

Exhibit 7

EXHIBIT 7 – U.S. Patent No. 10,224,999

Plaintiff asserts that at least the following “Accused Hotspot Instrumentalities” infringe the Asserted Claims of U.S. 10,224,999:

i) Smartphones:

Galaxy S20 (SM-G980, SM-G981); Galaxy S20+ (SM-G985, SM-G986); Galaxy S20 Ultra (SM-G988); Galaxy S20 FE (SM-G780, SM-G781); Galaxy S21 (SM-G991); Galaxy S21+ (SM-G996); Galaxy S21 Ultra (SM-G998); Galaxy S21 FE (SM-G990); Galaxy S22 (SM-S901); Galaxy S22+ (SM-S906); Galaxy S22 Ultra (SM-S908); Galaxy S23 (SM-S911); Galaxy S23+ (SM-S916); Galaxy S23 Ultra (SM-S918); Galaxy S23 FE (SM-S711); Galaxy S24 (SM-S921); Galaxy S24+ (SM-S926); Galaxy S24 Ultra (SM-S928); Galaxy S24 FE (SM-S821); Galaxy S25 (SM-S931); Galaxy S25+ (SM-S936); Galaxy S25 Ultra (SM-S938); Galaxy S25 Edge (SM-S935); Galaxy Z Flip 3 (SM-F711); Galaxy Z Flip 4 (SM-F721); Galaxy Z Flip 5 (SM-F731); Galaxy Z Flip 6 (SM-F741); Galaxy Z Fold 2 (SM-F916); Galaxy Z Fold 3 (SM-F926); Galaxy Z Fold 4 (SM-F936); Galaxy Z Fold 5 (SM-F946); Galaxy Z Fold 6 (SM-F956); Galaxy Note 20 (SM-N981); Galaxy Note 20 Ultra (SM-N986); Galaxy A32 5G (SM-A326); Galaxy A42 5G (SM-A426); Galaxy A12 (SM-A125); Galaxy A02s (SM-A025); Galaxy A54 5G (SM-A546); Galaxy A25 5G (SM-A256); Galaxy A26 5G (SM-A266); Galaxy A36 5G (SM-A366); Galaxy A16 5G (SM-A166); Galaxy A16 (SM-A165)

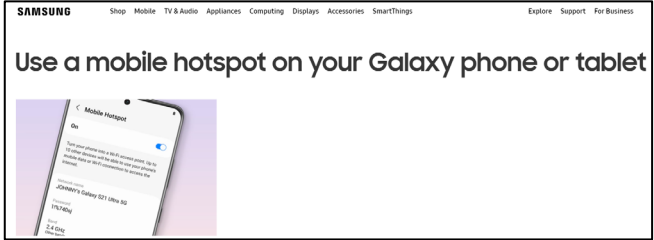
ii) Tablets:

Galaxy Tab S6 (SM-T860, SM-T865, SM-T866N); Galaxy Tab S6 5G (SM-T866N); Galaxy Tab S7 (SM-T870, SM-T875, SM-T878U); Galaxy Tab S7+ (SM-T970, SM-T976); Galaxy Tab S7 FE (SM-T730, SM-T736B); Galaxy Tab S8 (SM-X700, SM-X706); Galaxy Tab S8+ (SM-X800, SM-X806); Galaxy Tab S8 Ultra (SM-X900, SM-X906); Galaxy Tab S9 (SM-X710, SM-X716); Galaxy Tab S9+ (SM-X810, SM-X816); Galaxy Tab S9 Ultra (SM-X910, SM-X916); Galaxy Tab S10 FE (SM-X520, SM-X526); Galaxy Tab S10 FE+ (SM-X620); Galaxy Tab S10+ (SM-X826); Galaxy Tab S10 Ultra (SM-X920); Active4 Pro (SM-T636); Active5 (SM-X591B); Active5 Tactical Edition (SM-X591B); Active5 Pro (SM-X596)

iii) Personal Computers/ Laptops:

Galaxy Book S (SM-W767); Galaxy Book Go 5G (SM-X100); Galaxy Book Flex 2 Alpha (SM-X420); Galaxy Book Pro (SM-X50x); Galaxy Book Pro 360 (SM-X360); Galaxy Book2 360 (SM-X20x); Galaxy Book2 Pro (SM-X30x); Galaxy Book2 Pro 360 (SM-X360); Galaxy Book2 Pro 360 5G (SM-X366); Galaxy Book3 360 (SM-X40x); Galaxy Book3 Pro (SM-X50x); Galaxy Book3 Pro 360 (SM-X60x); Galaxy Book3 Pro 360 5G (SM-X66x); Galaxy Book4 (SM-X70x); Galaxy Book4 Ultra (SM-X7Ux); Galaxy Book4 Pro (SM-X7Px); Galaxy Book4 Pro 360 (SM-X7Mx);

Galaxy Book4 Edge (SM-X8Ex); Galaxy Book5 360 (SM-X90x); Galaxy Book5 Pro (SM-X91x); Galaxy Book5 Pro 360 (SM-X93x); Galaxy Book5 Pro 360 5G (SM-X936)

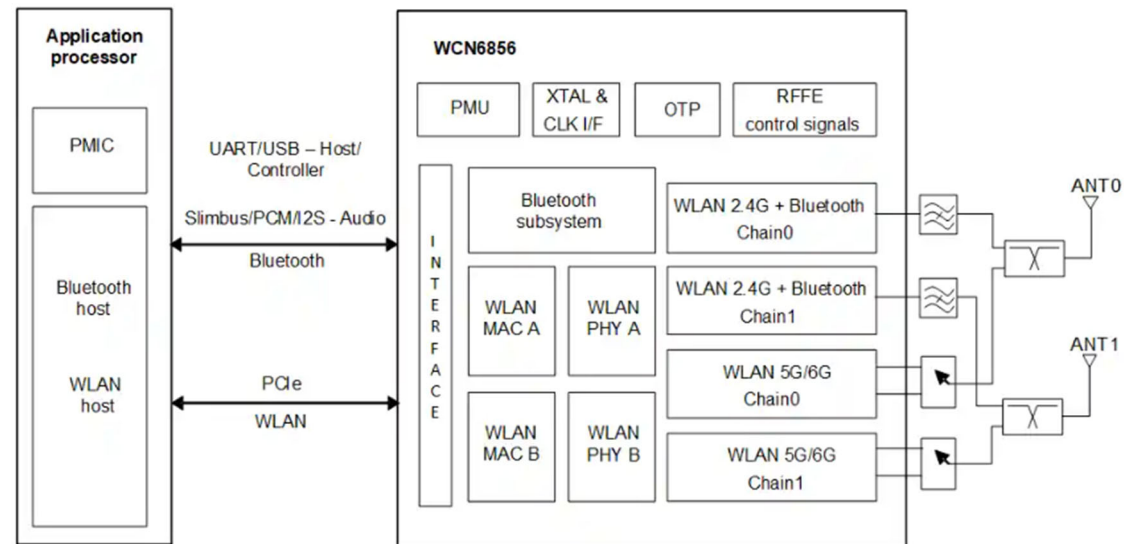
Claim 1	Accused Hotspot Instrumentalities ¹
[1PRE] A wireless network device, comprising:	The Accused Hotspot Instrumentalities serve as a wireless network device when in a tethering mode (e.g., enabled mobile hotspot). For example, Samsung’s website explains how to use a mobile hotspot on a Galaxy phone or tablet.  See https://www.samsung.com/us/support/answer/ANS00079036/
[1A] a wireless transmitter that is configured for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second;	The Accused Hotspot Devices comprise a transmitter configured to wirelessly transmit data using both (a) Wi-Fi 5/6/6E and (b) 5G cellular, which all have channels greater than 100 MHz and less than 500 MHz and/or greater than 100 Mbps and less than 480 Mbps for communicating with a connected device. The wireless transmitter, such as a transceiver, is provided by the Wi-Fi module (e.g., Wi-Fi/Bluetooth combo chip) and/or cellular module (e.g., 4G-LTE tuner/transceiver, 5G tuner/transceiver) of the Accused Hotspot Instrumentalities. The Wi-Fi/Bluetooth combo chip (e.g., Qualcomm WCN6855 and WCN7851-101) comprises a receiver or transceiver for signal or data transmission to the connected device.

