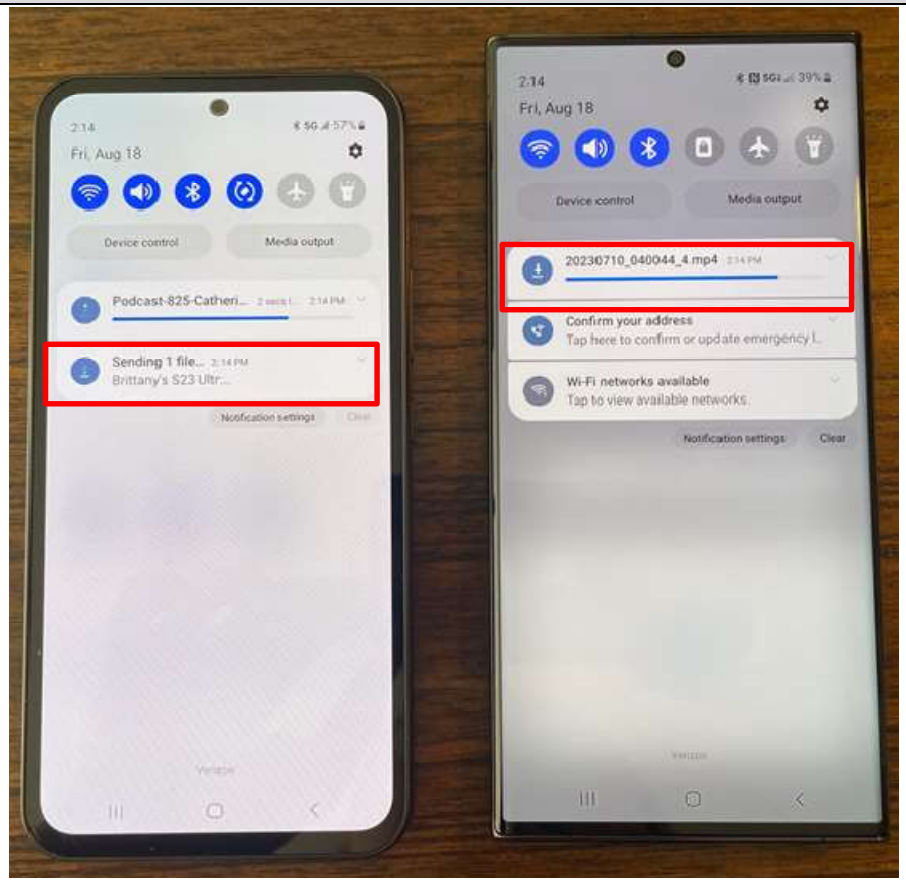
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

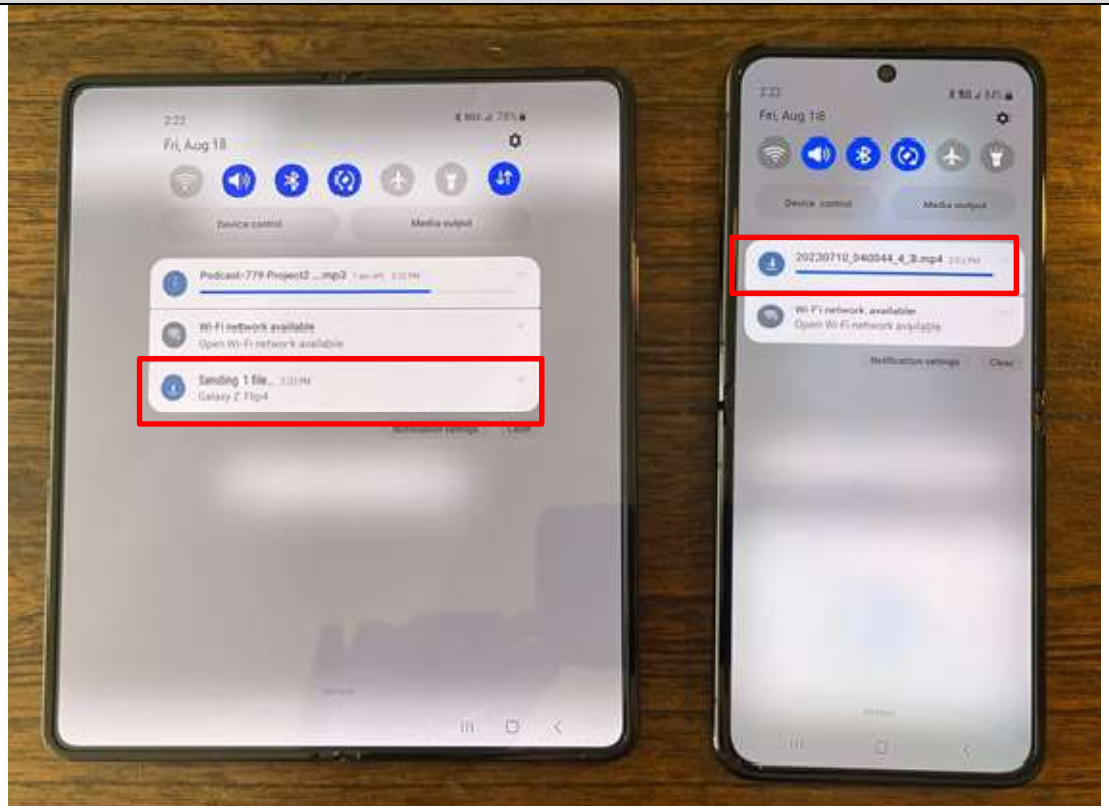


Video Information Transmitting Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

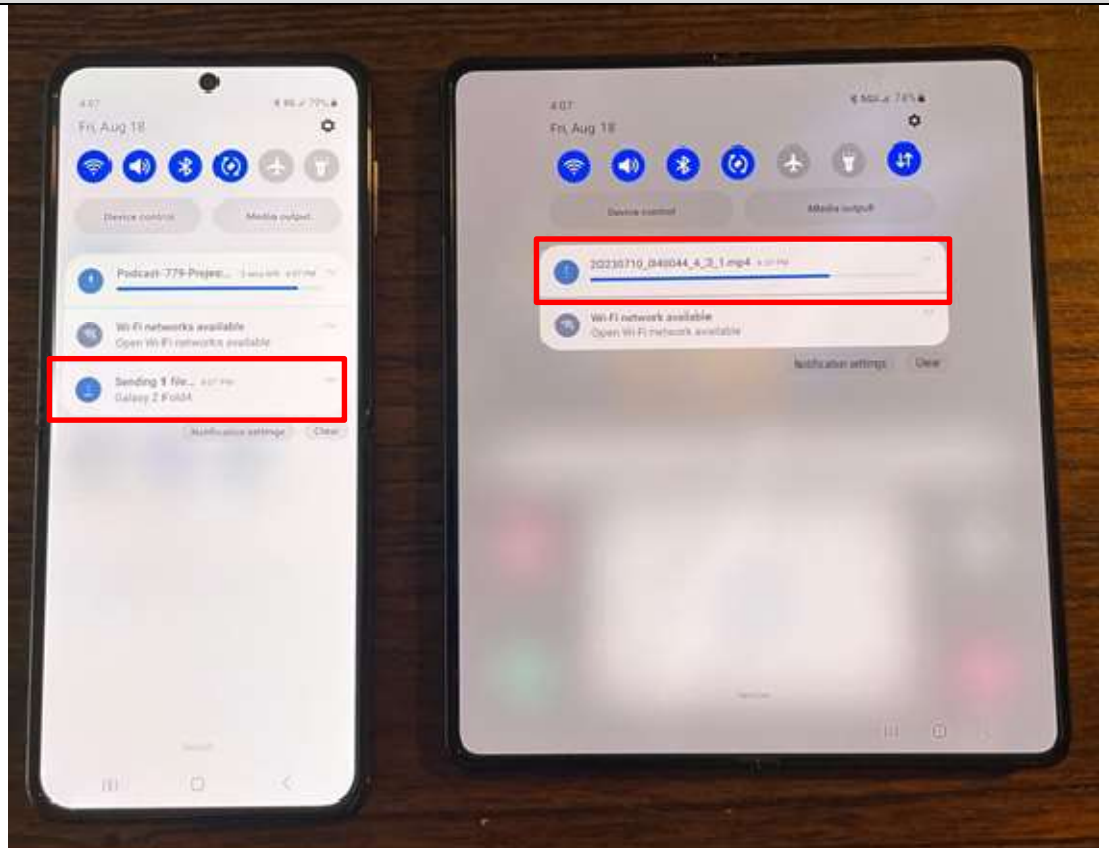
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 **Second Infringement Theory:** For example, the controller (*e.g.*, one or more processors in the chipset executing source code) of each of the Accused Samsung '590 Products is configured to control the transmission of video information via the Bluetooth communication chip and the cellular communication chip connects to the Internet or home network simultaneously. **Galaxy S23 Ultra:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	1.7 Simultaneous Transmission Capabilities According to FCC KDB Publication 447498 D04v01, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D04v01 procedures.

