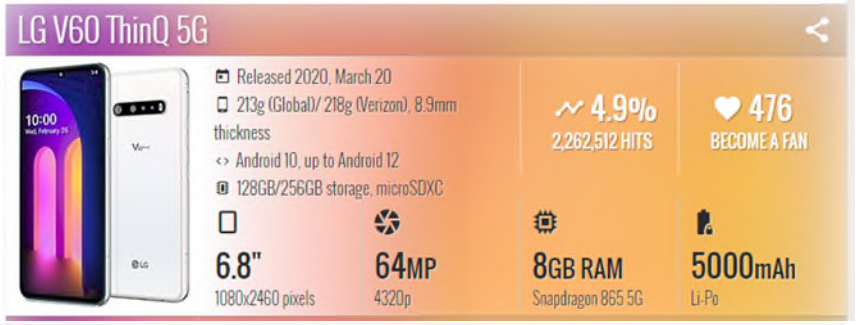
**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

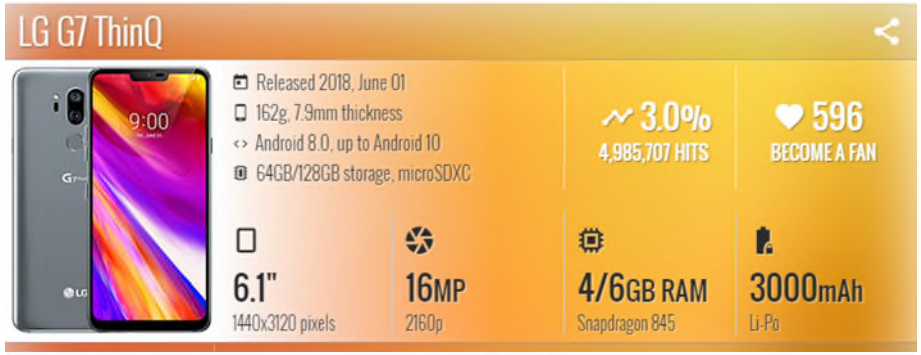
| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| **[18.pre]** A method for video processing, the method comprising: | To the extent the preamble is construed as a limitation, each of the 284 Accused Products[1] performs a method for video processing.<br><br>For example, each of the 284 Accused Products includes 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:<br><br>**LG V60 ThinQ 5G:**<br>  <br><br>**DISPLAY**<br>Type: P-OLED, HDR10+<br>Size: 6.8 inches, 109.8 $cm^2$ (~83.6% screen-to-body ratio)<br>Resolution: 1080 x 2460 pixels (~395 ppi density)<br>Protection: Corning Gorilla Glass 5<br>Always-on display<br><br>**MAIN CAMERA**<br>Dual: 64 MP, f/1.8, 27mm (standard), 1/1.72", 0.8µm, Dual pixel PDAF, OIS<br>13 MP, f/1.9, 12mm (ultrawide), 1/3.4", 1.0µm<br>0.3 MP, TOF 3D, f/1.4, (depth)<br>Features: Dual-LED dual-tone flash, HDR, panorama<br>Video: 8K@30fps, 4K@30/60fps, 1080p, HDR10+, 24-bit/192kHz stereo sound rec., gyro-EIS<br><br>**SELFIE CAMERA**<br>Single: 10 MP, f/1.9, 30mm (standard), 1/3.1", 1.22µm<br>Features: HDR<br>Video: 4K@30fps, gyro-EIS |

[1] The 284 Accused Products are listed in the Cover Pleading for the Disclosure of Asserted Claims and Infringement Contentions (P.R. 3-1) and Document Production Accompanying Disclosure (P.R. 3-2).



1

LG 1012

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | PLATFORM — OS: Android 10, upgradable to Android 12<br>Chipset: Qualcomm SM8250 Snapdragon 865 5G (7 nm+)<br>CPU: Octa-core (1x2.84 GHz Cortex-A77 & 3x2.42 GHz Cortex-A77 & 4x1.80 GHz Cortex-A55)<br>GPU: Adreno 650<br><br>LG V60 ThinQ 5G tech specs; https://www.gsmarena.com/lg_v60_thinq_5g-10103.php.<br><br>**LG G7 ThinQ:**<br>  <br>DISPLAY — Type: IPS LCD, HDR10<br>Size: 6.1 inches, 91.0 cm$^2$ (~82.6% screen-to-body ratio)<br>Resolution: 1440 x 3120 pixels, 19.5:9 ratio (~564 ppi density)<br>Protection: Corning Gorilla Glass 5<br>Always-on display<br>MAIN CAMERA — Dual: 16 MP, f/1.6, 30mm (standard), 1/3.1", 1.0µm, PDAF, Laser AF, OIS<br>16 MP, f/1.9, 16mm (ultrawide), 1/3.1", no AF<br>Features: LED flash, HDR, panorama<br>Video: 4K@30/60fps, 1080p@30/60fps, 720p@240fps, HDR, 24-bit/192kHz stereo sound rec.<br>SELFIE CAMERA — Single: 8 MP, f/1.9, 26mm (wide)<br>Video: 1080p@60fps<br>PLATFORM — OS: Android 8.0 (Oreo), upgradable to Android 10<br>Chipset: Qualcomm SDM845 Snapdragon 845 (10 nm)<br>CPU: Octa-core (4x2.8 GHz Kryo 385 Gold & 4x1.7 GHz Kryo 385 Silver)<br>GPU: Adreno 630 |

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | LG G7 ThinQ tech specs, https://www.gsmarena.com/lg_g7_thinq-9115.php.<br><br>*See also* Technical Specifications showing similar video processing functionality for additional 284 Accused Products available at the websites included in the table below:<br><br>**Accused Product** / **Specification**<br>LG V60 ThinQ 5G — https://www.lg.com/us/cell-phones/lg-lmv600amaattcb-att-v60-thinq-5g#<br>LG G7 ThinQ — https://www.lg.com/us/cell-phones/lg-G710ULM---LRA<br>LG G6 — https://www.lg.com/levant_en/mobile-phones/lg-G6-platinum<br>LG G5 — https://www.lg.com/us/cell-phones/lg-VS987-Titan-g5<br>LG K92 5G — https://www.lg.com/us/cell-phones/lg-lmk920tm0aucltn-usc-k92-5g<br>LG G8 ThinQ — https://www.lg.com/us/cell-phones/lg-LMG820UM1-att-g8-thinq<br>LG V30S ThinQ — https://www.lg.com/us/cell-phones/lg-US998R-Unlocked-Matte-v30s<br>LG Q6 — https://www.lg.com/us/cell-phones/lg-US700-Unlocked-q6<br><br>The AIDA64 Reports show that each of the 284 Accused Products contains an example of a video proccessing apparatus in the form of front-facing and rear-facing cameras.<br><br>**LG V60 ThinQ 5G:**<br>**AIDA 64 Report- Camera** |



3

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | << Rear-Facing Camera >><br>Resolution: 16 MP (4624 × 3468)<br>Focal Length: 5.58 mm<br>Focus Modes: infinity, auto, macro, continuous-video, continuous-picture<br>Video Stabilization: Supported<br>Zoom: Supported<br>Auto Exposure Locking: Supported<br>Auto White Balance Locking: Supported<br>Flash: Supported<br><br><< Front-Facing Camera >><br><br>Resolution: 10.0 MP (3648 × 2736)<br>Focal Length: 3.70 mm<br>Focus Modes: infinity, auto, macro, continuous-video, continuous-picture<br>Video Stabilization: Supported<br>Zoom: Supported<br>Auto Exposure Locking: Supported<br>Auto White Balance Locking: Supported<br>Flash: Not Supported<br><br><< Rear-Facing Camera >><br>Resolution: 13 MP (4160 × 3120)<br>Focal Length: 1.78 mm<br>Focus Modes: fixed, infinity<br>Video Stabilization: Supported<br>Zoom: Supported<br>Auto Exposure Locking: Supported<br>Auto White Balance Locking: Supported<br>Flash: Supported<br><br>**LG G7 ThinQ:** |



4

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **AIDA 64 Report- Camera**<br><br><< Rear-Facing Camera >><br>Resolution: 16 MP (4656 × 3492)<br>Focal Length: 4.03 mm<br>Focus Modes: infinity, auto, macro, continuous-video, continuous-picture<br>Video Stabilization: Supported<br>Zoom: Supported<br>Auto Exposure Locking: Supported<br>Auto White Balance Locking: Supported<br>Flash: Supported<br><br><< Front-Facing Camera >><br>Resolution: 8.0 MP (3264 × 2448)<br>Focal Length: 2.68 mm<br>Focus Modes: fixed, infinity<br>Video Stabilization: Supported<br>Zoom: Supported<br>Auto Exposure Locking: Supported<br>Auto White Balance Locking: Supported<br>Flash: Not Supported<br><br><< Rear-Facing Camera >><br>Resolution: 16 MP (4656 × 3492)<br>Focal Length: 2.38 mm<br>Focus Modes: fixed, infinity<br>Video Stabilization: Supported<br>Zoom: Supported<br>Auto Exposure Locking: Supported<br>Auto White Balance Locking: Supported<br>Flash: Supported |



5

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Additionally, the AIDA64 Reports and Technical Specifications show each of the 284 Accused Products contains a processor, which, in conjunction with other features and components discused in this claim chart, allows each of the 284 Accused Products to act as a video processing apparatus.<br><br>**LG V60 ThinQ 5G:**<br><br>**AIDA 64 Report- Processor**<br><br><<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 865 (SM8250)<br>Core Architecture: 4x Qualcomm Kryo 585 Silver @ 1804 MHz<br>3x ARM Cortex-A77 @ 2419 MHz<br>ARM Cortex-A77 @ 2841 MHz<br>Manufacturing Process: 7 nm<br>Instruction Set: 64-bit ARMv8-A<br><br>**LG G7 ThinQ:**<br><br>**AIDA 64 Report- Processor**<br><br><<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 845<br>Core Architecture: 4x Qualcomm Kryo 385 Silver @ 1766 MHz<br>4x Qualcomm Kryo 385 Gold @ 2803 MHz<br>Manufacturing Process: 10 nm<br>Instruction Set: 64-bit ARMv8-A |