¹ Unless indicated otherwise, the evidence cited in this table is representative of the operation of the Accused Hotspot Instrumentalities and upon information and belief, the Accused Hotspot Instrumentalities function in a substantially similar manner for purposes of this chart.

<https://devicehd.com/smartphones/en/product/64328d1550d90c8ad32d8f6b/>

<https://devicehd.com/smartphones/en/product/64295291e5917e62545296b9/>

See the figure below showing the Qualcomm WCN6855 coupled to an application processor and antenna.



<https://docs.qualcomm.com/bundle/publicresource/topics/80-WL542-10/overview.html>

The cellular module (e.g., Exynos RF 5500) also comprises a transmitter or transceiver for transmitting signals via a cellular network.

<https://semiconductor.samsung.com/news-events/tech-blog/exynos-rf-5500-and-exynos-sm-5800-chips-making-5g-wireless-communication-possible/>

The Accused Hotspot Instrumentalities comprise a Wi-Fi/Bluetooth combo chip that supports the transmission of wireless data with at least Wi-Fi 5 (160 MHz) or Wi-Fi 6 (160 MHz). According to the IEEE 802.11 standards, the Wi-Fi generations Wi-Fi 5 (802.11ac), Wi-Fi 6 (802.11ax-2019), and Wi-Fi 6E (802.11ax-2021). According to the

IEEE 802.11 standards, the Wi-Fi generations Wi-Fi 5, Wi-Fi 6, and Wi-Fi 6E, all provide 160 MHz channel widths.

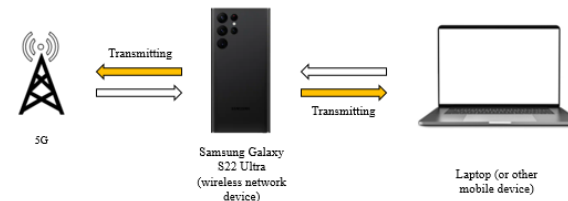
IEEE 802.11ax (Wi-Fi 5) allows for data transmissions over a contiguous or non-contiguous 160 MHz bandwidth. The 160 MHz contiguous spectrum comprises 8 channels (20 MHz) that are bonded together. The 160 MHz non-contiguous spectrum comprises two 4 channels (20 MHz) that are bonded together and concatenated to form 160 MHz non-contiguous spectrum. The 160 MHz bandwidth supports data rates of up to 6.93 Gbps, but does not indicate a minimum or lower bound for the data rate.

See e.g., help.keenetic.com/hc/en-us/articles/360012060379-Available-channels-on-the-5-GHz-Wireless-network, and help.keenetic.com/hc/en-us/articles/360010536300-What-you-need-to-know-about-Wi-Fi-6-IEEE-802-11ax

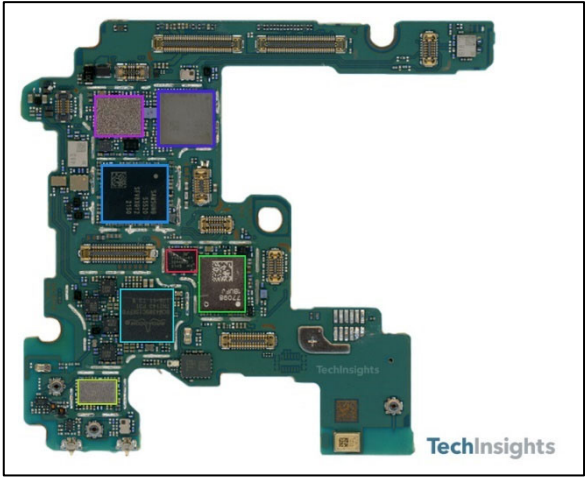
The Accused Hotspot Instrumentalities also comprise a mmWave antenna and tuner (e.g., transmitter or transceiver) to transmit wireless data over a 5G network. The Accused Hotspot Instrumentalities are compatible with at least one of the following cellular bands that fall at or between 100 MHz and 500 MHz:

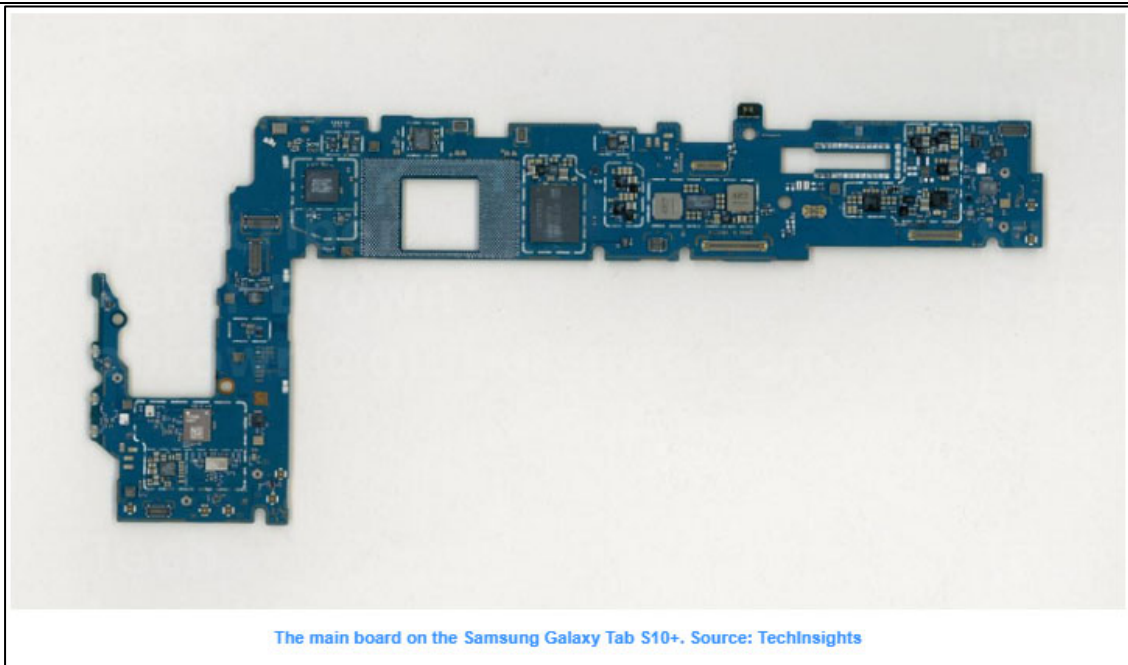
- 5G bands: n41, n48, n78
- 5G mmWave bands: n257, n260, n261

5G has various NR bands with bandwidths greater than 100 MHz and less than 500 MHz (n40, n41, n46, n48, n78, n90). Data rates for 5G can range from 10Mbps to 1,000Mbps. Data rates for 5G mmWave can reach data rates up to 10Gbps. Note actual 5G data rates are primarily dependent on telecommunication carriers.



An integrated circuit package (e.g., 5G system-on-a-chip) may comprise a plurality of functionalities within a single IC package such as signal encoding/decoding by a modem, frequency tuning by a front-end module, and/or transmitter/receiver by a

	transceiver. The IC is in communication with one or more antennas or an antenna array to wirelessly transmit and receive wireless data over a Wi-Fi network or cellular network. See claim element [1B] below.
[1B] a wireless receiver that is configured for receiving wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second;	The Accused Hotspot Instrumentalities comprise a receiver configured to wirelessly receive data using both (a) Wi-Fi 5/6/6E and (b) 5G cellular networks, which all have channels that support bandwidth greater than 100 MHz and less than 500 MHz and/or data rates greater than 100 Mbps and less than 480 Mbps, for communicating with a connected device. For example, below is an image of a Galaxy S22 Ultra circuit board a Broadcom Wi-Fi 6/6E chip, which comprises “at least one receiver or transceiver for signal or data reception from one or more devices.” See www.techinsights.com/blog/samsung-galaxy-s22-ultra-teardown  In another example, the image below shows a main circuit board from the Galaxy S10+, comprising a MediaTek 5G RF transceiver.