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
2	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 2.4 GHz Bluetooth MIMO	Yes	Yes	N/A	Yes	
10	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
13	GSM voice + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
14	GSM voice + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
15	GSM voice + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
22	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
23	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
25	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
26	UMTS + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
27	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
30	UMTS + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
31	UMTS + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
32	UMTS + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
36	LTE + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
39	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
40	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
42	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
43	LTE + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
44	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
47	LTE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
48	LTE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
49	LTE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
57	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
58	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
59	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

60	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
61	LTE + NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
62	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
65	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
66	LTE + NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
67	LTE + NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
71	NR + 2.4 GHz Bluetooth Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
74	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
75	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
77	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
78	NR + 2.4 GHz Bluetooth MIMO	Yes	Yes	Yes	Yes	
79	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
82	NR + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
83	NR + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
84	NR + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
88	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
94	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
95	GPRS/EDGE + 2.4 GHz Bluetooth MIMO	N/A	N/A	Yes	Yes	
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
100	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
101	GPRS/EDGE + 2.4 GHz Bluetooth MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

Galaxy Z Flip4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
2	GSM voice + 2.4 GHz WLAN Ant 2	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
4	GSM voice + 5 GHz WLAN Ant 1	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
8	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	
9	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
15	GSM voice + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
16	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
17	GSM voice + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
18	UMTS + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
19	UMTS + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
20	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
21	UMTS + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
22	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
23	UMTS + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
24	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
25	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
26	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
29	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
30	UMTS + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
31	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
32	UMTS + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
33	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
34	UMTS + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
35	LTE + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
37	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
38	LTE + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
39	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
40	LTE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
42	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
43	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
44	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
45	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
46	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
47	LTE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
48	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
49	LTE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
50	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
51	LTE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
52	LTE + NR	Yes	Yes	N/A	Yes	
53	LTE + NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
54	LTE + NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
55	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
56	LTE + NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
57	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
58	LTE + NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

59	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
60	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
61	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
62	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
63	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
64	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
65	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
66	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
67	LTE + NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
68	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
69	LTE + NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
71	NR + 2.4 GHz WLAN Ant 2	Yes	Yes	Yes	Yes	
72	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
73	NR + 5 GHz WLAN Ant 1	Yes	Yes	Yes	Yes	
74	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
75	NR + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
76	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
77	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	
78	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
79	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
80	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
81	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
82	NR + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
83	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
84	NR + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
85	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
86	NR + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
87	GPRS/EDGE + 2.4 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
88	GPRS/EDGE + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes	Yes	
89	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
90	GPRS/EDGE + 5 GHz WLAN Ant 1	N/A	N/A	Yes	Yes	
91	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
92	GPRS/EDGE + 2.4 GHz WLAN Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
93	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
94	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	
95	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
96	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
97	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
98	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
99	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
100	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
101	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
102	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
103	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

Galaxy Z Flip4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF721U/6090552.pdf

Galaxy Z Fold4:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 1-3
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	UMPC Body	UMPC Extremity	Notes
1	GSM voice + 2.4 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
2	GSM voice + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
3	GSM voice + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
4	GSM voice + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
5	GSM voice + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
6	GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
7	GSM voice + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
8	GSM voice + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
9	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
10	GSM voice + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
11	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
12	GSM voice + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
13	GSM voice + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
14	GSM voice + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
15	UMTS + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
16	UMTS + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
17	UMTS + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
18	UMTS + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
19	UMTS + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
20	UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
21	UMTS + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
22	UMTS + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
23	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
24	UMTS + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
25	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
26	UMTS + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
27	UMTS + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
28	UMTS + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
29	LTE + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
30	LTE + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
31	LTE + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
32	LTE + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
33	LTE + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
34	LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
35	LTE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
36	LTE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
37	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
38	LTE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
39	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
40	LTE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
41	LTE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
42	LTE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
43	LTE + NR	Yes	Yes	Yes	Yes	Yes	Yes	
44	LTE + NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
45	LTE + NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
46	LTE + NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
47	LTE + NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
48	LTE + NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
49	LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
50	LTE + NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
51	LTE + NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
52	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
53	LTE + NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
54	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
55	LTE + NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

56	LTE + NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
57	LTE + NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	N/A	Yes	Yes	Yes	^ Bluetooth Tethering is considered
58	NR + 2.4 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
59	NR + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
60	NR + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
61	NR + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
62	NR + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
63	NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	Yes	Yes	Yes	Yes	Yes	Yes	
64	NR + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	Yes	Yes	N/A	Yes	Yes	Yes	
65	NR + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
66	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
67	NR + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
68	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
69	NR + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
70	NR + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	Yes^	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
71	NR + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	Yes^	Yes*	N/A	Yes	Yes	Yes	* Pre-installed VOIP applications are considered. ^ Bluetooth Tethering is considered
72	GPRS/EDGE + 2.4 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
73	GPRS/EDGE + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
74	GPRS/EDGE + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
75	GPRS/EDGE + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
76	GPRS/EDGE + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
77	GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO	N/A	N/A	Yes	Yes	Yes	Yes	
78	GPRS/EDGE + 2.4 GHz WLAN MIMO + 6 GHz WLAN MIMO	N/A	N/A	N/A	Yes	Yes	Yes	
79	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
80	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
81	GPRS/EDGE + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
82	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	
83	GPRS/EDGE + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 2	N/A	N/A	N/A	Yes	Yes	Yes	
84	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	Yes^	Yes	Yes	Yes	^ Bluetooth Tethering is considered
85	GPRS/EDGE + 2.4 GHz WLAN Ant 2 + 6 GHz WLAN MIMO + 2.4 GHz Bluetooth Ant 1	N/A	N/A	N/A	Yes	Yes	Yes	

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

Galaxy A54 5G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Simultaneous transmission scenarios
Head & Body-worn & Hotspot & Phablet-10g	1	WWAN (2G/3G/LTE/NR) + (DTS Ant.1 or DTS Ant.2)
	2	WWAN (2G/3G/LTE/NR) + DTS MIMO
	3	WWAN (2G/3G/LTE/NR) + (UNII Ant.1 or UNII Ant.2)
	4	WWAN (2G/3G/LTE/NR) + UNII MIMO
	5	WWAN (2G/3G/LTE/NR) + BT
	6	WWAN (2G/3G/LTE/NR) + BT + (UNII Ant.1 or UNII Ant.2)
	7	WWAN (2G/3G/LTE/NR) + BT + UNII MIMO
	8	ENDC (LTE + NR) + (DTS Ant.1 or DTS Ant.2)
	9	ENDC (LTE + NR) + DTS MIMO
	10	ENDC (LTE + NR) + (UNII Ant.1 or UNII Ant.2)
	11	ENDC (LTE + NR) + UNII MIMO
	12	ENDC (LTE + NR) + BT
	13	ENDC (LTE + NR) + BT + (UNII Ant.1 or UNII Ant.2)
	14	ENDC (LTE + NR) + BT + UNII MIMO
Phablet-10g	15	Scenatios item (1-14) + NFC

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct, Hotspot and VoIP.
3. GPRS, W-CDMA, LTE, NR supports Hotspot and VoIP
4. U-NII Radio can transmit simultaneously with Bluetooth Radio.
5. NR Radio support to both SA and NSA(ENDC) Radio.
6. BT tethering is considered about each RF exposure conditions.
7. NFC can transmit simultaneously with other Radios in Phablet-10g condition.