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Technical specifications, User Guides, and/or AIDA 64 reports of the remaining 284 Accused Products also include similar disclosures showing that each is a video processing apparatus.<br><br>*See also* Appendix 10 showing that the remaining 284 Accused Products include processors and hardware that implement video processing. |
| **[18.a]** transmitting, via a first radio communication circuit, digital video information by radio to an external apparatus; | Each of the 284 Accused Products performs a method of transmitting, via a first radio communication circuit, digital video information by radio to an external apparatus.<br><br>For example, each of the 284 Accused Products includes a Wi-Fi communication chip configured to transmit digital video information by a radio to an external video processing apparatus (*e.g.*, via MMS/e-mail/Wi-Fi Direct).<br><br>**LG V60 ThinQ 5G:**<br><br>COMMS<br>WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct, DLNA<br>Bluetooth: 5.1, A2DP, LE, aptX HD<br>Positioning: GPS, GLONASS, GALILEO, BDS<br>NFC: Yes<br>Radio: FM radio (USA model only)<br>USB: USB Type-C 3.1, OTG<br><br>LG V60 ThinQ 5G tech specs; https://www.gsmarena.com/lg_v60_thinq_5g-10103.php.<br><br>**LG G7 ThinQ:**<br><br>COMMS<br>WLAN: Wi-Fi 802.11 a/b/g/n/ac, dual-band, Wi-Fi Direct, DLNA<br>Bluetooth: 5.0, A2DP, LE, aptX HD<br>Positioning: GPS, GLONASS, BDS<br>NFC: Yes<br>Radio: FM radio<br>USB: USB Type-C 3.1, OTG |

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | LG G7 ThinQ tech specs, https://www.gsmarena.com/lg_g7_thinq-9115.php.<br><br>The AIDA64 report shows that each of the 284 Accused Products has a Wi-Fi chip which in conjunction with a processor helps to transmit a digital video information to an external device.<br><br>**LG V60 ThinQ 5G:**<br>**AIDA 64 Report- Wi-Fi**<br><br><< Wi-Fi >><br>State: Enabled<br>SSID: <unknown ssid><br>BSSID: 02:00:00:00:00:00<br>Hidden SSID: Yes<br>IPv4 Address: 172.29.66.26<br>IPv6 Address: fe80::a24f:85ff:fedf:3b78<br>Signal Strength: -66 dBm (Very Good)<br>Link Speed: 576 Mbps<br>Frequency: 5180 MHz<br>Gateway: 172.29.64.1<br>DNS1: 209.244.0.3<br>DNS2: 8.8.4.4<br>DHCP Lease Duration: 24 hours<br>5 GHz Band: Supported<br>Wi-Fi Aware: Supported<br>Wi-Fi Direct: Supported<br><br>**LG G7 ThinQ:**<br>**AIDA 64 Report- Wi-FI** |



8

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | << Wi-Fi >><br>State: Enabled<br>SSID: <unknown ssid><br>BSSID: 02:00:00:00:00:00<br>Hidden SSID: Yes<br>IPv4 Address: 172.29.66.214<br>IPv6 Address: fe80::aef6:f7ff:feb5:6f5d<br>Signal Strength: -62 dBm (Very Good)<br>Link Speed: 520 Mbps<br>Frequency: 5180 MHz<br>Network ID: 2<br>Gateway: 172.29.64.1<br>DNS1: 209.244.0.3<br>DNS2: 8.8.4.4<br>DHCP Lease Duration: 24 hours<br>5 GHz Band: Supported<br>Wi-Fi Aware: Not Supported<br>Wi-Fi Direct: Supported<br><br>For example, the following screenshots show each of the 284 Accused Products using a Wi-Fi communication chip to transmit information by using one or more of MMS and/or Wi-Fi Direct (similar functionality also applies to E-mail over Wi-Fi):<br><br>Video Information Transmitting Device (G7 ThinQ)-cellular off \| Video Information Receiving Device (V60 ThinQ) |

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | |



10

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Video Information Transmitting Device (V60 ThinQ)-cellular off<br>Video Information Receiving Device (G7 ThinQ)<br> <br> |

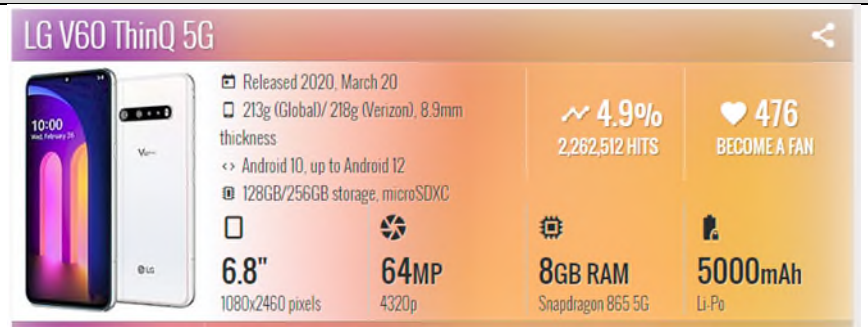
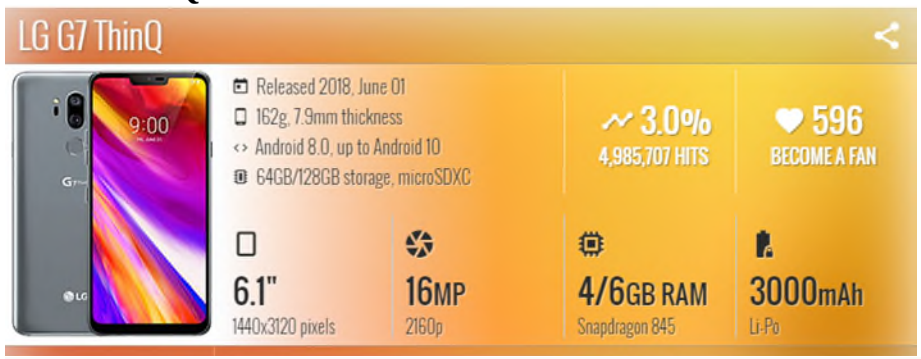


11

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <br><br>In the alternative, **f**or example, each of the 284 Accused Products includes a cellular communication chip configured to transmit digital video information by a radio to an external video processing apparatus (*e.g.*, via MMS/e-mail).<br>Specifically, each of the 284 Accused Products uses a cellular communication chip configured to operate in one or more of 2G/3G/LTE protocols in order to transmit digital video information by a radio to an external video processing apparatus by using cellular data services. With respect to the present claim limitation, each such protocol operates identically.<br>**LG V60 ThinQ 5G:** |



12

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |  <br>NETWORK Technology GSM / CDMA / HSPA / EVDO / LTE / 5G<br>PLATFORM OS Android 10, upgradable to Android 12<br>Chipset Qualcomm SM8250 Snapdragon 865 5G (7 nm+)<br>CPU Octa-core (1x2.84 GHz Cortex-A77 & 3x2.42 GHz Cortex-A77 & 4x1.80 GHz Cortex-A55)<br>GPU Adreno 650<br>LG V60 ThinQ 5G tech specs; https://www.gsmarena.com/lg_v60_thinq_5g-10103.php.<br><br>**LG G7 ThinQ:**<br>  <br>NETWORK Technology GSM / CDMA / HSPA / LTE |

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | PLATFORM<br>OS: Android 8.0 (Oreo), upgradable to Android 10<br>Chipset: Qualcomm SDM845 Snapdragon 845 (10 nm)<br>CPU: Octa-core (4x2.8 GHz Kryo 385 Gold & 4x1.7 GHz Kryo 385 Silver)<br>GPU: Adreno 630<br><br>LG G7 ThinQ tech specs, https://www.gsmarena.com/lg_g7_thinq-9115.php<br><br>Further, AIDA64 reports confirm that each of the 284 Accused Products includes one or more processors to connect to an external display apparatus and transmit digital information (*e.g.*, via MMS protocol over cellular network and/or via e-mail or phone call):<br><br>**LG V60 ThinQ 5G:**<br><br>**AIDA 64 Report- System** |



14

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <<< System >>><br><br>Device Model: LG V60 ThinQ<br>Device Type: Phablet<br>Manufacturer: LGE<br>Model: LM-V600<br>Brand: lge<br>Board: kona<br>Device: timelm<br>Hardware: timelm<br>Platform: kona<br>Product: timelm<br>Installed RAM: 8 GB LPDDR4X<br>Total Memory: 7681 MB<br>Available Memory: 3317 MB<br>Internal Storage Total Space: 95.09 GB<br>Internal Storage Free Space: 88.30 GB<br>Bluetooth Version: 5.1<br><br>**AIDA 64 Report- Processor** |



15

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 865 (SM8250)<br>Core Architecture: 4x Qualcomm Kryo 585 Silver @ 1804 MHz<br>3x ARM Cortex-A77 @ 2419 MHz<br>ARM Cortex-A77 @ 2841 MHz<br>Manufacturing Process: 7 nm<br>Instruction Set: 64-bit ARMv8-A<br><br>**LG G7 ThinQ:**<br><br>**AIDA 64 Report- System** |