**Main board**

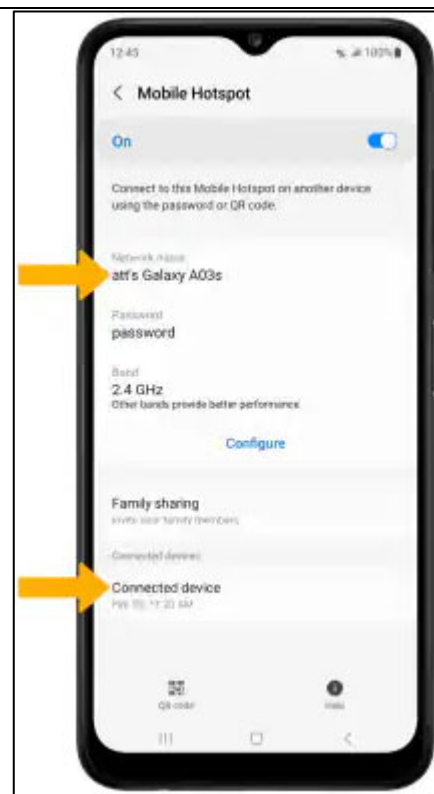
The main board of the Samsung Galaxy Tab S10+ includes the main memory and sensors for operation of the tablet. The electronic components found on the smart tablet include:

- ST Microelectronics' six-axis MEMS accelerometer
- [Texas Instruments'](#) 250 mA LDO regulator and 250 mA LDO regulator
- [Murata's](#) SAW filter, Rx/D front-end module,
- MediaTek's GPS receiver, clock buffer and 5G RF transceiver
- Diodes Inc.'s 300 mA/3.0 V LDO regulator
- [Qorvo's](#) RF antenna tuner and front-end module
- [Infineon's](#) SPDT RF switch
- Silergy's DC-DC converter
- Analog Devices' buck-boost regulator
- Vishay's RGB/IR light sensor
- Cirrus Logic's Class-D audio amplifier
- Samsung's secure element chip

	See https://electronics360.globalspec.com/article/22285/techinsights-teardown-samsung-galaxy-tab-s10 See claim element [1A] above.
[1C] wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver,	The transmitter of the Accused Hotspot Instrumentalities is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver. For example, the transmitter of the Accused Hotspot Instrumentalities is configured to: 1. receive wireless data through the 5G communication protocol and transmit the received data over the Wi-Fi6 (802.11ax) communication protocol. 2. receive wireless data through the Wi-Fi6 (802.11ax) communication protocol and transmit the received data over the 5G communication protocol. 3. receive wireless data through the 5G communication protocol and transmit information determined from the wireless data over the 5G. 4. receive wireless data through the WiFi6 (802.11ax) communication protocol and transmit information determined from the wireless data over the WiFi6 (802.11ax). The diagram illustrates the Accused Product's configuration for transmitting wireless data. It shows a central 'Accused Product' (a smartphone) connected to two networks: '5G Mobile Network' and 'WiFi Network'. In the 5G Mobile Network, the product receives data (Rx) via a tower antenna (labeled 1) and transmits data (Tx) back to the tower (labeled 2). In the WiFi Network, the product receives data (Rx) from a laptop (labeled 3) and transmits data (Tx) back to the laptop (labeled 4).

[1D] wherein the wireless network device is configured for processing wireless data received by the wireless receiver, and	The Accused Hotspot Instrumentalities comprise a controller that is configurable for processing wireless data in both a Wi-Fi network (e.g., Wi-Fi 5/6/6E) and a cellular network (e.g., 4G-LTE or 5G), which are wireless networks. For example, the Galaxy S20 Ultra comprises, among other things, a Qualcomm Snapdragon 865 processor in communication with a STMicroelectronics STM32G071EB 32-bit ARM microcontroller and a Qualcomm SDX55M 5G modem. See www.ifixit.com/Teardown/Samsung+Galaxy+S20+Ultra+Teardown/131607?srltid=AfmBOorbKmG1FgZYkgqQsKc3mMYaHd6vA_c9nDDoDhWlkT_IkjlHRT-t In another example, the Galaxy S22 Ultra comprises, among other things, a Qualcomm Snapdragon 8 Gen 1 in communication with a Samsung RF Transceiver S5520, a Broadcom Front-End Module AFEM-9140, a Skyworks Front-End Module SKY58083-11, a Broadcom Wi-Fi 6/6E&BT 5.0 SoC BCM4389, and a Qorvo Front-End Module QM77098. See www.techinsights.com/blog/samsung-galaxy-s22-ultra-teardown Wi-Fi protocols, such as Wi-Fi 5, Wi-Fi 6 and Wi-Fi 6E, use IP and/or MAC addresses to identify connected devices. See e.g., www.techtarget.com/searchnetworking/answer/What-is-the-difference-between-an-IP-address-and-a-physical-address/. The Accused Hotspot Devices utilize WPA2 and/or WPA3 protocols to allow for secure broadcasting of a Wi-Fi hotspot, which employs a handshake sequence that requires data processing via network information of devices requesting to join the mobile hotspot. See https://insights.samsung.com/2022/12/16/how-to-turn-your-galaxy-smartphone-into-a-hotspot-3/; https://en.wikipedia.org/wiki/Wi-Fi_Protected_Access The cellular modem in the Accused Hotspot Instrumentalities also configures the Accused Hotspot Devices for operation in a cellular network (e.g., 4G LTE or 5G).
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[1E] wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter.	The Accused Hotspot Instrumentalities include a controller that can determine whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter. In one example, the Accused Hotspot Instrumentalities show the mobile user devices connected to the Wi-Fi network provided by the mobile hotspot. The user can select a connected device for a list of connected devices and block the device from the network. The controller can configure network settings (e.g., blacklist, firewall settings) of the Accused Hotspot Instrumentalities to filter out wireless data transmissions (e.g., signals or data communication) based on blocked (blacklisted) MAC addresses or source IP addresses. This can prevent a previously connected device from establishing a connection to the mobile hotspots, based on a blacklisted MAC address of the device.
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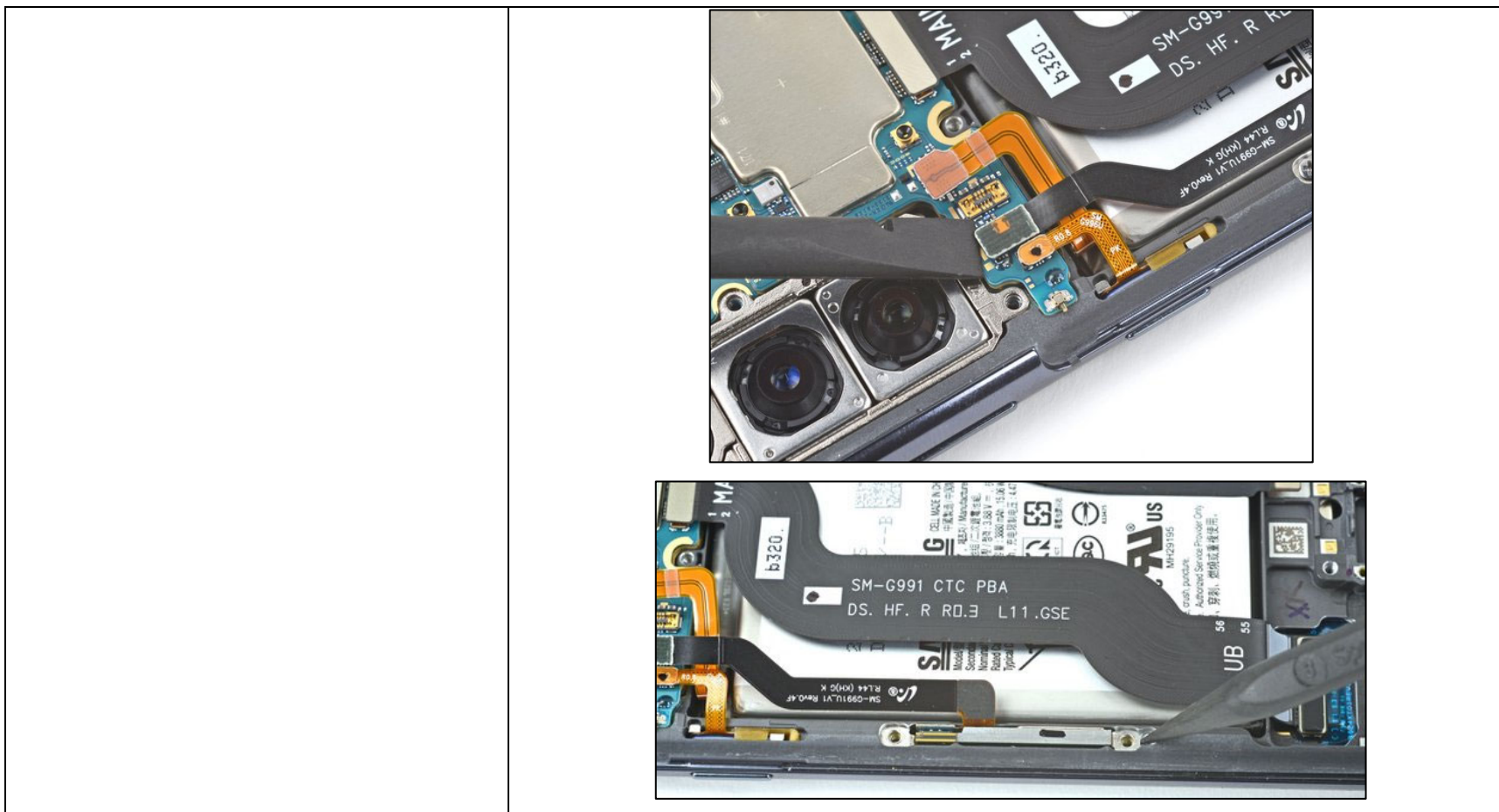