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

For example, the following screenshots show the Accused Samsung '590 Products connected to the Internet via the cellular communication chipset as shown by the following status icon visible on the top of the products:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Icon	Meaning
4G / LTE	LTE network connected
5G	5G network connected
5G	LTE network connected in LTE network that includes the 5G network
	Wi-Fi connected
	Bluetooth feature turned on

Galaxy S23 Ultra User Guide, pg. 30.

The Bluetooth communication chip is used to transmit video information via Bluetooth file share while simultaneously connecting to the Internet via a cellular connection (5G or LTE) to download content as Wi-Fi is switched off (similar functionality also applies to receiving e-mail or MMS or streaming video or doing a video call over a cellular network while transmitting a Bluetooth file simultaneously):

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement	
	Video Information Transmitting Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)



<table>
<tr><th>U.S. Patent No. 10,129,590</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>
<table>
<tr><td>Video Information Transmitting Device (Samsung Galaxy A54 5G) (Wi-Fi Router Off)</td><td>Video Information Receiving Device (Samsung Galaxy S23 Ultra) (Wi-Fi Router Off)</td></tr>
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</td></tr>
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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

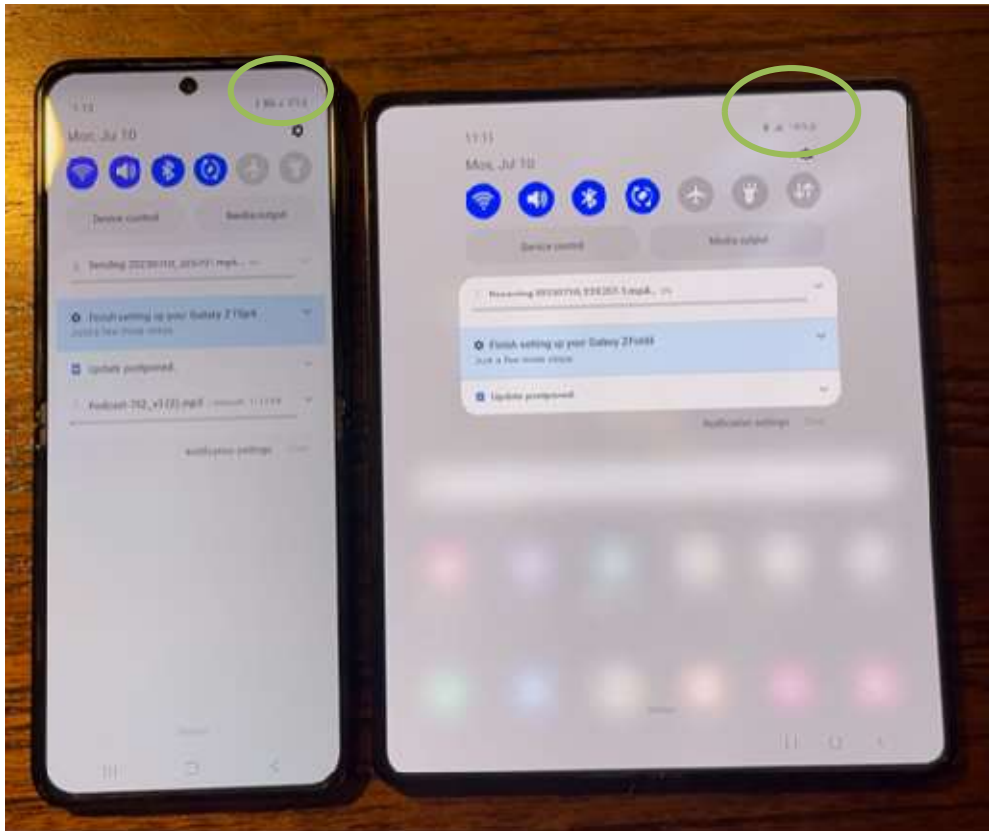


Video Information Transmitting Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)

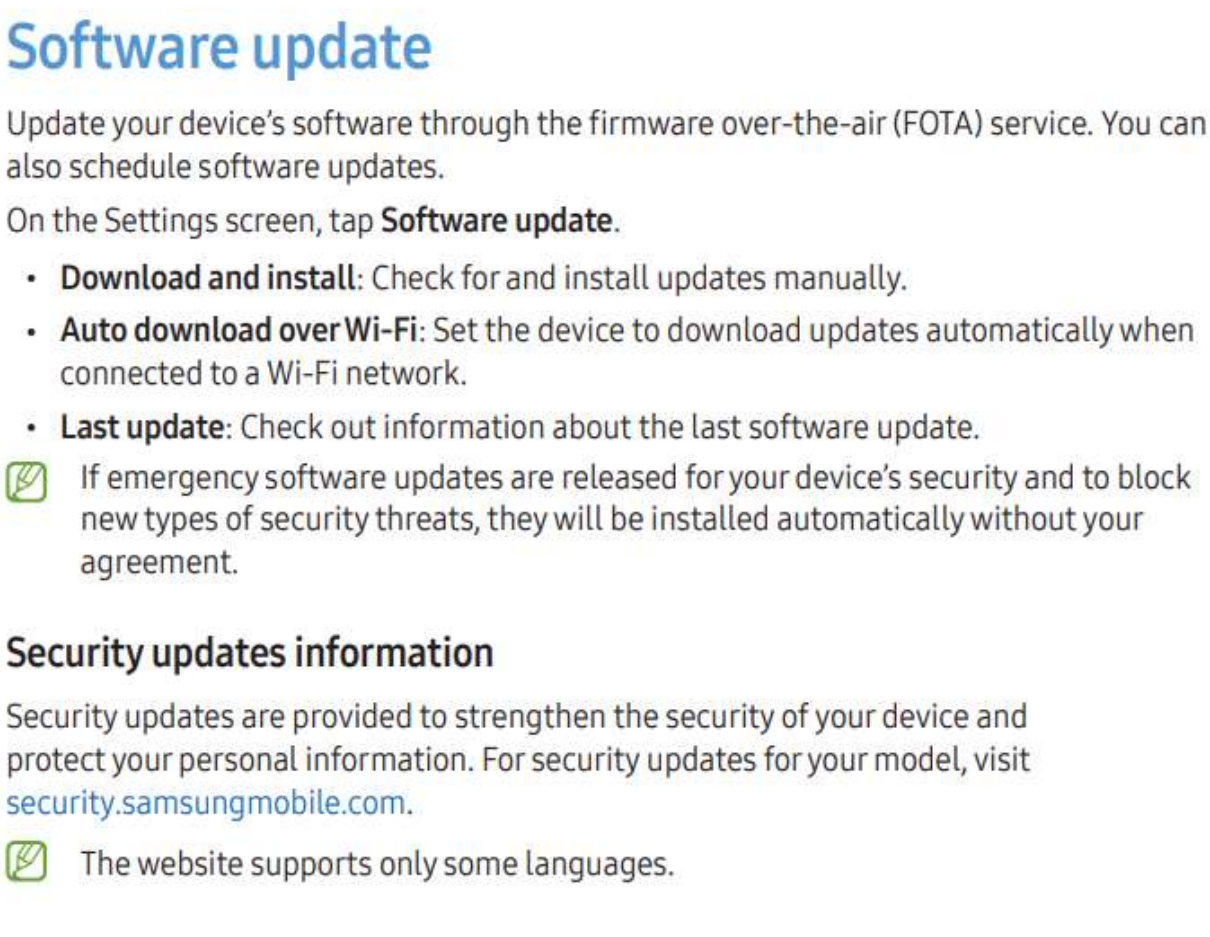
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement



Video Information Transmitting Device (Samsung Galaxy ZFlip 4) (Wi-Fi Router Off)	Video Information Receiving Device (Samsung Galaxy ZFold 4) (Wi-Fi Router Off)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a controller (e.g., a chipset with one or more CPUs) that controls simultaneous communication by WiFi or Bluetooth and cellular circuits in a similar manner when implementing Samsung QuickShare/Bluetooth File Share and connecting to the Internet. *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.samsung.com/us/support/answer/ANS00083184/.