16

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <<< System >>><br><br>Device Model: LG G7 ThinQ<br>Device Type: Phablet<br>Manufacturer: LGE<br>Model: LM-G710<br>Brand: lge<br>Board: sdm845<br>Device: judyln<br>Hardware: judyln<br>Platform: sdm845<br>Product: judyln_lao_com<br>Serial: LMG710ULM277c579d<br>Installed RAM: 4 GB LPDDR4X<br>Total Memory: 3646 MB<br>Available Memory: 1089 MB<br>Internal Storage Total Space: 45.83 GB<br>Internal Storage Free Space: 42.72 GB<br>Bluetooth Version: 5.0<br><br>**AIDA 64 Report- Processor** |



17

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 845<br>Core Architecture: 4x Qualcomm Kryo 385 Silver @ 1766 MHz<br>4x Qualcomm Kryo 385 Gold @ 2803 MHz<br>Manufacturing Process: 10 nm<br>Instruction Set: 64-bit ARMv8-A<br><br>*See also* Technical Specifications showing similar networking functionality for additional 284 Accused Products available at the websites included in the table below: |

| Accused Product | Specification |
|---|---|
| LG V60 ThinQ 5G | https://www.lg.com/us/cell-phones/lg-lmv600amaattcb-att-v60-thinq-5g# |
| LG G7 ThinQ | https://www.lg.com/us/cell-phones/lg-G710ULM---LRA |
| LG G6 | https://www.lg.com/levant_en/mobile-phones/lg-G6-platinum |
| LG G5 | https://www.lg.com/us/cell-phones/lg-VS987-Titan-g5 |
| LG K92 5G | https://www.lg.com/us/cell-phones/lg-lmk920tm0aucltn-usc-k92-5g |
| LG G8 ThinQ | https://www.lg.com/us/cell-phones/lg-LMG820UM1-att-g8-thinq |
| LG V30S ThinQ | https://www.lg.com/us/cell-phones/lg-US998R-Unlocked-Matte-v30s |
| LG Q6 | https://www.lg.com/us/cell-phones/lg-US700-Unlocked-q6 |



18

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | For example, the following screenshots show exemplary 284 Accused Products using a cellular communication chip to transmit digital video information via MMS and similar functionality also applies to transmitting digital video via e-mail:<br><br>Video Information Transmitting Device (G7 ThinQ) – Wi-Fi off \| Video Information Receiving Device (V60 ThinQ) – Wi-Fi off<br><br> |

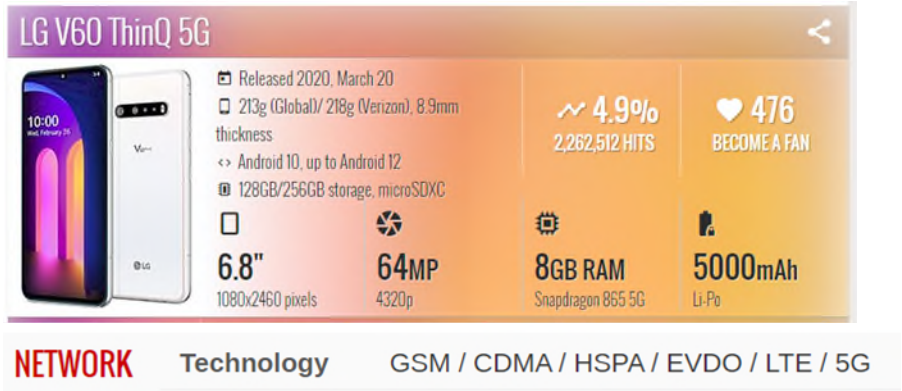


19

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Video Information Transmitting Device (V60 ThinQ) – Wi-Fi off<br>Video Information Receiving Device (G7 ThinQ) – Wi-Fi off<br> <br><br>Technical specifications, User Guides, and/or AIDA 64 reports of the remaining 284 Accused Products also include similar disclosures about networking functionality. |

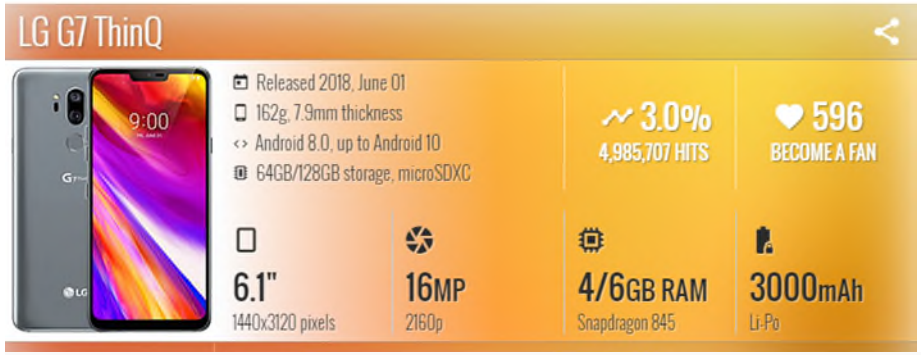


20

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | *See also* Appendix 10 showing that the remaining 284 Accused Products include the radio circuitry that performs this claim limitation. |
| **[18.b]** connecting, via a second radio communication circuit, to an internet or a home network; | Each of the 284 Accused Products performs a method of connecting, via a second radio communication circuit, to an internet or a home network and receiving digital information.<br><br>For example, each of the 284 Accused Products includes a cellular communication chip configured to connect to an internet or a home network by radio (*e.g.*, via cellular data services), and receive digital information (*e.g.*, via MMS/e-mail/Internet).<br><br>Specifically, each of the 284 Accused Products uses a cellular communication chip configured to operate in one or more of 2G/3G/LTE protocols in order to connect to an internet or a home network by radio, and receive digital information by using cellular data services.<br><br>**LG V60 ThinQ 5G:**<br>  |



21

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | PLATFORM — OS: Android 10, upgradable to Android 12; Chipset: Qualcomm SM8250 Snapdragon 865 5G (7 nm+); CPU: Octa-core (1x2.84 GHz Cortex-A77 & 3x2.42 GHz Cortex-A77 & 4x1.80 GHz Cortex-A55); GPU: Adreno 650<br>LG V60 ThinQ 5G tech specs; https://www.gsmarena.com/lg_v60_thinq_5g-10103.php.<br><br>**LG G7 ThinQ:**<br>  <br>NETWORK — Technology: GSM / CDMA / HSPA / LTE<br>PLATFORM — OS: Android 8.0 (Oreo), upgradable to Android 10; Chipset: Qualcomm SDM845 Snapdragon 845 (10 nm); CPU: Octa-core (4x2.8 GHz Kryo 385 Gold & 4x1.7 GHz Kryo 385 Silver); GPU: Adreno 630<br>LG G7 ThinQ tech specs, https://www.gsmarena.com/lg_g7_thinq-9115.php.<br><br>Further, AIDA64 reports confirm that each of the 284 Accused Products includes one or more processors to access the Internet, and receive digital information (*e.g.*, via MMS protocol over cellular network and/or via e-mail or phone call):<br><br>**LG V60 ThinQ 5G:** |



22

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **AIDA 64 Report- System**<br><br><<< System >>><br><br>Device Model: LG V60 ThinQ<br>Device Type: Phablet<br>Manufacturer: LGE<br>Model: LM-V600<br>Brand: lge<br>Board: kona<br>Device: timelm<br>Hardware: timelm<br>Platform: kona<br>Product: timelm<br>Installed RAM: 8 GB LPDDR4X<br>Total Memory: 7681 MB<br>Available Memory: 3317 MB<br>Internal Storage Total Space: 95.09 GB<br>Internal Storage Free Space: 88.30 GB<br>Bluetooth Version: 5.1 |



23

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **AIDA 64 Report- Processor**<br><br><<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 865 (SM8250)<br>Core Architecture: 4x Qualcomm Kryo 585 Silver @ 1804 MHz<br>3x ARM Cortex-A77 @ 2419 MHz<br>ARM Cortex-A77 @ 2841 MHz<br>Manufacturing Process: 7 nm<br>Instruction Set: 64-bit ARMv8-A<br><br>**LG G7 ThinQ:**<br><br>**AIDA 64 Report- System** |



24

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <<< System >>><br><br>Device Model: LG G7 ThinQ<br>Device Type: Phablet<br>Manufacturer: LGE<br>Model: LM-G710<br>Brand: lge<br>Board: sdm845<br>Device: judyln<br>Hardware: judyln<br>Platform: sdm845<br>Product: judyln_lao_com<br>Serial: LMG710ULM277c579d<br>Installed RAM: 4 GB LPDDR4X<br>Total Memory: 3646 MB<br>Available Memory: 1089 MB<br>Internal Storage Total Space: 45.83 GB<br>Internal Storage Free Space: 42.72 GB<br>Bluetooth Version: 5.0<br><br>**AIDA 64 Report- Processor** |



25

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 845<br>Core Architecture: 4x Qualcomm Kryo 385 Silver @ 1766 MHz<br>4x Qualcomm Kryo 385 Gold @ 2803 MHz<br>Manufacturing Process: 10 nm<br>Instruction Set: 64-bit ARMv8-A<br><br>*See also* Technical Specifications showing similar networking functionality for additional 284 Accused Products available at the websites included in the table below:<br><br>**Accused Product** — **Specification**<br>LG V60 ThinQ 5G — https://www.lg.com/us/cell-phones/lg-lmv600amaattcb-att-v60-thinq-5g#<br>LG G7 ThinQ — https://www.lg.com/us/cell-phones/lg-G710ULM---LRA<br>LG G6 — https://www.lg.com/levant_en/mobile-phones/lg-G6-platinum<br>LG G5 — https://www.lg.com/us/cell-phones/lg-VS987-Titan-g5<br>LG K92 5G — https://www.lg.com/us/cell-phones/lg-lmk920tm0aucltn-usc-k92-5g<br>LG G8 ThinQ — https://www.lg.com/us/cell-phones/lg-LMG820UM1-att-g8-thinq<br>LG V30S ThinQ — https://www.lg.com/us/cell-phones/lg-US998R-Unlocked-Matte-v30s<br>LG Q6 — https://www.lg.com/us/cell-phones/lg-US700-Unlocked-q6<br><br>Technical specifications, User Guides, and/or AIDA 64 reports of the remaining 284 Accused Products also include similar disclosures about networking functionality. |