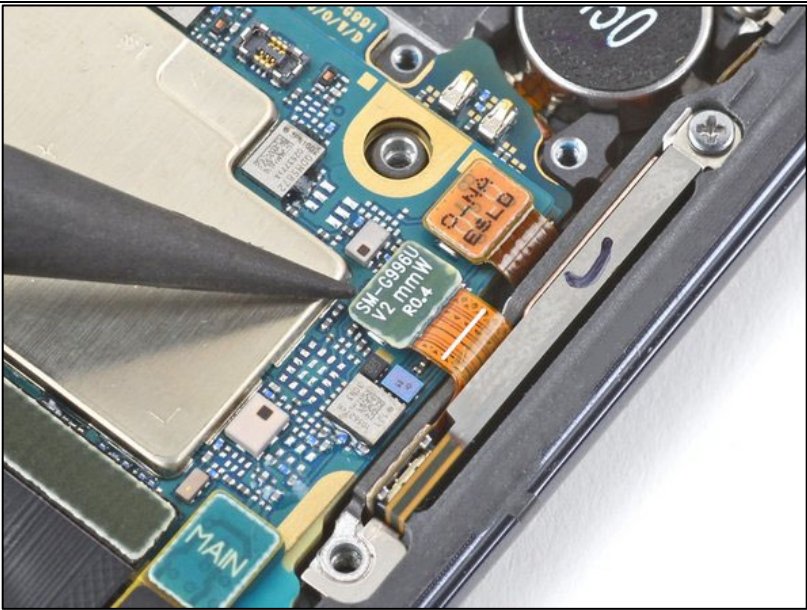
See <https://www.att.com/device-support/article/wireless/KM1472824/Samsung/SamsungSMA037U>; and devices.vodafone.com.au/samsung/galaxy-s21-5g-android-11-0/connectivity/use-your-phone-as-wi-fi-hotspot/

In another example, the Accused Hotspot Instrumentalities utilize WPA2 and/or WPA3 security protocols, which employ a handshake verification process that screens unwanted data from unauthorized devices attempting to join a Wi-Fi mobile hotspot. See insights.samsung.com/2022/12/16/how-to-turn-your-galaxy-smartphone-into-a-hotspot-3/; en.wikipedia.org/wiki/Wi-Fi_Protected_Access

	When broadcasting a Nearby Share or Wi-Fi mobile hotspot (utilizing WPA2 protocol), the Accused Hotspot Devices receive data from devices attempting to connect and determine which device(s) to transmit data back to.
Claim 8	Accused Hotspot Instrumentalities
[8] The wireless network device of claim 1 wherein the wireless transmitter is configured for transmitting half duplex wireless data and wherein the wireless receiver is configured for receiving half duplex wireless data.	The receiver and/or the transmitter of the Accused Hotspot Instrumentalities are configured to transmit or receive signals in half-duplex signal modulation through Wi-Fi networks (e.g., Wi-Fi 5/802.11ac, Wi-Fi 6/802.11ax, or Wi-Fi 6E/ 802.11ax networks) and/or cellular networks (e.g., 4G-LTE or 5G).
Claim 9	Accused Hotspot Instrumentalities
[9] The wireless network device of claim 1 wherein the wireless transmitter is configured for transmitting full duplex wireless data and wherein the wireless receiver is configured for receiving full duplex wireless data.	The transceiver of the Accused Hotspot Instrumentalities is configured for transmitting and receiving full duplex wireless data. For example, the transceiver of the Accused Hotspot Instrumentalities is configured to transmit and receive data on 4G-LTE and 5G cellular networks on wireless bands for frequency division duplexing (FDD). The image below shows an example of an Accused Hotspot Instrumentality (e.g., Galaxy S23) that supports several 4G-LTE and 5G FDD bands.