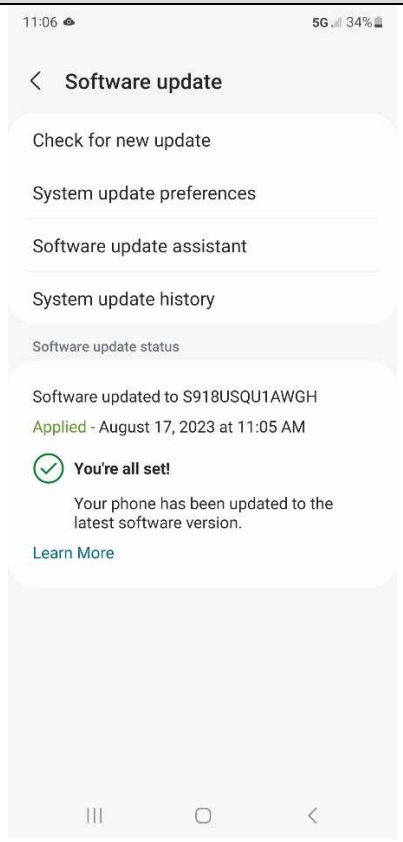
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Doctrine of Equivalents To the extent Samsung argues that this limitation is not literally met in any Accused Samsung '590 Product, Maxell asserts that this limitation is met under the doctrine of equivalents because the identified structure matches the function, way, and result of the claimed element and, to the extent there is a difference, the difference is insubstantial. For example, to the extent that Samsung argues that the Accused Samsung '590 Products do not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling each of the first and second radio communication circuit so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously. Using this software, hardware, or combination of the two, these products perform substantially the same function in substantially the same way as claimed. For example, the Accused Samsung '590 Products include an application processor/CPU which executes the operating system and source code for various applications to control Bluetooth, Wi-Fi, and cellular functionalities occurring simultaneous. The performance of this function achieves substantially the same result, for example, simultaneous transmission of video information with connection to the internet or home network.
[23.m] wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the cellular phone is available, and the cellular phone executes an update process such that an updated operating system of the cellular phone is stored in the cellular phone after execution of the update process.	In each of the Accused Samsung '590 Products, the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available, and the video processing apparatus executes an update process such that an updated operating system of the video processing apparatus is stored in the video processing apparatus after execution of the update process. For example, the operating system can be updated by connecting to the Internet via cellular communication circuits. **Galaxy S23 Ultra:**

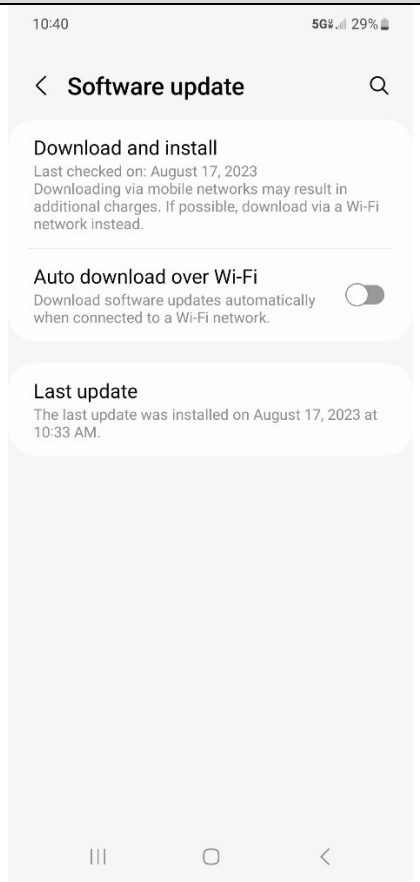
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Galaxy S23 Series User Guide at pg. 163. **Galaxy Z Flip4:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy Z Fold4:**

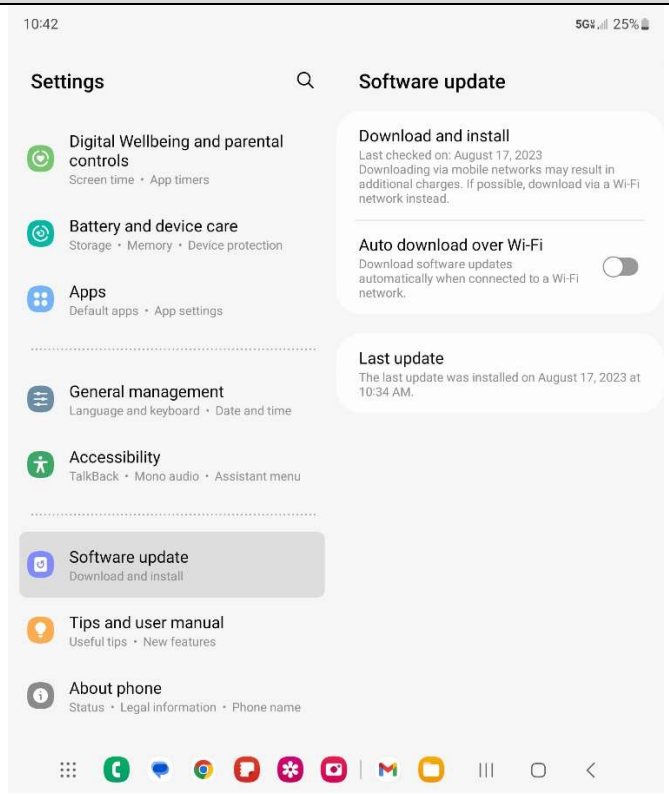
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy Z Flip4 and Fold4 User Guide at pgs. 165. **Galaxy A54 5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Software update/System updates Check for and install available software updates for your device. Options may vary by service provider. ○ From Settings, tap **Software update/System updates** for the following options: • **Check for updates**: Manually check for software updates. • **Check for software updates**: Manually check for software updates. • **Continue update**: Resume an update that was interrupted. • **Show software update history**: View a list of all software updates on your device. • **Smart updates**: Install security updates automatically. • **Download and install**: Check for software updates and install if any are available. • **Auto download over Wi-Fi**: Automatically download software updates when the device is connected to a Wi-Fi network. • **Last update**: View information about the installation of the current software. • **Use software upgrade assistant**: Install a tool to install system updates. Galaxy A54 User Guide at pg. 146. For example, the following screenshots show exemplary Accused Samsung '590 Products using the second radio communication circuits ("Download and install" option) to receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available: Galaxy S23 Ultra:

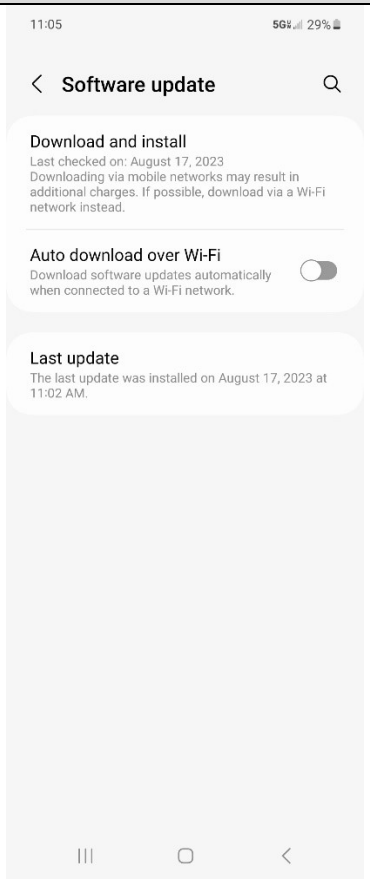
U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy A54G:

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 Samsung Galaxy ZFold4:

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Samsung Galaxy ZFlip 4:

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	 *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for receiving a signal from the Internet and updating the operating system in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00077582/.
[24] The cellular phone of claim 23, wherein the second or third radio communication	In each of the Accused Samsung '590 Products, the second or third radio communication circuits receive a signal from the internet indicating that an update for an application of the cellular phone is available, and the cellular phone executes an application update process such that an updated

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
circuits receive a signal from the internet indicating that an update for an application of the cellular phone is available, and the cellular phone executes an application update process such that an updated application of the cellular phone is stored in the cellular phone after execution of the application update process.	application of the cellular phone is stored in the cellular phone after execution of the application update process. For example, in each of the Accused Samsung '590 Products, at least a Wi-Fi or cellular communication circuit receives a signal from the internet indicating that an update for an application of the cellular phone is available, and the cellular phone executes an application update process such that an updated application of the cellular phone is stored in the cellular phone after execution of the application update process. **Galaxy Z Fold4 and Z Flip4:** Security update You can easily check the date of the last installed security software update and find out if newer updates are available. ○ From Settings, tap **Security and privacy** > **Updates** > **Security update** to see the latest security update installed and check if a newer update is available. Galaxy Z Fold4 and Z Flip4 User Guide at p. 150.