26

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | For example, the following screenshots show exemplary 284 Accused Products using a cellular communication chip to receive digital video information via MMS and similar functionality also applies to receiving digital video via e-mail: |

| Video Information Transmitting Device (G7 ThinQ) – Wi-Fi off | Video Information Receiving Device (V60 ThinQ) – Wi-Fi off |
|---|---|

27

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (V60 ThinQ) – Wi-Fi off | Video Information Receiving Device (G7 ThinQ) – Wi-Fi off |

28

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | In the alternative, each of the 284 Accused Products includes a Wi-Fi communication chip configured to connect to an internet (*e.g.*, connect to the Internet via Wi-Fi) or a home network (*e.g.*, router without internet or another device in the home via Wi-Fi Direct to form a home network) by radio, and receiving digital information (*e.g.*, by Internet, e-mail, Wi-Fi Direct, and/or MMS).<br><br>**LG V60 ThinQ 5G:**<br><br>COMMS<br>WLAN: Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct, DLNA<br>Bluetooth: 5.1, A2DP, LE, aptX HD<br>Positioning: GPS, GLONASS, GALILEO, BDS<br>NFC: Yes<br>Radio: FM radio (USA model only)<br>USB: USB Type-C 3.1, OTG<br><br>LG V60 ThinQ 5G tech specs; https://www.gsmarena.com/lg_v60_thinq_5g-10103.php.<br><br>**LG G7 ThinQ:**<br><br>COMMS<br>WLAN: Wi-Fi 802.11 a/b/g/n/ac, dual-band, Wi-Fi Direct, DLNA<br>Bluetooth: 5.0, A2DP, LE, aptX HD<br>Positioning: GPS, GLONASS, BDS<br>NFC: Yes<br>Radio: FM radio<br>USB: USB Type-C 3.1, OTG<br><br>LG G7 ThinQ tech specs, https://www.gsmarena.com/lg_g7_thinq-9115.php.<br><br>The AIDA64 report shows that each of the 284 Accused Products has a Wi-Fi chip which in conjunction with a processor helps to receive a digital video information from an external device. |



29

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **LG V60 ThinQ 5G:**<br>**AIDA 64 Report- Wi-Fi**<br><< Wi-Fi >><br>State: Enabled<br>SSID: <unknown ssid><br>BSSID: 02:00:00:00:00:00<br>Hidden SSID: Yes<br>IPv4 Address: 172.29.66.26<br>IPv6 Address: fe80::a24f:85ff:fedf:3b78<br>Signal Strength: -66 dBm (Very Good)<br>Link Speed: 576 Mbps<br>Frequency: 5180 MHz<br>Gateway: 172.29.64.1<br>DNS1: 209.244.0.3<br>DNS2: 8.8.4.4<br>DHCP Lease Duration: 24 hours<br>5 GHz Band: Supported<br>Wi-Fi Aware: Supported<br>Wi-Fi Direct: Supported<br>**AIDA 64 Report- Processor** |



30

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 865 (SM8250)<br>Core Architecture: 4x Qualcomm Kryo 585 Silver @ 1804 MHz<br>3x ARM Cortex-A77 @ 2419 MHz<br>ARM Cortex-A77 @ 2841 MHz<br>Manufacturing Process: 7 nm<br>Instruction Set: 64-bit ARMv8-A<br><br>**LG G7 ThinQ:**<br><br>**AIDA 64 Report- Wi-Fi** |



31

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | << Wi-Fi >><br>State: Enabled<br>SSID: <unknown ssid><br>BSSID: 02:00:00:00:00:00<br>Hidden SSID: Yes<br>IPv4 Address: 172.29.66.214<br>IPv6 Address: fe80::aef6:f7ff:feb5:6f5d<br>Signal Strength: -62 dBm (Very Good)<br>Link Speed: 520 Mbps<br>Frequency: 5180 MHz<br>Network ID: 2<br>Gateway: 172.29.64.1<br>DNS1: 209.244.0.3<br>DNS2: 8.8.4.4<br>DHCP Lease Duration: 24 hours<br>5 GHz Band: Supported<br>Wi-Fi Aware: Not Supported<br>Wi-Fi Direct: Supported<br><br>**AIDA 64 Report- Processor**<br><br><<< CPU >>><br><br>SoC Model: Qualcomm Snapdragon 845<br>Core Architecture: 4x Qualcomm Kryo 385 Silver @ 1766 MHz<br>4x Qualcomm Kryo 385 Gold @ 2803 MHz<br>Manufacturing Process: 10 nm<br>Instruction Set: 64-bit ARMv8-A |



32

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | *See also* Technical Specifications showing similar networking functionality for additional 284 Accused Products available at the websites included in the table below: |

| Accused Product | Specification |
|---|---|
| LG V60 ThinQ 5G | https://www.lg.com/us/cell-phones/lg-lmv600amaattcb-att-v60-thinq-5g# |
| LG G7 ThinQ | https://www.lg.com/us/cell-phones/lg-G710ULM---LRA |
| LG G6 | https://www.lg.com/levant_en/mobile-phones/lg-G6-platinum |
| LG G5 | https://www.lg.com/us/cell-phones/lg-VS987-Titan-g5 |
| LG K92 5G | https://www.lg.com/us/cell-phones/lg-lmk920tm0aucltn-usc-k92-5g |
| LG G8 ThinQ | https://www.lg.com/us/cell-phones/lg-LMG820UM1-att-g8-thinq |
| LG V30S ThinQ | https://www.lg.com/us/cell-phones/lg-US998R-Unlocked-Matte-v30s |
| LG Q6 | https://www.lg.com/us/cell-phones/lg-US700-Unlocked-q6 |

Technical specifications, User Guides, and/or AIDA 64 reports of the remaining 284 Accused Products also include similar disclosures about networking functionality.

For example, the following screenshots show each of the 284 Accused Products using a Wi-Fi communication chip to receive information by using one or more of MMS and/or Wi-Fi Direct (similar functionality also applies to E-mail over Wi-Fi):

| Video Information Transmitting Device (G7 ThinQ)-cellular off | Video Information Receiving Device (V60 ThinQ) |
|---|---|



33

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | |



34

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Video Information Transmitting Device (V60 ThinQ)-cellular off<br>Video Information Receiving Device (G7 ThinQ)<br> <br> |



35

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | <br>*See also* Appendix 10 showing that the remaining 760 Accused Products include radio circuitry for connecting to an internet or a home network. |
| **[18.c]** receiving digital information; | Each of the 286 Accused Products receives digital information via its radio circuitry using wifi and/or cellular communications protocols. See contentions relating to Claim 18.b, said contentions herein incorporated by reference. |



36

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| **U.S. Patent No. 10,244,284** | **Exemplary Evidence of Infringement** |
|---|---|
| **[18.d]** controlling each of the first and second radio communication circuits such that the first radio communication circuit transmits digital video information to the external apparatus and the second radio communication circuit connects to the internet or the home network simultaneously; | Each of the 284 Accused Products performs a method of controlling each of the first and second radio communication circuits such that the first radio communication circuit transmits digital video information to the external apparatus and the second radio communication circuit connects to the internet or the home network simultaneously.<br><br>For example, the controller (*e.g.*, CPU) of each of the 284 Accused Products is configured to control transmitting digital video information via the Wi-Fi communication chip and the cellular communication chip connects to the Internet or home network simultaneously.<br><br>For example, upon information and belief, under certain conditions the controller (*e.g.*, CPU) of each of the 284 Accused Products is configured to control transmitting video using a Wi-Fi communication chip over MMS/e-mail/Wi-Fi Direct and each of the 284 Accused Products connects to the Internet simultaneously using the cellular communication chip to provide cellular data services.<br><br>Additionally, on information and belief, each of the 284 Accused Products' CPU implements the 3GPP standard to control each of the first and second radio communication circuits such that the first radio communication circuit transmits digital video information from the external video processing apparatus and the second radio communication circuit connects to the internet or the home network simultaneously. |

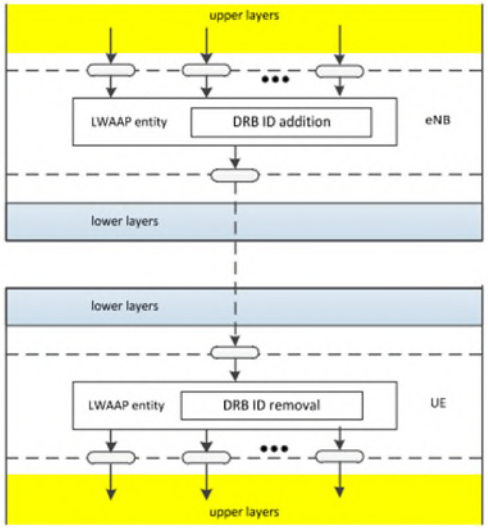


37

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **5.5 LTE-WLAN Aggregation**<br>For the LWA bearer option<br>- the GTP-U (TS 29.281 [2]) protocol over UDP over IP shall be supported as the transport for the downlink user data stream of PDCP PDUs and the uplink flow control feedback stream on the Xw interface. The GTP-U PDU includes a RAN Container with flow control information as specified in TS 36.625 [3] which is carried in the GTP-U extension header. The transport bearer is identified by the GTP-U TEID (TS 29.281 [2]) and the IP address of the eNB and WT respectively. There is one UL data stream (if flow control is supported) and there is one DL data stream per E-RAB at the Xw interface:<br>  - The DL data stream is used for DL user data transmission from the eNB to the WT.<br>  - The UL data stream is used for UL flow control feedback transmission from the WT to the eNB.<br>- the packet processing function in the eNB shall send downstream packets corresponding toa given E-RAB to the WT IP address (received in XwAP) associated to the DL transport bearer of that particular E-RAB. The packet processing function in the WT shall send upstream packets corresponding to a given E-RAB to the eNB IP address (received in XwAP) associated to the UL transport bearer of that particular E-RAB.<br>- in addition, user data forwarding (from WT to eNB ) may be performed by eNB providing another GTP-U TEID to receive the DL data forwarded by the WT.<br>3GPP TS 36.464 version 13.0.0 at 7. |