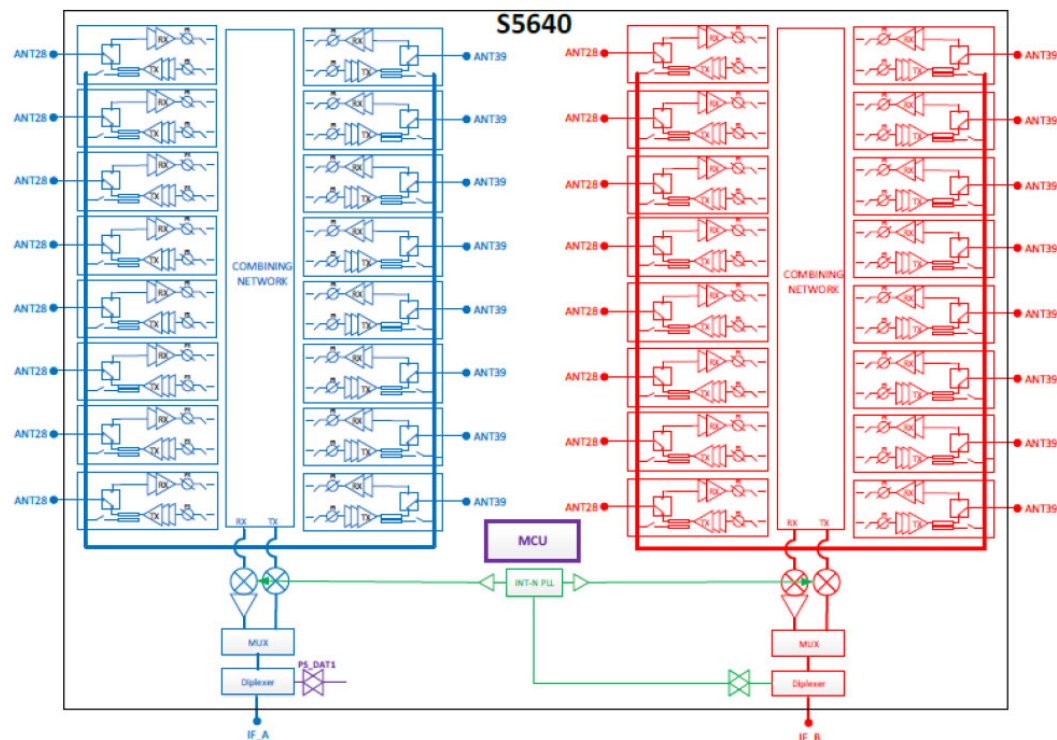
	Network/Bearer <table><tr><th>Number of SIM</th><th>SIM size</th><th>SIM Slot Type</th><th>Infra</th></tr><tr><td>Dual-SIM</td><td>Nano-SIM (4FF), Embedded-SIM</td><td>SIM 1 + SIM 2 or Embedded SIM</td><td>2G GSM, 3G WCDMA, 4G LTE FDD, 4G LTE TDD, 5G Sub6 FDD, 5G Sub6 TDD</td></tr><tr><td>2G GSM GSM850, GSM900, DCS1800, PCS1900</td><td>3G UMTS B1(2100), B2(1900), B4(AWS), B5(850), B8(900)</td><td>4G FDD LTE B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B8(900), B12(700), B13(700), B17(700), B18(800), B19(800), B20(800), B25(1900), B26(850), B28(700), B66(AWS-3)</td><td>4G TDD LTE B38(2600), B39(1900), B40(2300), B41(2500)</td></tr><tr><td>5G FDD Sub6 N1(2100), N2(1900), N3(1800), N5(850), N7(2600), N8(900), N12(700), N20(800), N25(1900), N28(700), N66(AWS-3)</td><td>5G TDD Sub6 N38(2600), N40(2300), N41(2500), N77(3700), N78(3500)</td><td></td><td></td></tr></table> See https://www.samsung.com/latin_en/smartphones/galaxy-s/galaxy-s23-cream-256gb-sm-s911bzekgto/	Number of SIM	SIM size	SIM Slot Type	Infra	Dual-SIM	Nano-SIM (4FF), Embedded-SIM	SIM 1 + SIM 2 or Embedded SIM	2G GSM, 3G WCDMA, 4G LTE FDD, 4G LTE TDD, 5G Sub6 FDD, 5G Sub6 TDD	2G GSM GSM850, GSM900, DCS1800, PCS1900	3G UMTS B1(2100), B2(1900), B4(AWS), B5(850), B8(900)	4G FDD LTE B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B8(900), B12(700), B13(700), B17(700), B18(800), B19(800), B20(800), B25(1900), B26(850), B28(700), B66(AWS-3)	4G TDD LTE B38(2600), B39(1900), B40(2300), B41(2500)	5G FDD Sub6 N1(2100), N2(1900), N3(1800), N5(850), N7(2600), N8(900), N12(700), N20(800), N25(1900), N28(700), N66(AWS-3)	5G TDD Sub6 N38(2600), N40(2300), N41(2500), N77(3700), N78(3500)		
Number of SIM	SIM size	SIM Slot Type	Infra														
Dual-SIM	Nano-SIM (4FF), Embedded-SIM	SIM 1 + SIM 2 or Embedded SIM	2G GSM, 3G WCDMA, 4G LTE FDD, 4G LTE TDD, 5G Sub6 FDD, 5G Sub6 TDD														
2G GSM GSM850, GSM900, DCS1800, PCS1900	3G UMTS B1(2100), B2(1900), B4(AWS), B5(850), B8(900)	4G FDD LTE B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B8(900), B12(700), B13(700), B17(700), B18(800), B19(800), B20(800), B25(1900), B26(850), B28(700), B66(AWS-3)	4G TDD LTE B38(2600), B39(1900), B40(2300), B41(2500)														
5G FDD Sub6 N1(2100), N2(1900), N3(1800), N5(850), N7(2600), N8(900), N12(700), N20(800), N25(1900), N28(700), N66(AWS-3)	5G TDD Sub6 N38(2600), N40(2300), N41(2500), N77(3700), N78(3500)																
Claim 11	Accused Hotspot Instrumentalities																
[11] The wireless network device of claim 1 wherein the wireless network device comprises two or more antennas.	The Accused Hotspot Instrumentalities include at least two antennas, at least an antenna associated with a Wi-Fi network and an antenna associated with a cellular network. For example, the images below show antennas of the Samsung Galaxy S21 comprising at least two mmWave 5G antennas and a Wi-Fi antenna.																



	 See https://www.ifixit.com/Guide/Samsung+Galaxy+S21+5G+Antenna+Replacement/148692
Claim 12	Accused Hotspot Instrumentalities
[12] The wireless network device of claim 11 wherein the wireless network device is configured for using MIMO antenna technology.	The Accused Hotspot Devices utilize the Qualcomm Snapdragon processor mobile platforms (specific chipset varies by accused product) are configured to employ MIMO in 5G and Wi-Fi contexts. The Accused Hotspot Instrumentalities include transmitters and receivers to support at least 2x2 SU-MIMO (single user). In Wi-Fi networks, IEEE 802.11n (i.e., Wi-Fi 4) introduced SU-MIMO support for up to 4x4 MIMO, while both 802.11ac (i.e., Wi-Fi 5) and 802.11ax (i.e., Wi-Fi 6/6E) support up to 8x8 SU-MIMO. In Cellular networks, 4G-LTE supports up to 4x4 SU-MIMO and 5G supports up to 4x4 SU-MIMO /64x64 MU-MIMO.

	See product sheet for the Qualcomm Snapdragon processor used in Galaxy S22 Ultra: https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/snapdragon-8-gen-1-mobile-platform-product-brief.pdf
Claim 13	Accused Hotspot Instrumentalities
[13] The wireless network device of claim 1 wherein the wireless network device is configured for performing beamforming.	The Accused Hotspot Instrumentalities is configured to perform beamforming. For example, the Accused Hotspot Instrumentalities comprise 5G modem (e.g., Snapdragon X75) in communication with multiple antennas, configured to perform beamforming by using MIMO technology to direct wireless RF signals in a specific direction based on information from the controller. See https://docs.qualcomm.com/bundle/publicresource/87-27161-1_REV_C_Snapdragon_X75_5G_Modem-RF_System_Product_Brief.pdf See claim elements [14A], [15A] below.
Claim 14	Accused Hotspot Instrumentalities
[14A] The wireless network device of claim 1 wherein the wireless network device comprises an adaptable antenna; and	The Accused Hotspot Instrumentalities comprise one or more adaptable antennas or antenna elements. See e.g., https://r2.community.samsung.com/t5/Tech-Talk/What-is-4-4-MIMO-and-Does-My-Smartphone-Need-It/td-p/4938055 The Accused Hotspot Instrumentalities include transmitters and receivers to support at least 2x2 SU-MIMO (single user). In Wi-Fi networks, IEEE 802.11n (i.e., Wi-Fi 4) introduced SU-MIMO support for up to 4x4 MIMO, while both 802.11ac (i.e., Wi-Fi 5) and 802.11ax (i.e., Wi-Fi 6/6E) support up to 8x8 SU-MIMO. In Cellular networks, 4G-LTE supports up to 4x4 SU-MIMO and 5G supports up to 4x4 SU-MIMO /64x64 MU-MIMO. The Accused Hotspot Instrumentalities can employ adaptive antenna technology through at least beamforming, antenna selection, and/or spatial filtering. For example, the Accused Hotspot Instrumentalities can use multiple antennas in MIMO technology to direct wireless RF signals in a specific direction based on information from the

	controller, select an antenna of multiple antennas to send or receive signals based on signal strength, or use multiple antennas to filter or ignore interference. See https://docs.qualcomm.com/bundle/publicresource/87-27161-1_REV_C_Snapdragon_X75_5G_Modem-RF_System_Product_Brief.pdf See claim elements [13] above and [15A] below.
[14B] wherein the wireless transmitter is configured for using the adaptable antenna for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.	See claim elements [1A]-[1C] and claim [11] above.
Claim 15	Accused Hotspot Instrumentalities
[15A] The wireless network device of claim 1 wherein the wireless network device comprises a steerable antenna; and	The Accused Hotspot Instrumentalities comprise at least one steerable antenna. The steerable antenna includes an antenna array that consists of multiple individual antenna elements arranged in a specific geometric pattern. Each element radiates a signal, and the combination of these signals forms the overall radiation pattern of the array. Beam steering is achieved by controlling the phase of the signals fed to each individual antenna element in the array. According to an Operational Description for an Accused mmWave Product, the Accused mmWave Product includes a “mmW Antenna Module,” which includes “two separate phased array chips (S5640).” Each phase array chip includes 20 antenna ports: 10 for 28 GHz band and 10 for 39 GHz band.