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Update apps from the Galaxy Store

Galaxy Apps has exclusive content made just for Samsung devices. You will need to update these apps separately from your Play Store apps.

Open **Galaxy Store**, tap the **Menu** icon (the three horizontal lines), in the bottom right corner, and then tap **Updates**. From here, you can either tap the **circling arrow** next to individual apps to update one at a time, or tap **Update all** to install all available updates.

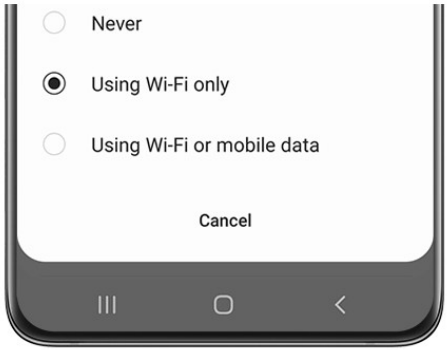


See https://www.samsung.com/us/support/answer/ANS00080581/

Turn on automatic updates in the Galaxy Store

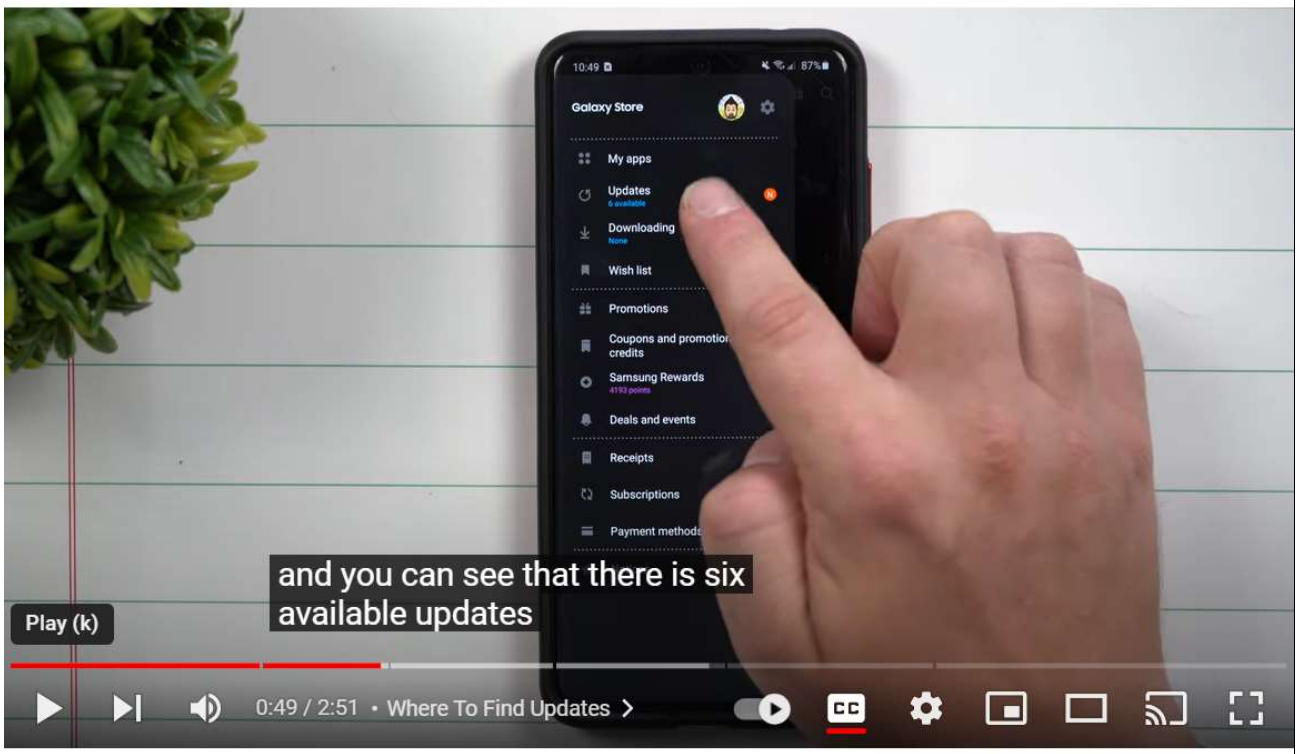
When apps update automatically, you won't have to give updating them a second thought. Follow these steps to turn on Auto Updates in the Galaxy Store:

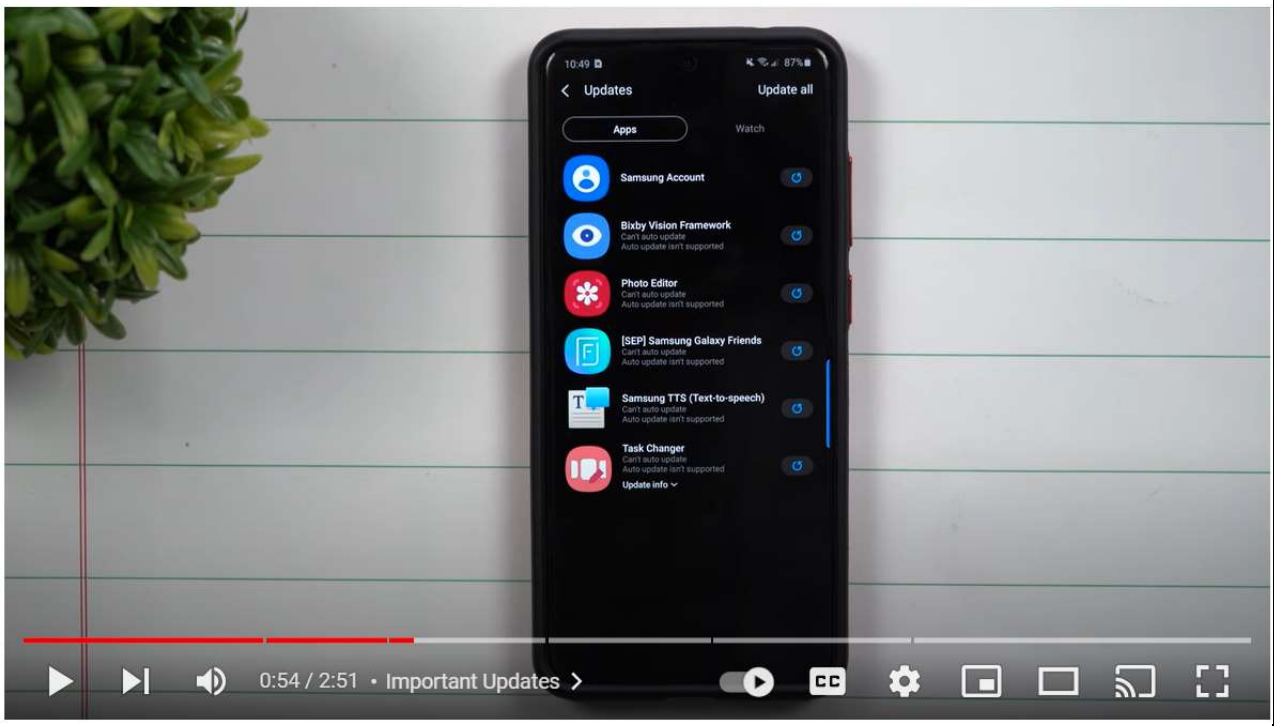
Open **Galaxy Store**, and then tap the **Menu** icon (the three horizontal lines), in the bottom right corner. Tap the **Settings** icon (it looks like a gear), and then tap **Auto update apps**. Select your desired setting.