38

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | 4.2 LWAAP architecture<br>4.2.1 LWAAP entities<br>The description in this sub clause is a model and does not specify or restrict implementations.<br>RRC is generally in control of the LWAAP configuration.<br>Functions of the LWAAP sublayer are performed by LWAAP entities. For an LWAAP entity configured at the eNB, there is a peer LWAAP entity configured at the UE and vice versa. For all LWA bearers, there is one LWAAP entity in the eNB and one LWAAP entity in the UE.<br>An LWAAP entity receives/delivers LWAAP SDUs from/to upper layers (i.e. PDCP) and sends/receives LWAAP PDUs to/from its peer LWAAP entity via WLAN:<br>- At the eNB, when an LWAAP entity receives an LWAAP SDU from upper layers, it constructs the corresponding LWAAP PDU and delivers it to lower layers;<br>- At the UE, when an LWAAP entity receives an LWAAP PDU from lower layers, it reassembles the corresponding LWAAP SDU and delivers it to upper layers.<br>Figure 4.2.1-1 illustrates the overview model of the LWAAP sublayer.<br>  <br><br>**Figure 4.2.1-1: Overview model of the LWAAP sublayer** |



39

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **5.1 Data transfer procedures**<br>**5.1.1 DL data transfer procedures**<br>When receiving an LWAAP data PDU from lower layers, the LWAAP entity in the UE shall:<br>- identify the upper layer entity to which the LWAAP SDU is destined based on the DRB ID included in the LWAAP header;<br>- reassemble the LWAAP SDU from the LWAAP data PDU by removing the LWAAP header from the LWAAP data PDU;<br>- deliver the reassembled LWAAP SDU to the upper layer entity identified by the DRB ID.<br>3GPP TS 36.360 version 13.0.0 at 6-7. |



40

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|

**Simultaneous Transmission Scenarios**

| No. | Capable Transmit Configuration | Head | Body-Worn Accessory | Wireless Router | Phablet | Notes |
|---|---|---|---|---|---|---|
| 1 | 1x CDMA voice + 2.4 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 2 | 1x CDMA voice + 5 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 3 | 1x CDMA voice + 2.4 GHz Bluetooth | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 4 | 1x CDMA voice + 2.4 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 5 | 1x CDMA voice + 5 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 6 | 1x CDMA voice + 2.4 GHz Wi-Fi Ant 1 + 5 GHz Wi-Fi Ant 2 | Yes | Yes | N/A | Yes | |
| 7 | GSM voice + 2.4 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 8 | GSM voice + 5 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 9 | GSM voice + 2.4 GHz Bluetooth | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 10 | GSM voice + 2.4 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 11 | GSM voice + 5 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 12 | GSM voice + 2.4 GHz Wi-Fi Ant 1 + 5 GHz Wi-Fi Ant 2 | Yes | Yes | N/A | Yes | |
| 13 | UMTS + 2.4 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 14 | UMTS + 5 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 15 | UMTS + 2.4 GHz Bluetooth | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 16 | UMTS + 2.4 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 17 | UMTS + 5 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 18 | UMTS + 2.4 GHz Wi-Fi Ant 1 + 5 GHz Wi-Fi Ant 2 | Yes | Yes | Yes | Yes | |
| 19 | LTE + 2.4 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 20 | LTE + 5 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 21 | LTE + 2.4 GHz Bluetooth | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 22 | LTE + 2.4 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 23 | LTE + 5 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 24 | LTE + 2.4 GHz Wi-Fi Ant 1 + 5 GHz Wi-Fi Ant 2 | Yes | Yes | Yes | Yes | |
| 25 | CDMA/EVDO data + 2.4 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 26 | CDMA/EVDO data + 5 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 27 | CDMA/EVDO data + 2.4 GHz Bluetooth | Yes*^ | Yes* | Yes^ | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |
| 28 | CDMA/EVDO data + 2.4 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 29 | CDMA/EVDO data + 5 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 30 | CDMA/EVDO data + 2.4 GHz Wi-Fi Ant 1 + 5 GHz Wi-Fi Ant 2 | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 31 | GPRS/EDGE + 2.4 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 32 | GPRS/EDGE + 5 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 33 | GPRS/EDGE + 2.4 GHz Bluetooth | Yes*^ | Yes* | Yes^ | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |
| 34 | GPRS/EDGE + 2.4 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 35 | GPRS/EDGE + 5 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 36 | GPRS/EDGE + 2.4 GHz Wi-Fi Ant 1 + 5 GHz Wi-Fi Ant 2 | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |

LG G7 ThinQ FCC SAR Test Report, available at https://apps.fcc.gov/eas/GetApplicationAttachment.html?id=3820678



41

**Simultaneous Transmission Scenarios**

| No. | Capable Transmit Configuration | Head | Body-Worn Accessory | Wireless Router | Phablet | Notes |
|---|---|---|---|---|---|---|
| 1 | 1x CDMA voice + 2.4 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 2 | 1x CDMA voice + 5 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 3 | 1x CDMA voice + 2.4 GHz Bluetooth | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 4 | 1x CDMA voice + 2.4 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 5 | 1x CDMA voice + 5 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 6 | 1x CDMA voice + 2.4 GHZ Wi-Fi Antenna 2 + 2.4 GHz Bluetooth | Yes* | Yes | N/A | Yes | * Bluetooth Tethering is considered |
| 7 | 1x CDMA voice + 2.4 GHz Bluetooth + 5 GHz Wi-Fi | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 8 | 1x CDMA voice + 2.4 GHz Bluetooth + 5 GHz Wi-Fi MIMO | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 9 | 1x CDMA voice + 2.4 GHz Wi-Fi + 5 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 10 | 1x CDMA voice + 2.4 GHz Wi-Fi MIMO + 5 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 11 | GSM voice + 2.4 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 12 | GSM voice + 5 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 13 | GSM voice + 2.4 GHz Bluetooth | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 14 | GSM voice + 2.4 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 15 | GSM voice + 5 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 16 | GSM voice + 2.4 GHZ Wi-Fi Antenna 2 + 2.4 GHz Bluetooth | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 17 | GSM voice + 2.4 GHz Bluetooth + 5 GHz Wi-Fi | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 18 | GSM voice + 2.4 GHz Bluetooth + 5 GHz Wi-Fi MIMO | Yes^ | Yes | N/A | Yes | ^ Bluetooth Tethering is considered |
| 19 | GSM voice + 2.4 GHz Wi-Fi + 5 GHz Wi-Fi | Yes | Yes | N/A | Yes | |
| 20 | GSM voice + 2.4 GHz Wi-Fi MIMO + 5 GHz Wi-Fi MIMO | Yes | Yes | N/A | Yes | |
| 21 | UMTS + 2.4 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 22 | UMTS + 5 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 23 | UMTS + 2.4 GHz Bluetooth | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 24 | UMTS + 2.4 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 25 | UMTS + 5 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 26 | UMTS + 2.4 GHZ Wi-Fi Antenna 2 + 2.4 GHz Bluetooth | Yes^ | Yes | Yes | Yes | ^ Bluetooth Tethering is considered |
| 27 | UMTS + 2.4 GHz Bluetooth + 5 GHz Wi-Fi | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 28 | UMTS + 2.4 GHz Bluetooth + 5 GHz Wi-Fi MIMO | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 29 | UMTS + 2.4 GHz Wi-Fi + 5 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 30 | UMTS + 2.4 GHz Wi-Fi MIMO + 5 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 31 | LTE + 2.4 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 32 | LTE + 5 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 33 | LTE + 2.4 GHz Bluetooth | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 34 | LTE + 2.4 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 35 | LTE + 5 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 36 | LTE + 2.4 GHZ Wi-Fi Antenna 2 + 2.4 GHz Bluetooth | Yes* | Yes | Yes | Yes | * Bluetooth Tethering is considered |
| 37 | LTE + 2.4 GHz Bluetooth + 5 GHz Wi-Fi | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 38 | LTE + 2.4 GHz Bluetooth + 5 GHz Wi-Fi MIMO | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 39 | LTE + 2.4 GHz Wi-Fi + 5 GHz Wi-Fi | Yes | Yes | Yes | Yes | |
| 40 | LTE + 2.4 GHz Wi-Fi MIMO + 5 GHz Wi-Fi MIMO | Yes | Yes | Yes | Yes | |
| 41 | LTE + 5G NR | Yes* | Yes | N/A | Yes | |
| 42 | LTE + 2.4 GHz Wi-Fi + 5G NR | Yes | Yes | Yes | Yes | |
| 43 | LTE + 5 GHz Wi-Fi + 5G NR | Yes | Yes | Yes | Yes | |
| 44 | LTE + 2.4 GHz Bluetooth + 5G NR | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 45 | LTE + 2.4 GHz Wi-Fi MIMO + 5G NR | Yes | Yes | Yes | Yes | |
| 46 | LTE + 5 GHz Wi-Fi MIMO + 5G NR | Yes | Yes | Yes | Yes | |
| 47 | LTE + 2.4 GHZ Wi-Fi Antenna 2 + 2.4 GHz Bluetooth + 5G NR | Yes^ | Yes | Yes | Yes | ^ Bluetooth Tethering is considered |
| 48 | LTE + 2.4 GHz Bluetooth + 5 GHz Wi-Fi + 5G NR | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 49 | LTE + 2.4 GHz Bluetooth + 5 GHz Wi-Fi MIMO + 5G NR | Yes^ | Yes | Yes^ | Yes | ^ Bluetooth Tethering is considered |
| 50 | LTE + 2.4 GHz Wi-Fi + 5 GHz Wi-Fi + 5G NR | Yes | Yes | Yes | Yes | |
| 51 | LTE + 2.4 GHz Wi-Fi MIMO + 5 GHz Wi-Fi MIMO + 5G NR | Yes | Yes | Yes | Yes | |
| 52 | CDMA/EVDO data + 2.4 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 53 | CDMA/EVDO data + 5 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 54 | CDMA/EVDO data + 2.4 GHz Bluetooth | Yes*^ | Yes* | Yes^ | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |
| 55 | CDMA/EVDO data + 2.4 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 56 | CDMA/EVDO data + 5 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 57 | CDMA/EVDO data + 2.4 GHZ Wi-Fi Antenna 2 + 2.4 GHz Bluetooth | Yes*^ | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |
| 58 | CDMA/EVDO data + 2.4 GHz Bluetooth + 5 GHz Wi-Fi | Yes*^ | Yes* | Yes^ | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |
| 60 | CDMA/EVDO data + 2.4 GHz Wi-Fi + 5 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 61 | CDMA/EVDO data + 2.4 GHz Wi-Fi MIMO + 5 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 62 | GPRS/EDGE + 2.4 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 63 | GPRS/EDGE + 5 GHz Wi-Fi | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 64 | GPRS/EDGE + 2.4 GHz Bluetooth | Yes*^ | Yes* | Yes^ | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |
| 65 | GPRS/EDGE + 2.4 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 66 | GPRS/EDGE + 5 GHz Wi-Fi MIMO | Yes* | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered |
| 67 | GPRS/EDGE + 2.4 GHZ Wi-Fi Antenna 2 + 2.4 GHz Bluetooth | Yes*^ | Yes* | Yes | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |
| 68 | GPRS/EDGE + 2.4 GHz Bluetooth + 5 GHz Wi-Fi | Yes*^ | Yes* | Yes^ | Yes | * Pre-installed VOIP applications are considered<br>^ Bluetooth Tethering is considered |