See fccid.io/A3LSMA536V/Operational-Description/A3LSMA536V-Operational-Description-Main-Part-R4-5651659.pdf (“Operational Description”).

A teardown of a Galaxy S20 Ultra describes that this Accused mmWave Product includes “two Qualcomm RF ICs ... w/multilayer package substrate antenna array ...”
See electronics360.globalspec.com/article/15093/teardown-samsung-galaxy-s20-ultra-5g

The “Criticality of 5G Modem to RF Integration; A look inside Samsung Galaxy S20 Ultra” article (<https://omdia.tech.informa.com/om006104/criticality-of-5g-modem-to-rf-integration-a-look-inside-samsung-galaxy-s20-ultra>) describes a teardown of the S20 Ultra, including that the Qualcomm RF ICs in the Galaxy S20 Ultra are QTM525 mmWave Antenna modules.

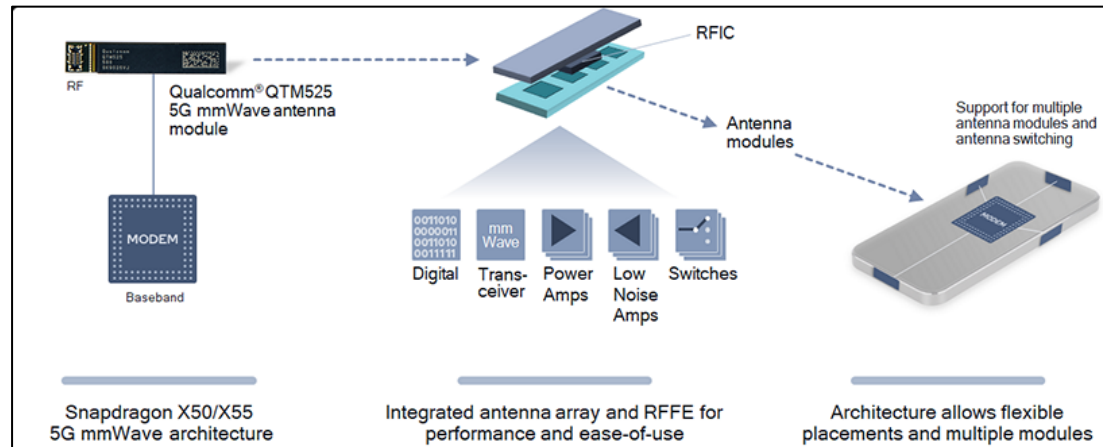
The Qualcomm article “5G Modems, RF and Antennas — Getting mmWave Data into the Device describes the QTM525 mmWave antenna module as including an “array of tiny mmWave antenna elements” See www.qualcomm.com/developer/blog/2019/11/5g-modems-rf-and-antennas-getting-mmwave-data-device

The Qualcomm article further describes the QTM525 mmWave antenna module, in communication with the 5G module (e.g., Snapdragon X50, X55, X60, X70), as capable of beamforming and beam tracking to avoid obstructions.

mmWave technology works well in cities, where you can locate a small cell on top of a building and serve an entire block. In a dense, urban environment, the buildings would normally be an obstruction. But beamforming and beam tracking take advantage of them as an endless series of surfaces off of which the mmWaves can bounce.

On the device, multiple mmWave antenna modules like the QTM052 and QTM525 are located in different places, as shown in the image below. The baseband modem switches among the antenna modules, depending on the source of the strongest signal. All of that takes place in real time in fractions of a millisecond.