See https://www.samsung.com/us/support/answer/ANS00080581/

APPENDIX 6: MARCH 7, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1, 5, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 23, 24 AND 25 OF U.S. PATENT NO. 10,129,590 TO ACCUSED SAMSUNG '590 PRODUCTS

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U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=SikWbEgGW1Y *See also* Appendix 8 showing that the remaining Accused Samsung '590 Products also include a cellular circuit for receiving a signal from the Internet and updating an application in a similar manner. *See* https://www.samsung.com/us/support/answer/ANS00077582/.
[25] The cellular phone of claim 23, wherein the first modulation scheme comprises shift keying modulation and	In each of the Accused Samsung '590 Products, the first modulation scheme comprises shift keying modulation and the second modulation scheme comprises quadrature amplitude modulation (QAM).

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the second modulation scheme comprises quadrature amplitude modulation (QAM).	**Second Infringement Theory** For example, each of the Accused Samsung '590 Products includes a Bluetooth communication circuit which uses a phase shift keying (PSK) modulation scheme and a cellular communication circuit which uses a QAM modulation scheme. **Bluetooth Modulation/Demodulation Method:**

Table 9-106
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	1.0	GFSK	0	17.51	56.403
2441	1.0	GFSK	39	18.18	65.736
2480	1.0	GFSK	78	16.90	49.000

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Bluetooth Mode	Peak Conducted Power	
				[dBm]	[mW]
2402	1 Mbps	0	LE	17.98	62.734
2440	1 Mbps	19	LE	18.36	68.517
2480	1 Mbps	39	LE	17.33	54.125

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

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Table 9-86
Bluetooth Maximum Average RF Power– Antenna 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Power Scheme	Channel No.	Avg Conducted Power	
					[dBm]	[mW]
2402	1.0	GFSK	ePA	0	18.57	71.928
2441	1.0	GFSK	ePA	39	18.77	75.266
2480	1.0	GFSK	ePA	78	18.58	72.078
2402	2.0	π/4-DQPSK	ePA	0	15.55	35.892
2441	2.0	π/4-DQPSK	ePA	39	15.16	32.817
2480	2.0	π/4-DQPSK	ePA	78	14.85	30.514
2402	3.0	8DPSK	ePA	0	15.56	35.975
2441	3.0	8DPSK	ePA	39	15.18	32.984
2480	3.0	8DPSK	ePA	78	15.14	32.651

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

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9.7. Bluetooth

Bluetooth output power Results

Band (GHz)	Antenna	Mode	Ch #	Freq. (MHz)	Max. Average Power (dBm)		Reduced. Average Power (dBm)	
					Meas Pwr	Tune-up Limit	Meas Pwr	Tune-up Limit
2.4	BT Ant.	GFSK (BDR)	0	2402	15.03	15.5	10.41	11.0
			39	2441	15.27		11.86	12.0
			78	2480	14.81		11.96	12.0
		EDR	0	2402	12.45	13.0	12.45	13.0
			39	2441	12.15		12.15	
			78	2480	11.43		11.43	
		LE	0	2402	13.64	14.0	8.45	9.0
			19	2440	13.71		8.35	
			39	2480	12.87		7.99	

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Maximum Duty Cyle	Measured Duty Cycle	Crest Factor (maximum duty/ measured duty cycle)
GFSK	DH5	2.893	3.750	78.00%	77.10%	1.01

- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf

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	Bluetooth Low Energy (LE)	Bluetooth Classic
Frequency Band	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)	2.4GHz ISM Band (2.402 – 2.480 GHz Utilized)
Channels	40 channels with 2 MHz spacing (3 advertising channels/37 data channels)	79 channels with 1 MHz spacing
Channel Usage	Frequency-Hopping Spread Spectrum (FHSS)	Frequency-Hopping Spread Spectrum (FHSS)
Modulation	GFSK	GFSK, π/4 DQPSK, 8DPSK
Data Rate	LE 2M PHY: 2 Mb/s LE 1M PHY: 1 Mb/s LE Coded PHY (S=2): 500 Kb/s LE Coded PHY (S=8): 125 Kb/s	EDR PHY (8DPSK): 3 Mb/s EDR PHY (π/4 DQPSK): 2 Mb/s BR PHY (GFSK): 1 Mb/s
Tx Power*	≤ 100 mW (+20 dBm)	≤ 100 mW (+20 dBm)
Rx Sensitivity	LE 2M PHY: ≤-70 dBm LE 1M PHY: ≤-70 dBm LE Coded PHY (S=2): ≤-75 dBm LE Coded PHY (S=8): ≤-82 dBm	≤-70 dBm
Data Transports	Asynchronous Connection-oriented Asynchronous Connectionless Isochronous Connection-oriented Isochronous Connectionless	Asynchronous Connection-oriented Synchronous Connection-oriented
Communication Topologies	Point-to-Point (including piconet) Broadcast Mesh	Point-to-Point (including piconet)
Positioning Features	Presence (Advertising) Proximity (RSSI) Direction (AoA/AoD) Distance (Coming)	None

https://www.bluetooth.com/learn-about-bluetooth/tech-overview/ (*e.g.*, DQPSK or DPSK)

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	For example, each of the Accused Samsung '590 Products includes a cellular communication circuit which uses a QAM modulation scheme.

and fading.

Two modulation modes are defined. A mandatory mode, called Basic Rate, uses a shaped, binary FM modulation to minimize transceiver complexity. An optional mode, called Enhanced Data Rate, uses PSK modulation and has two variants: π/4-DQPSK and 8DPSK. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate, 2 Mb/s for Enhanced Data Rate using π/4-DQPSK and 3 Mb/s for Enhanced Data Rate using 8DPSK.

Bluetooth

2 FREQUENCY BANDS AND CHANNEL ARRANGEMENT

The Bluetooth system operates in the 2.4 GHz ISM band. This frequency band is 2400 - 2483.5 MHz.

Regulatory Range	RF Channels
2.400-2.4835 GHz	f=2402+k MHz, k=0,…,78

Table 2.1: Operating frequency bands

RF channels are spaced 1 MHz and are ordered in channel number k as shown in Table 2.1.

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Bluetooth devices are classified into three power classes based on their highest output power capabilities.

Power Class	Maximum Output Power (Pmax)	Nominal Output Power	Minimum Output Power[1]	Power Control
1	100 mW (20 dBm)	N/A	1 mW (0 dBm)	Pmin<+4 dBm to Pmax Optional: Pmin[2] to Pmax
2	2.5 mW (4 dBm)	1 mW (0 dBm)	0.25 mW (-6 dBm)	Optional: Pmin[2] to Pmax
3	1 mW (0 dBm)	N/A	N/A	Optional: Pmin[2] to Pmax

Table 3.1: Power classes

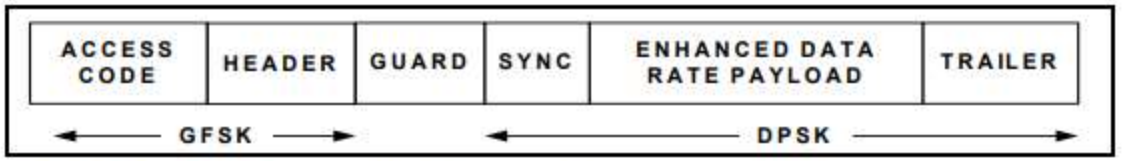
3.1 BASIC RATE

3.1.1 Modulation Characteristics

The Modulation is GFSK (Gaussian Frequency Shift Keying) with a bandwidth-bit period product BT=0.5. The Modulation index shall be between 0.28 and 0.35. A binary one shall be represented by a positive frequency deviation, and a binary zero shall be represented by a negative frequency deviation. The symbol timing shall be less than ±20 ppm.