42

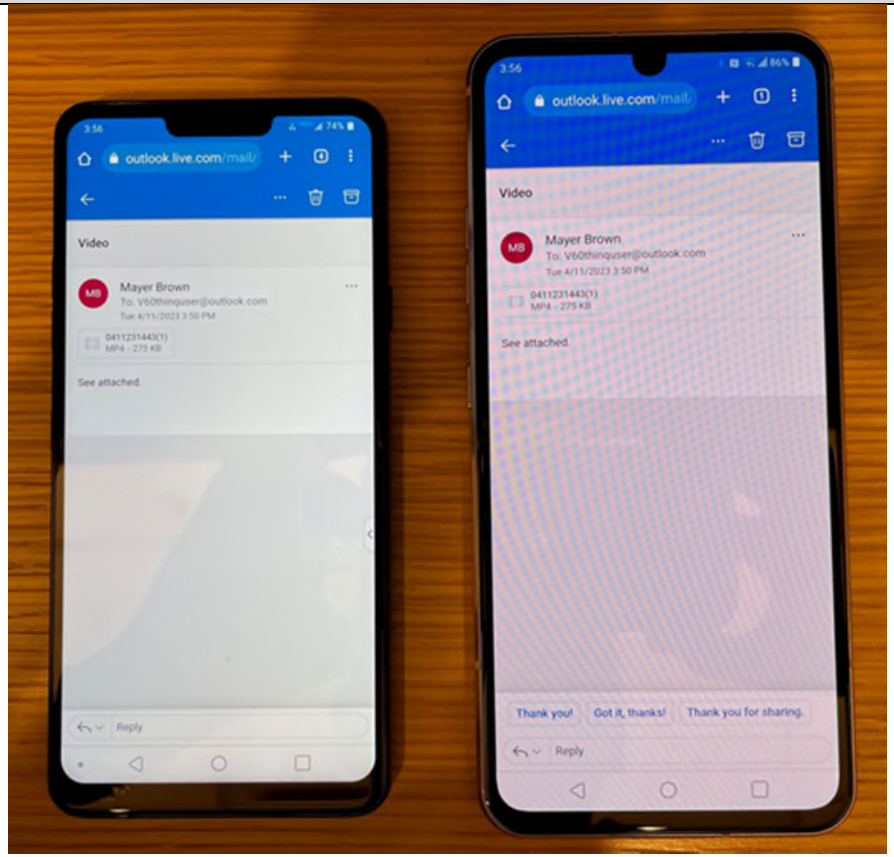
**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| **U.S. Patent No. 10,244,284** | **Exemplary Evidence of Infringement** |
|---|---|
| | LG V60 ThinQ 5G FCC SAR Report, available at https://apps.fcc.gov/eas/GetApplicationAttachment.html?id=4633217<br><br>For example, the following screenshots show the 284 Accused Products connected to the Internet via the cellular chipset, while simultaneously, upon information and belief, the Wi-Fi circuit is used to transmit video information via Wi-Fi Direct to share content, E-mail and/or MMS:<br><br>Video Information Transmitting Device (G7 ThinQ) \| Video Information Receiving Device (V60 ThinQ) |



43

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

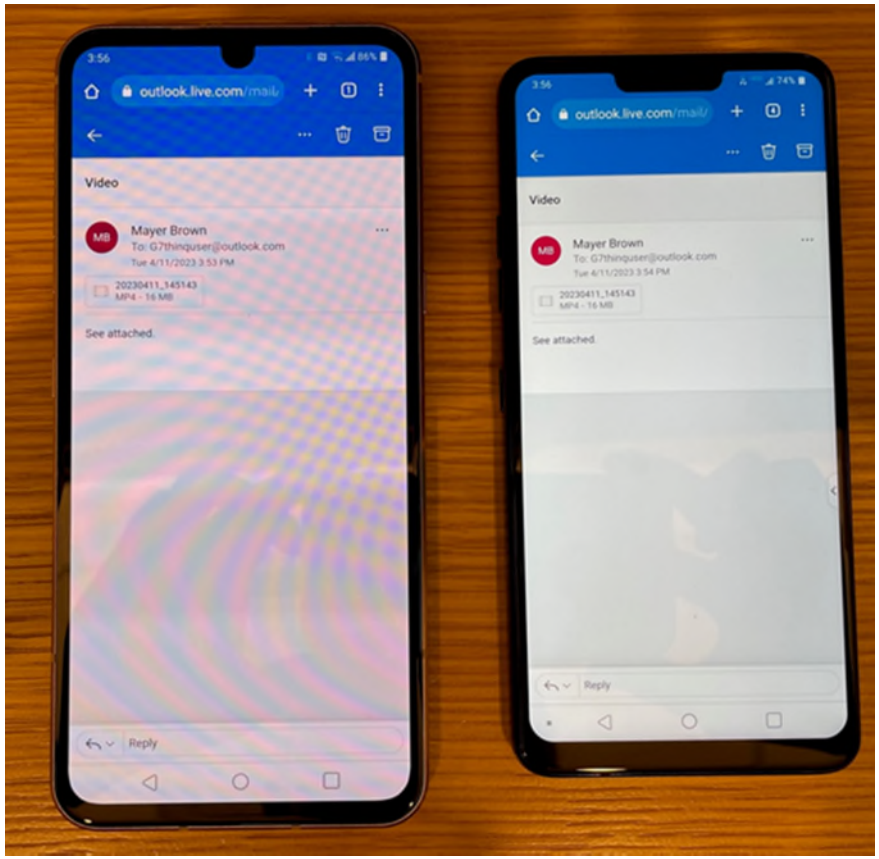
| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |  |



44

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (V60 ThinQ) | Video Information Receiving Device (G7 ThinQ) |






45

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (G7 ThinQ) | Video Information Receiving Device (V60 ThinQ) |

46

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (G7 ThinQ) | Video Information Receiving Device (V60 ThinQ) |

47

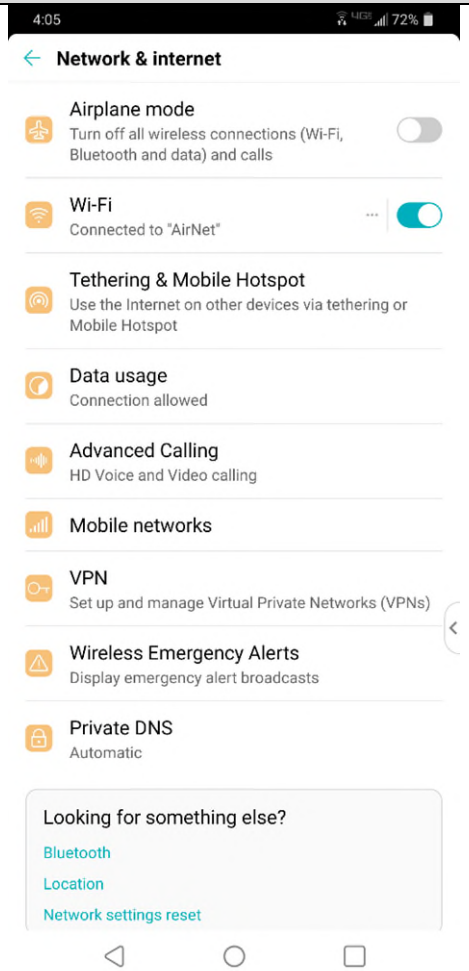
**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