See *Id.*



See *Id.*

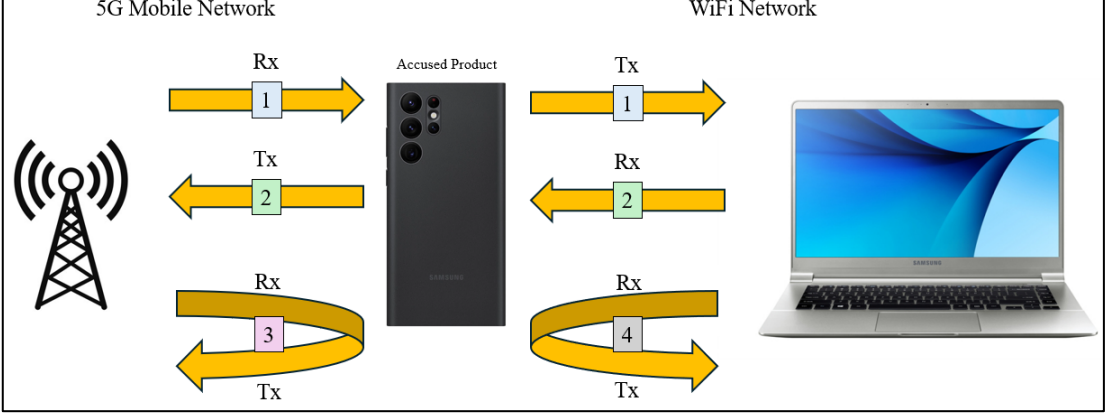
[15B] wherein the wireless transmitter is configured for using the steerable antenna for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.	The at least one steerable antenna in the Accused Hotspot Devices is configured to operate with a 5G modem on a 5G network, which provides a channel bandwidth that fall at or between 100 MHz and 500 MHz. See claim elements [1A] and [15A] above.																				
Claim 21	Accused Hotspot Instrumentalities																				
[21A] The wireless network device of claim 1 wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals in more than one frequency band, and	The transmitter/transceiver of the Accused Hotspot Instrumentalities wireless is configured to transmit wireless data through electromagnetic signals in more than one frequency band. For example, the transceiver of the Accused Hotspot Instrumentalities is configured to transmit and receive data on 4G-LTE and 5G cellular networks on wireless bands for frequency division duplexing (FDD). The image below shows an example of an Accused Hotspot Instrumentality (e.g., Galaxy S23) that supports several 4G-LTE and 5G FDD bands. <table><tr><th colspan="4">Network/Bearer</th></tr><tr><th>Number of SIM</th><th>SIM size</th><th>SIM Slot Type</th><th>Infra</th></tr><tr><td>Dual-SIM</td><td>Nano-SIM (4FF), Embedded-SIM</td><td>SIM 1 + SIM 2 or Embedded SIM</td><td>2G GSM, 3G WCDMA, 4G LTE FDD, 4G LTE TDD, 5G Sub6 FDD, 5G Sub6 TDD</td></tr><tr><td>2G GSM GSM850, GSM900, DCS1800, PCS1900</td><td>3G UMTS B1(2100), B2(1900), B4(AWS), B5(850), B8(900)</td><td>4G FDD LTE B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B8(900), B12(700), B13(700), B17(700), B18(800), B19(800), B20(800), B25(1900), B26(850), B28(700), B66(AWS-3)</td><td>4G TDD LTE B38(2600), B39(1900), B40(2300), B41(2500)</td></tr><tr><td>5G FDD Sub6 N1(2100), N2(1900), N3(1800), N5(850), N7(2600), N8(900), N12(700), N20(800), N25(1900), N28(700), N66(AWS-3)</td><td>5G TDD Sub6 N38(2600), N40(2300), N41(2500), N77(3700), N78(3500)</td><td></td><td></td></tr></table>	Network/Bearer				Number of SIM	SIM size	SIM Slot Type	Infra	Dual-SIM	Nano-SIM (4FF), Embedded-SIM	SIM 1 + SIM 2 or Embedded SIM	2G GSM, 3G WCDMA, 4G LTE FDD, 4G LTE TDD, 5G Sub6 FDD, 5G Sub6 TDD	2G GSM GSM850, GSM900, DCS1800, PCS1900	3G UMTS B1(2100), B2(1900), B4(AWS), B5(850), B8(900)	4G FDD LTE B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B8(900), B12(700), B13(700), B17(700), B18(800), B19(800), B20(800), B25(1900), B26(850), B28(700), B66(AWS-3)	4G TDD LTE B38(2600), B39(1900), B40(2300), B41(2500)	5G FDD Sub6 N1(2100), N2(1900), N3(1800), N5(850), N7(2600), N8(900), N12(700), N20(800), N25(1900), N28(700), N66(AWS-3)	5G TDD Sub6 N38(2600), N40(2300), N41(2500), N77(3700), N78(3500)		
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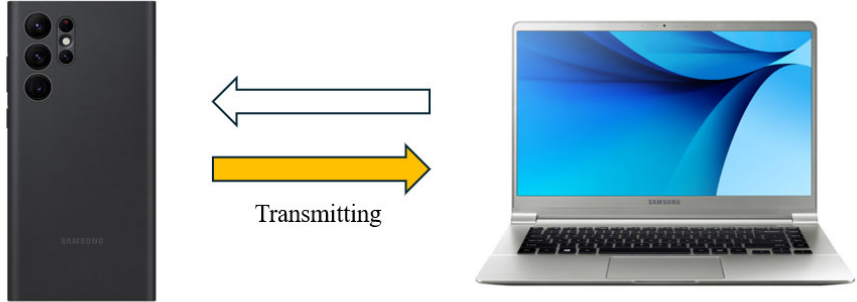
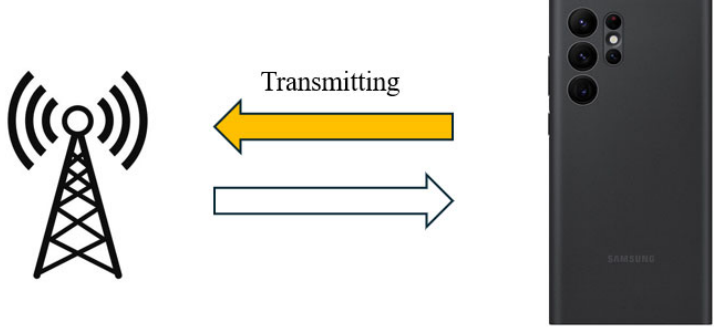
	See https://www.samsung.com/latin_en/smartphones/galaxy-s/galaxy-s23-cream-256gb-sm-s911bzekgto/ In another example, the 5G RF front end module (e.g., 5G transceiver) coupled to a multi-band antenna, used for carrier aggregation. Carrier aggregation allows the Accused Hotspot Instrumentalities to transmit/receive wireless data in different frequency bands at the same time. This includes the use of contiguous or non-contiguous frequency bands to transmit or receive data for a larger overall bandwidth.
[21B] wherein the wireless receiver is configured for receiving wireless data through electromagnetic signals in more than one frequency band.	The receiver/transceiver of the Accused Hotspot Instrumentalities wireless is configured to receive wireless data through electromagnetic signals in more than one frequency band. See claim element [21A] above.
Claim 22	Accused Hotspot Instrumentalities
[22] The wireless network device of claim 1 wherein the wireless transmitter is configured for transmitting wireless data at more than one data rate.	The transmitter/transceiver of the Accused Hotspot Instrumentalities is configured to transmit wireless data at more than one data rate through at least frequency division duplexing (FDD), time division duplexing (TDD), MIMO, or OFDMA. For example, the Accused Hotspot Instrumentalities is configured to use MIMO to send multiple independent data streams over the same frequency channel, where independent data streams are transmitted at different data rates. See https://docs.qualcomm.com/bundle/publicresource/87-27161-1_REV_C_Snapdragon_X75_5G_Modem-RF_System_Product_Brief.pdf See e.g., https://r2.community.samsung.com/t5/Tech-Talk/What-is-4-4-MIMO-and-Does-My-Smartphone-Need-It/td-p/4938055

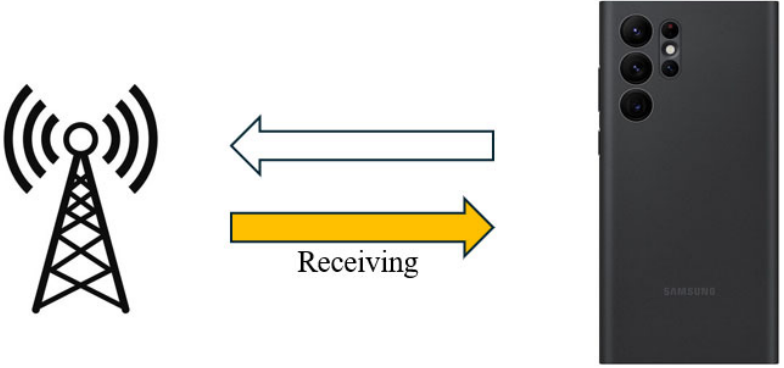
Claim 23	Accused Hotspot Instrumentalities
[23] The wireless network device of claim 1 wherein the wireless receiver is configured for receiving wireless data at more than one data rate.	The receiver/transceiver of the Accused Hotspot Instrumentalities is configured to transmit wireless data at more than one data rate through at least frequency division duplexing (FDD), time division duplexing (TDD), MIMO, or OFDMA. See claims [21], [22] above and claim elements [39A] and [39B] below.
Claim 26	Accused Hotspot Instrumentalities
[26] The wireless network device of claim 1 wherein the wireless network device is configured to operate in a cellular network.	See claim elements [1A]-[1D] above.
Claim 27	Accused Hotspot Instrumentalities
[27] The wireless network device of claim 1 wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 100 MHz.	The transmitter/transceiver of the Accused Hotspot Instrumentalities is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 100 MHz. The Accused Hotspot Instrumentalities comprise a Wi-Fi transmitter/transceiver (e.g., Wi-Fi/Bluetooth combo chip) that supports the transmission of wireless data with at least Wi-Fi 5 (160 MHz) or Wi-Fi 6 (160 MHz). According to the IEEE 802.11 standards, the Wi-Fi generations Wi-Fi 5 (802.11ac), Wi-Fi 6 (802.11ax-2019), and Wi-Fi 6E (802.11ax-2021), all provide 160 MHz channel widths. For example, IEEE 802.11ax (Wi-Fi 5) allows for data transmissions over a contiguous or non-contiguous 160 MHz bandwidth. The 160 MHz contiguous spectrum comprises 8 channels (20 MHz) that are bonded together. The 160 MHz non-contiguous spectrum comprises two 4 channels (20 MHz) that are bonded together and concatenated to form 160 MHz non-contiguous spectrum. The 160 MHz bandwidth supports data rates of up to 6.93 Gbps, but does not indicate a minimum or lower bound for the data rate. See claim elements [1A] above.