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	3.2.1 Modulation Characteristics During access code and packet header transmission the Basic Rate GFSK modulation mode shall be used. During the transmission of the synchronization sequence, payload, and trailer sequence a PSK type of modulation with a data rate of 2 Mb/s or optionally 3 Mb/s shall be used. The following subsections specify the PSK modulation for this transmission. ***3.2.1.1 Modulation Method Overview*** The PSK modulation format defined for the 2 Mb/s transmission shall be π/4 rotated differential encoded quaternary phase shift keying (π/4-DQPSK). The PSK modulation format defined for the 3 Mb/s transmission shall be differential encoded 8-ary phase shift keying (8DPSK). The modulation shall employ square-root raised cosine pulse shaping to generate the equivalent lowpass information-bearing signal v(t). The output of the transmitter shall be a bandpass signal that can be represented as $$S(t) = Re\left[v(t)e^{j2\pi F_c t}\right] \quad \text{(EQ 1)}$$ with F_c denoting the carrier frequency. ***3.2.1.2 Differential Phase Encoding*** For the M-ary modulation, the binary data stream $\{b_n\}$, n=1,2,3, ...N, shall be mapped onto a corresponding sequence {Sk}, k=1,2, ...N/$\log_2$(M) of complex valued signal points. M=4 applies for 2 Mb/s and M=8 applies for 3 Mb/s. Gray coding shall be applied as shown in Table 3.4 and Table 3.5. In the event that the length of the binary data stream N is not an integer multiple of log2(M), the last symbol of the sequence $\{S_k\}$ shall be formed by appending data zeros to the appropriate length. The signal points S_k shall be defined by: $$S_k = S_{k-1}e^{j\varphi_k} \qquad k = 1, 2, ..N/\log_2(M) \quad \text{(EQ 2)}$$ $$S_0 = e^{j\phi} \qquad \text{with } \phi \in [0, 2\pi) \quad \text{(EQ 3)}$$ Receiver:

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	4.2.1 Actual Sensitivity Level The actual sensitivity level shall be defined as the input level for which a raw bit error rate (BER) of 0.01% is met. The requirement for a Bluetooth π/4-DQPSK and 8DPSK Enhanced Data Rate receiver shall be an actual sensitivity level of –70 dBm or better. The receiver shall achieve the –70 dBm sensitivity level with any Bluetooth transmitter compliant to the Enhanced Data Rate transmitter specification as defined in Section 3.2. **4.2.6 Reference Signal Definition** A 2 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = π/4-DQPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB A 3 Mb/s Bluetooth signal used as "wanted" or "interfering signal" is defined as: Modulation = 8DPSK Symbol Rate = 1 Ms/s ± 1 ppm Frequency accuracy better than ±1 ppm Modulating Data for wanted signal = PRBS9 Modulating Data for interfering signal = PRBS15 RMS Differential Error Vector Magnitude < 5% Average power over the GFSK and DPSK portions of the packet shall be equal to within +/- 1 dB *See* Bluetooth Core Specification v 5.0, December 6, 2016 available at Vol. 1, Part A https://www.bluetooth.com/specifications/specs/core-specification-5-0/

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	Data is transmitted over the air in packets. Two modes are defined: a mandatory mode called Basic Rate and an optional mode called Enhanced Data Rate. The symbol rate for all modulation modes is 1 Msym/s. The gross air data rate is 1 Mb/s for Basic Rate. Enhanced Data Rate has a primary modulation mode that provides a gross air data rate of 2 Mb/s, and a secondary modulation mode that provides a gross air data rate of 3 Mb/s. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 354, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ The general Enhanced Data Rate packet format is shown in Figure 1.3. Each packet consists of 6 entities: the access code, the header, the guard period, the synchronization sequence, the Enhanced Data Rate payload and the trailer. The access code and header use the same modulation mode as for Basic Rate packets while the synchronization sequence, the Enhanced Data Rate payload and the trailer use the Enhanced Data Rate modulation mode. The guard time allows for the transition between the modulation modes.  *Figure 1.3: Standard Enhanced Data Rate packet format* *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 355, https://www.bluetooth.com/specifications/specs/core-specification-5-0/

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	6.5 PACKET TYPES The packets used on the piconet are related to the logical transports on which they are used. Four logical transports with distinct packet types are defined (see Section 4): • SCO logical transport • eSCO logical transport • ACL logical transport • CSB logical transport. To indicate the different packets on a logical transport, the 4-bit TYPE code is used. The packet types are divided into four segments. The first segment is reserved for control packets. All control packets occupy a single time slot. The second segment is reserved for packets occupying a single time slot. The third segment is reserved for packets occupying three time slots. The fourth segment is reserved for packets occupying five time slots. The slot occupancy is reflected in the segmentation and can directly be derived from the type code. Table 6.2 summarizes the packets defined for the SCO, eSCO, ACL, and CSB logical transport types; a dash means the value is reserved for future use. All packet types with a payload shall use GFSK modulation unless specified otherwise in the following sections. *See* Bluetooth Core Specification v 5.0, December 6, 2016, at page 410, https://www.bluetooth.com/specifications/specs/core-specification-5-0/ **Cellular Frequency Bandwidth and Modulation/Demodulation Method:**

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Table 9-20
LTE Band 66 (AWS) Antenna A Measured P_{Limit} for DSI = 3 (Hotspot Mode) - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.26	19.36	**19.55**	0	0
	1	50	19.28	19.38	19.52		0
	1	99	19.37	19.49	19.54		0
	50	0	19.43	19.38	19.51	0-1	0
	50	25	19.47	19.35	19.51		0
	50	50	19.40	19.46	**19.53**		0
	100	0	19.43	19.40	19.52		0
16QAM	1	0	19.55	19.67	19.54	0-1	0
	1	50	19.94	19.53	19.59		0
	1	99	19.55	19.85	19.53		0
	50	0	19.45	19.45	19.53	0-2	0
	50	25	19.46	19.40	19.55		0
	50	50	19.45	19.51	19.53		0
	100	0	19.44	19.38	19.52		0
64QAM	1	0	19.57	19.37	19.68	0-2	0
	1	50	19.51	19.55	19.67		0
	1	99	19.72	19.57	19.61		0
	50	0	19.43	19.39	19.51	0-3	0
	50	25	19.44	19.38	19.49		0
	50	50	19.41	19.45	19.50		0
	100	0	19.45	19.38	19.51		0
256QAM	1	0	18.26	18.62	18.42	0-5	1
	1	50	18.35	18.33	18.39		1
	1	99	18.39	18.41	18.42		1
	50	0	18.32	18.28	18.28		1
	50	25	18.35	18.26	18.29		1
	50	50	18.38	18.41	18.31		1
	100	0	18.34	18.30	18.31		1

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Table 9-59
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]		
DFT-s-OFDM π/2 BPSK	1	1	24.04	0	0.0
	1	53	24.15		0.0
	1	104	24.01		0.0
	50	0	23.62	0-0.5	0.5
	50	28	24.13	0	0.0
	50	56	23.55	0-0.5	0.5
	100	0	23.70		0.5
DFT-s-OFDM QPSK	1	1	23.93	0	0.0
	1	53	**24.03**		0.0
	1	104	23.92		0.0
	50	0	23.13	0-1	1.0
	50	28	**24.14**	0	0.0
	50	56	23.02	0-1	1.0
	100	0	23.15		1.0
DFT-s-OFDM 16QAM	1	1	23.36	0-1	1.0
CP-OFDM QPSK	1	1	22.48	0-1.5	1.5

Samsung S23 Ultra FCC SAR Test Report, available at https://fccid.io/A3LSMS918U/RF-Exposure-Info/SAR-Part-1-Report-6266754.pdf

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement

Table 9-5
LTE Band 71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.33**	0	0
	1	50	24.05		0
	1	99	24.13		0
	50	0	**23.26**	0-1	1
	50	25	23.21		1
	50	50	23.18		1
	100	0	23.00		1
16QAM	1	0	23.39	0-1	1
	1	50	23.10		1
	1	99	23.22		1
	50	0	22.15	0-2	2
	50	25	22.10		2
	50	50	22.04		2
	100	0	22.07		2
64QAM	1	0	22.30	0-2	2
	1	50	22.35		2
	1	99	22.26		2
	50	0	21.05	0-3	3
	50	25	21.01		3
	50	50	21.05		3
	100	0	21.07		3
256QAM	1	0	19.05	0-5	5
	1	50	19.13		5
	1	99	18.96		5
	50	0	18.85		5
	50	25	18.92		5
	50	50	19.11		5
	100	0	19.05		5

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Table 9-48
NR Band n71 Measured P_{Max} for all DSI - 20 MHz Bandwidth