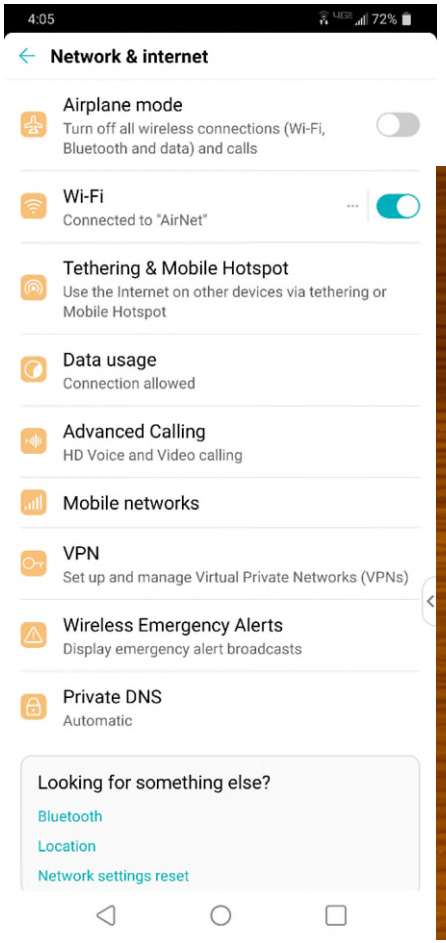
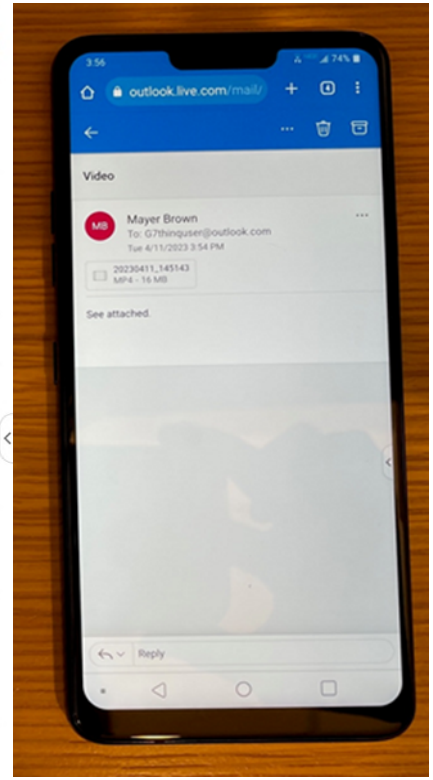
| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Video Information Transmitting Device (V60 ThinQ) / Video Information Receiving Device (G7 ThinQ)<br> <br><br>For example, the following screenshots show the 284 Accused Products connected to a home network "Air Net" while simultaneously transmitting video information via e-mail or MMS: |



48

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |  |

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Further, the following screenshots show that the G7 ThinQ connected to home network while simultaneously transmitting video via cellular connection using MMS:     |



50

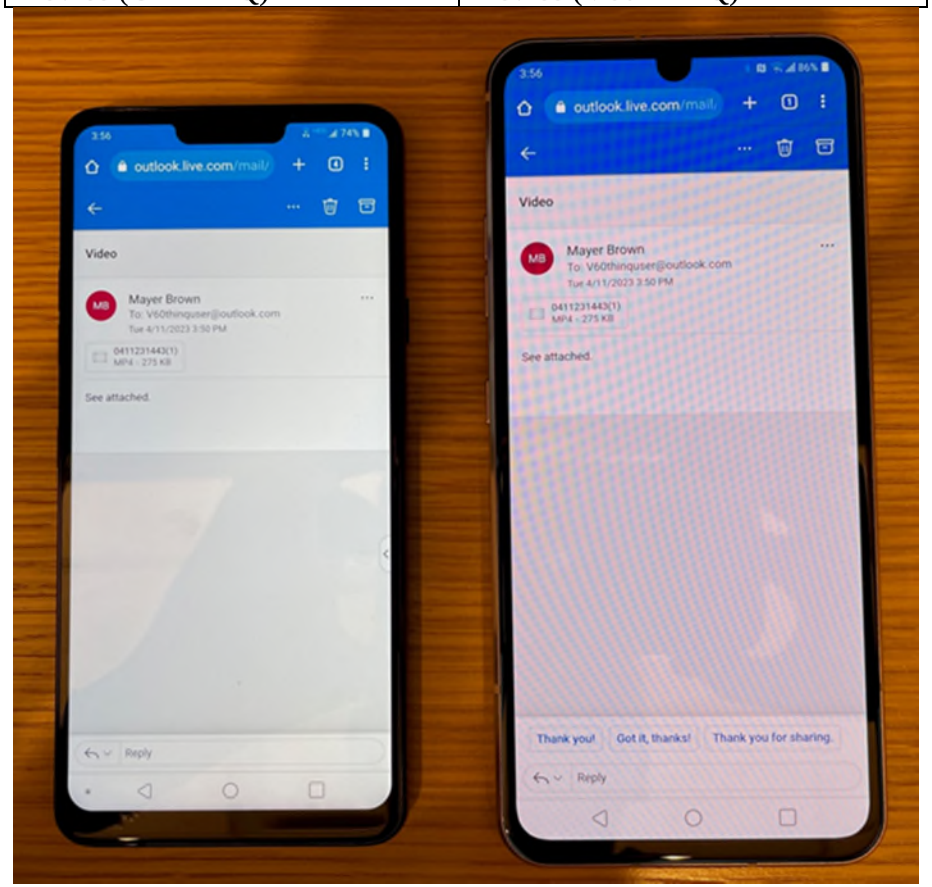
| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | In the alternative, for example, the controller (*e.g.*, CPU) of each of the 284 Accused Products is configured to control transmitting digital video information via the cellular communication chip over e-mail and/or MMS and the Wi-Fi communication chip connects to the Internet or home network simultaneously. The application processor/CPU executes operating system and software for various functions to control assignment of connections such that the cellular communication chip uses cellular connectivity to transmit digital video information via e-mail and/or MMS while simultaneously the Wi-Fi communication chip is used to connect to the Internet or a home network.<br><br>Similarly, upon information and belief, under certain conditions, cellular connections are preferred to provide MMS and E-mail services to transmit video while simultaneously the Wi-Fi communication chip is used to connect to the Internet as shown by both icons being available on the status bar. Maxell reserves its rights to further supplement its contentions based on discovery that will reveal the conditions when cellular is preferred over Wi-Fi for MMS and E-mail services to transmit video information and vice versa:<br><br>As an additional example of simultaneous connections, upon information and belief, under certain conditions, each of the 284 Accused Products transmits video over a cellular communication chip via MMS/e-mail and each of the 284 Accused Products uses the Wi-Fi communication chip to connect to a home network by forming a home network between additional devices in the home via Wi-Fi Direct.<br><br>As an additional example of simultaneous connections, upon information and belief, under certain conditions, the 284 Accused Products transmit video using a cellular communication chip via MMS/e-mail and the 284 Accused Products uses the Wi-Fi communication chip to connect to the Internet (*e.g.*, connect to the Internet via Wi-Fi) simultaneously, as shown by both icons being available on the status bar. |



51

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (G7 ThinQ) | Video Information Receiving Device (V60 ThinQ) |

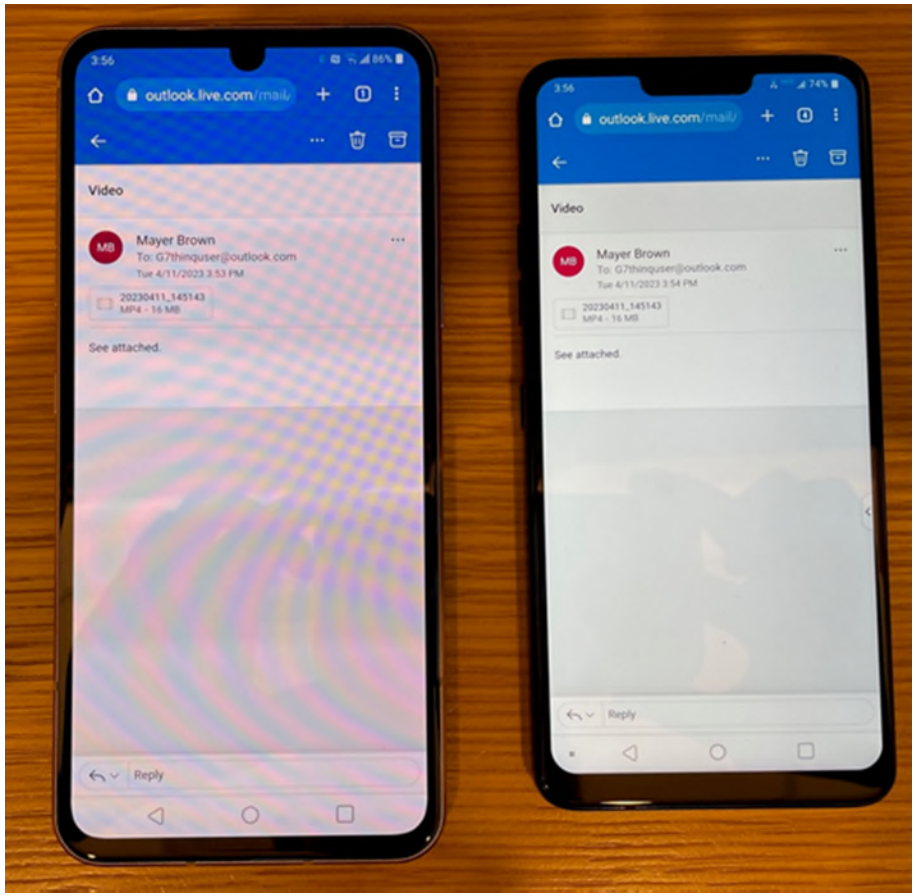





52

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (V60 ThinQ) | Video Information Receiving Device (G7 ThinQ) |