Claim 28	Accused Hotspot Instrumentalities
[28] The wireless network device of claim 1 wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 160 MHz.	The transmitter/transceiver of the Accused Hotspot Instrumentalities is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 160 MHz. See claim [27] above.
Claim 31	Accused Hotspot Instrumentalities
[31PRE] A wireless networking method, comprising:	See claim elements [1PRE] above.
[31A] transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second with a wireless transmitter that is part of or in communication with a wireless network device;	See claim elements [1A] above.
[31B] receiving wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second with a wireless receiver that is part of or in	See claim elements [1B] above.

communication with the wireless network device;	
[31C] processing wireless data received by the wireless receiver with a processor that is part of or in communication with the wireless network device; and	See claim elements [1D] above.
[31D] determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter,	The “processed wireless data” refers to the wireless data received by the wireless receiver in element [31C]. It is the essence of, and an inherent operation of, a tethering device to transmit to the tethered device some or all of the information that it receives. See claim elements [1E] above.
[31E] wherein the wireless data transmitted in the transmitting step contains information present in or determined from wireless data that was received by the wireless receiver in the receiving step.	The transmitter of the Accused Hotspot Instrumentalities is configured to transmit wireless data that contains information present in or determined from wireless data that was received by the wireless receiver in the receiving step. For example, the Accused Hotspot Instrumentalities are configured to: 1. receive wireless data through the 5G communication protocol and transmit the received data over the Wi-Fi 6 (802.11ax) communication protocol. 2. receive wireless data through the Wi-Fi 6 (802.11ax) communication protocol and transmit the received data over the 5G communication protocol. 3. receive wireless data through the 5G communication protocol and transmit information determined from the wireless data over the 5G. 4. receive wireless data through the Wi-Fi 6 (802.11ax) communication protocol and transmit information determined from the wireless data over the WiFi6 (802.11ax).

	 The diagram illustrates the Accused Product (a Samsung smartphone) as a central device connected to two networks. On the left, the 5G Mobile Network is represented by a tower icon. Three communication paths are shown: Path 1 (Rx) is a yellow arrow pointing from the tower to the phone; Path 2 (Tx) is a yellow arrow pointing from the phone to the tower; Path 3 (Rx/Tx) is a yellow loop arrow around the phone. On the right, the WiFi Network is represented by a laptop icon. Two communication paths are shown: Path 1 (Tx) is a yellow arrow pointing from the phone to the laptop; Path 2 (Rx) is a yellow arrow pointing from the laptop to the phone. A third path (4) is a yellow loop arrow around the phone, labeled Rx and Tx.
Claim 32	Accused Hotspot Instrumentalities
[32PRE] A wireless network device, comprising:	See claim element [1PRE] above.
[32A] a wireless transmitter that is capable of transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;	The Accused Hotspot Instrumentalities comprise a wireless transmitter that is capable of transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz. For example, the Accused Hotspot Instrumentalities are all configured to use both (a) Wi-Fi 5/6/6E and (b) 5G cellular, which all have channels greater than 100 MHz and less than 500 MHz for communicating with a connected device. Wi-Fi 5, Wi-Fi 6 and Wi-Fi 6E all have 160 MHz channels.

	 Accused Product 5G has various NR bands with bandwidths greater than 100 MHz and less than 500 MHz (n40, n41, n46, n48, n78, n90)  Accused Product See claim elements [1A] and [1B] above.
[32B] a wireless receiver that is capable of receiving wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;	The Accused Hotspot Instrumentalities are all configured to use both (a) WiFi 5/6/6E and (b) 5G cellular, which all have channels greater than 100 MHz and less than 500 MHz for communicating with a “ultrawideband wireless device.” Wi-Fi 5, Wi-Fi 6 and Wi-Fi 6E all have 160 MHz channels.

	 Accused Product 5G has various NR bands with bandwidths greater than 100 MHz and less than 500 MHz (n40, n41, n46, n48, n78, n90)  Accused Product See claim elements [1A] and [1B] above.
[32C] wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or	See claim element [1C] above.

determined from wireless data that has been received by the wireless receiver,	
[32D] wherein the wireless network device is configured for processing wireless data received by the wireless receiver,	See claim element [1D] above.
[32E] wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter, and	The “processed wireless data” refers to the wireless data received by the wireless receiver in element [32D]. It is the essence of, and an inherent operation of, a tethering device to transmit to the tethered device some or all of the information that it receives. See claim elements [1E] above.
[32F] wherein the wireless network device is configured for transmitting beacon frames with the wireless transmitter.	The Accused Hotspot Instrumentalities transmit beacon frames via both cellular (4G and 5G) and Wi-Fi. Logical channels in 4G and 5G transmit beacon frames to broadcast information about the network. The logical channels with beacon frames include one or more of: • Broadcast Control Channel (BCCH) • Paging Control Channel (PCCH) • Common Control Channel (CCH) • Dedicated Control Channel (DCCH) • Dedicated Traffic Channel (DTCH) See https://www.electronics-notes.com/articles/connectivity/5g-mobile-wireless-cellular/data-channels-physical-transport-logical.php. Beacon frames are management frames in IEEE 802.11. See https://en.wikipedia.org/wiki/Beacon_frame.

Claim 39	Accused Hotspot Instrumentalities
[39PRE] A wireless network device, comprising:	See claim element [1PRE] above.
[39A] a wireless transmitter configured for transmitting wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;	The Accused Hotspot Instrumentalities comprise a wireless transmitter configured for transmitting wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz The wireless transmitter comprises a 5G transmitter/transceiver (e.g., 5G RF front end module), and a Wi-Fi transmitter/transceiver (e.g., Wi-Fi/Bluetooth combo chip), configured to transmit wireless data according to the 5G standard that modulates signal transmissions in orthogonal frequency division multiplexing (OFDM), Wi-Fi 5 that modulates signals in OFDM, and Wi-Fi 6 that modulates signals for multiple users in an efficiency OFDM format, multi-user orthogonal frequency division multiple access (OFDMA). See https://www.cisco.com/c/en/us/products/wireless/what-is-ofdma.html; https://www.5gtechnologyworld.com/ofdma-improves-spectrum-use-in-wi-fi-6/; https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/draft_whitepaper_-_leading_the_technology_inventions_for_a_unified_more_capable_air_interface_v.1.0.pdf An integrated circuit package (e.g., 5G system-on-a-chip) may comprise a plurality of functionalities within a single IC package such as signal encoding/decoding by a modem, frequency tuning by a front-end module, and/or transmitter/receiver by a transceiver. The IC is in communication with one or more antennas or an antenna array to wirelessly transmit and receive wireless data over a Wi-Fi network or cellular network. See claim elements [1A] and [1B] above.

[39B] a wireless receiver is configured for receiving wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;	The Accused Hotspot Instrumentalities comprise a wireless receiver is configured for receiving wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz The receiver comprises a 5G receiver/transceiver (e.g., 5G RF front end module), and a Wi-Fi receiver/transceiver (e.g., Wi-Fi/Bluetooth combo chip), configured to receive wireless data according to the 5G standard that modulates signal receptions in orthogonal frequency division multiplexing (OFDM), Wi-Fi 5 that modulates signals in OFDM, and Wi-Fi 6 that modulates signals for multiple users in a efficiency OFDM format, multi-user orthogonal frequency division multiple access (OFDMA). See https://www.cisco.com/c/en/us/products/wireless/what-is-ofdma.html; https://www.5gtechnologyworld.com/ofdma-improves-spectrum-use-in-wi-fi-6/; https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/draft_whitepaper_-_leading_the_technology_inventions_for_a_unified_more_capable_air_interface_v.1.0.pdf An integrated circuit package (e.g., 5G system-on-a-chip) may comprise a plurality of functionalities within a single IC package such as signal encoding/decoding by a modem, frequency tuning by a front-end module, and/or transmitter/receiver by a transceiver. The IC is in communication with one or more antennas or an antenna array to wirelessly transmit and receive wireless data over a Wi-Fi network or cellular network. See claim elements [1A] and [1B] above.
[39C] wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver,	See claim element [1C] above.
[39D] wherein the wireless network device is configured for processing	See claim element [1D] above.

wireless data received by the wireless receiver,	
[39E] wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter.	See claim element [1E] above.