NR Band n71 20 MHz Bandwidth					
			Channel		
Modulation	RB Size	RB Offset	136100 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
DFT-s-OFDM π/2 BPSK	1	1	24.39	0	0.0
	1	53	24.11		0.0
	1	104	24.06		0.0
	50	0	23.86	0-0.5	0.5
	50	28	24.30	0	0.0
	50	56	23.71	0-0.5	0.5
	100	0	23.81		0.5
DFT-s-OFDM QPSK	1	1	**24.38**	0	0.0
	1	53	24.20		0.0
	1	104	23.93		0.0
	50	0	23.40	0-1	1.0
	50	28	**24.39**	0	0.0
	50	56	23.25	0-1	1.0
	100	0	23.42		1.0
DFT-s-OFDM 16QAM	1	1	23.51	0-1	1.0
CP-OFDM QPSK	1	1	22.75	0-1.5	1.5

Galaxy Z Fold4 FCC SAR Test Report, available at https://fcc.report/FCC-ID/A3LSMF936U/5986685.pdf

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Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 14) HSUPA (Category 6) DC-HSDPA (Category 14) HSPA+ (DL only)		100%
LTE	FDD Bands : 2, 4, 5, 7, 12, 13, 14, 25 26, 30, 66, 71 TDD Bands 38, 40, 41-PC3, 41-PC2, 48	QPSK 16QAM 64QAM 256QAM Rel. 16 Carrier Aggregation (2 Uplink and 4 Downlinks) **Uplink Carrier Aggregation(2CC)** CA_41C & CA_48C		100% (FDD) 63.3% (TDD) 43.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
5G NR (Sub 6)	FDD Bands : n2, n5, n12, n25, n30, n66, n71 TDD Bands n41-PC3, n41-PC2, n48 n77-PC3, n77-PC2	DFT-s-ODFM: ■ π/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM CP-ODFM: ■QPSK, 16QAM, 64QAM, 256QAM		100%
Wi-Fi	2.4 GHz	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20)		98.7% (802.11b)
	5 GHz	802.11a / 802.11n (HT20/40) 802.11ac (VHT20/40/80) 802.11ax (HE20/40/80)		96.0% (802.11a) 95.2% (802.11ac (VHT80)
	Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.3 LE		77.1%
NFC	13.56 MHz	Type A/B/F		100%

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	- Galaxy A54 5G FCC SAR Test Report, available at https://fccid.io/A3LSMA546U/RF-Exposure-Info/4790632108-S1V3-FCC-Report-SAR-6356395.pdf ETSI is proud to have a leading role in the development of mobile communication technologies. The Institute has been in the front line of this work: • from the development of the Global System for Mobile communication™ (GSM) specifications (2G), through the evolved technologies such as High Speed Circuit Switched Data (HSCSD), the General Packet Radio Service (GPRS) and Enhanced Data rates for Global Evolution (EDGE), • over the introduction of the Universal Mobile Telecommunications System (UMTS, 3G) in 3GPP and its evolution via High Speed Downlink Packet Access (HSDPA) and Enhanced Uplink/High Speed Uplink Packet Access (HSUPA) • over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP • up to ongoing development in 3GPP of the 5th generation (5G) https://www.etsi.org/technologies/mobile **3G: UMTS** UMTS is offering greater spectral efficiency than GSM™ and has 2 modes: • an FDD mode (Frequency Division Duplex) where uplink (user equipment UE => UTRA network = UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different frequency bands; this mode is also called Wideband CDMA (WCDMA) or Direct Spread CDMA; • a TDD mode (Time Division Duplex) where uplink (UE => UTRAN) and downlink (UTRAN => UE) communication are separated in the frequency domain via different time slots; note: The 3.84Mchip/s option was also called TD-CDMA or HCR (high chip rate) TDD.

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	UMTS was and still is continuously enhanced over several releases (also in parallel to developments of the 4th generation) e.g. by: • high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308 • enhanced Uplink for FDD (also called HSUPA = high speed uplink packed access; or EDCH = enhanced dedicated channel) in Rel-6: see 3GPP TS 25.319: if combined with 16QAM: up to 11 Mbit/s • higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11) • Multiple Input Multiple Output Antennas (MIMO) in Rel-7 • Dual-Cell HSDPA (DC-HSDPA) operation on adjacent carriers in Rel-8: if combined with 64QAM: up to 42 Mbit/s; if combined with MIMO: up to 84 Mbit/s • MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s • 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11) • 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s • Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s https://www.etsi.org/technologies/mobile/3g **4G LTE:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-13 (Sep.14-Dec.15, ASN.1 freeze: March 16): • Narrowband Internet of Things (IOT) • Further LTE Physical Layer Enhancements for MTC • Dual Connectivity enhancements for LTE Extension of Dual Connectivity in E-UTRAN • Licensed-Assisted Access (LAA) using LTE • Elevation Beamforming/Full-Dimension (FD) MIMO for LTE • Indoor Positioning enhancements for UTRA and LTE • Further Enhancements of Minimization of Drive Tests for E-UTRAN • Enhanced LTE Device to Device Proximity Services • Multicarrier Load Distribution of UEs in LTE • Support of single-cell point-to-multipoint transmission in LTE • Enhanced Signalling for Inter-eNB Coordinated Multi-Point (CoMP) for LTE • RAN enhancements for extended DRX in LTE • LTE-WLAN Radio Level Integration and Interworking Enhancement, LTE-WLAN RAN Level Integration supporting legacy WLAN • RAN aspects of Application specific Congestion control for Data Communication • Base Station (BS) RF requirements for Active Antenna System (AAS), SON for AAS-based deployments • Dedicated Core Networks • RAN Aspects of RAN Sharing Enhancements for LTE • Radiated requirements for the verification of multi-antenna reception perf. of UEs • UE core requirements for uplink 64 QAM

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-15 (March 17-June 18, ASN.1 freeze: Sep.18): • Further NB-IoT enhancements • Even further enhanced MTC for LTE • Enhancements to LTE operation in unlicensed spectrum • V2X phase 2 based on LTE • Further enhancements to Coordinated Multi-Point (CoMP) Operation for LTE • UE Positioning Accuracy Enhancements for LTE • Enhancements for high capacity stationary wireless link and intro of DL 1024 QAM • Bluetooth/WLAN measurement collection in LTE Minimization of Drive Tests • Quality of Experience Measurement Collection for streaming services in E-UTRAN • UL data compression in LTE • Increased number of E-UTRAN data bearers • Further video enhancements for LTE https://www.etsi.org/technologies/mobile/4g **5G:**

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	Rel-16 considered e.g. the following NR enhancements: • eNB(s) Architecture Evolution for E-UTRAN and NG-RAN • Enhancements on MIMO for NR • NR positioning support • 5G V2X with NR sidelink • Cross Link Interference handling and Remote Interference Management for NR • NR-based access to unlicensed spectrum • 2-step RACH for NR • L1 enhancements for NR Ultra-Reliable and Low Latency Communication (URLLC) • UE Power Saving in NR • NR mobility enhancements • Multi-RAT Dual-Connectivity and Carrier Aggregation enhancements (LTE, NR) • Integrated access and backhaul for NR • Single Radio Voice Call Continuity from 5G to 3G • Optimisations on UE radio capability signalling – NR/E-UTRA Aspects • Support of NR Industrial Internet of Things (IoT) • Private Network Support for NG-RAN • NG interface usage for Wireless Wireline Convergence • RF requirements for NR frequency range 1 (FR1) • Add support of NR DL 256QAM for frequency range 2 (FR2)

U.S. Patent No. 10,129,590	Exemplary Evidence of Infringement
	REL-17 IS WORKING E.G. ON THE FOLLOWING NR ENHANCEMENTS: • ◦ Further enhancements on MIMO for NR ◦ NR Sidelink enhancement ◦ NR Dynamic spectrum sharing (DSS) ◦ Enhanced Industrial Internet of Things (IoT) and ultra-reliable and low latency communication (URLLC) support for NR ◦ Solutions for NR to support non-terrestrial networks (NTN) ◦ UE power saving enhancements for NR ◦ NR multicast and broadcast services ◦ Enhancements to Integrated Access and Backhaul (IAB) for NR ◦ NR small data transmissions in INACTIVE state ◦ Multiple Input Multiple Output (MIMO) Over-the-Air (OTA) requirements for NR UEs ◦ Enhancement of Private Network support for NG-RAN ◦ Introduction of DL 1024QAM for NR FR1 ◦ Enhanced NR support for high speed train scenario for frequency range 1 (FR1) https://www.etsi.org/technologies/mobile/5g