53

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (G7 ThinQ) | Video Information Receiving Device (V60 ThinQ) |

54

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | Video Information Transmitting Device (G7 ThinQ) | Video Information Receiving Device (V60 ThinQ) |

55

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | Video Information Transmitting Device (V60 ThinQ) / Video Information Receiving Device (G7 ThinQ)<br> <br><br>*See also* Appendix 10 showing that the remaining 760 Accused Products include processor circuitry that are controllers, as well as radio circuits, that, in operation perform this limitation by connecting simultaneously. |

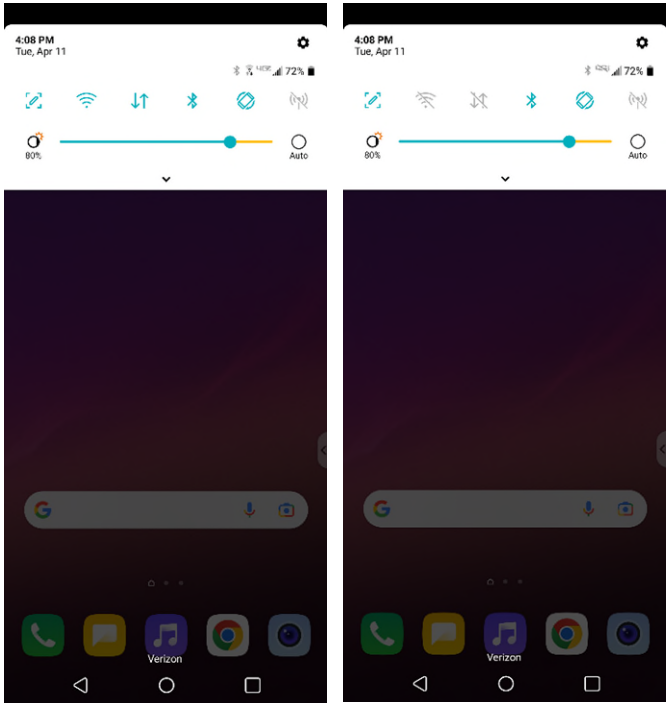


56

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **Doctrine of Equivalents:**<br>To the extent LG Electronics argues that this limitation is not literally met in each of the 284 Accused Products, 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 LG Electronics argues that each of the 284 Accused Products does not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling assignment of connection by radio transmission for each of the first and second radio communication units, so that the first radio communication unit transmits digital video information and the second radio communication unit 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, each of the 284 Accused Products includes an application processor/CPU executes the operating system and software for various applications to control cellular and Wi-Fi functionalities occurring simultaneous. The performance of this function achieves substantially the same result, for example, simultaneous transmission of video information with connection to an Internet or home network. |
| **[18.e]** controlling assignment between the first radio communication circuit and the external apparatus, and assignment between the second radio communication circuit and the internet or the home network; and | Each of the 284 Accused Products performs a method of controlling each of the first and second radio communication circuits such that the first radio communication circuit transmits digital video information to the external apparatus and the second radio communication circuit connects to the internet or the home network simultaneously; and controlling assignment between the first radio communication circuit and the external apparatus, and assignment between the second radio communication circuit and the internet or the home network.<br>Under either alternative provided with respect to the contentions for Claim 18.e, herein incorporated by reference, the controller (*e.g.*, CPU) of each of the 284 Accused Products is configured to control assignment between the first radio communication circuit and the external video processing apparatus and controls assignment between the second radio communication circuit and the internet or the home network. For example, the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software |

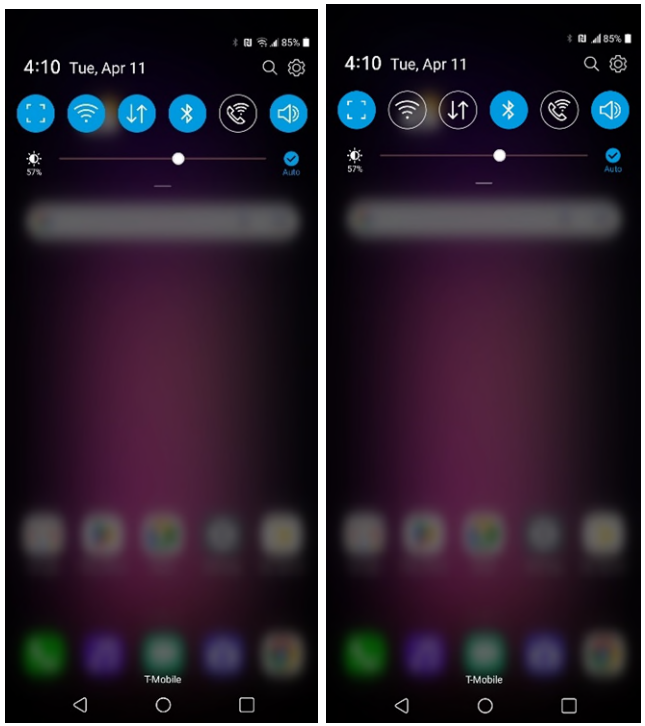


57

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | to control performing each one of the functions identified above including, for example, MMS/e-mail/connecting to the router/connecting to the Internet/Wi-Fi Direct.<br><br>Additional evidence of the controller controlling assignment between the first radio communication circuit and the external video processing apparatus, and assignment between the second radio communication circuit and the internet or the home network can be shown based on each of the 284 Accused Products' ability to transmit an indication to turn the Wi-Fi and cellular communication chips on/off and assign a connection accordingly.<br><br>User indication to turn cellular/Wi-Fi off (G7 ThinQ)<br><br>  |



58

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | User indication to turn cellular/Wi-Fi off (V60 ThinQ)<br>  <br><br>*See also* Appendix 10 showing that the remaining 760 Accused Products include processor circuitry that are controllers, as well as radio circuits, that, in operation perform this limitation by controlling assignment between the radio circuits and the external apparatus and internet or home network. |



59

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **<u>Doctrine of Equivalents:</u>**<br>To the extent LG Electronics argues that this limitation is not literally met in each of the 284 Accused Products, 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 LG Electronics argues that each of the 284 Accused Products does not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling assignment of connection by radio transmission for each of the first and second radio communication units, so that the first radio communication unit transmits digital video information and the second radio communication unit 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, each of the 284 Accused Products includes an application processor/CPU executes the operating system and software for various applications to control cellular and Wi-Fi functionalities occurring simultaneous. The performance of this function achieves substantially the same result, for example, simultaneous transmission of video information with connection to an Internet or home network. |
| **[18.f]** controlling the assignment such that the assignment between the first radio communication circuit and the external apparatus is prioritized more than the assignment between the second radio | Each of the 284 Accused Products performs a method of controlling the assignment such that the assignment between the first radio communication circuit and the external apparatus is prioritized more than the assignment between the second radio communication circuit and the internet or the home network when a user issues an indication to transmit digital video information by the first radio communication circuit while acquiring information from the internet or the home network by the second radio communication circuit.<br><br>In each of the 284 Accused Products, the controller is further configured to control the assignment such that the assignment between the Wi-Fi communication chip and the external video processing apparatus |



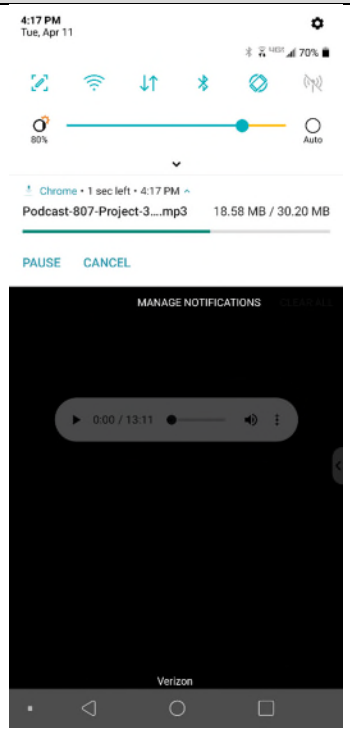
60

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| communication circuit and the internet or the home network when a user issues an indication to transmit digital video information by the first radio communication circuit while acquiring information from the internet or the home network by the second radio communication circuit. | is prioritized more than the assignment between the cellular communication chip and the internet or the home network when a user issues an indication to transmit digital video information by the Wi-Fi communication chip while acquiring information from the internet or the home network by the cellular communication chip.<br><br>Specifically, upon information and belief, under certain conditions the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize the assignment between the Wi-Fi communication chip and the external video processing apparatus more than the assignment between the cellular communication chip and the internet or the home network when a user issues an indication to transmit digital video information by the Wi-Fi communication chip while acquiring information from the internet or the home network by the cellular communication chip.<br><br>For example, when a user indicates to transmit using "Wi-Fi Direct" while acquiring information from the Internet using a cellular connection (*e.g.*, the user issues a "Wi-Fi Direct" transfer request while a song is downloading in background over cellular connection or the user is using cellular data services), the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize using the Wi-Fi communication chip for Wi-Fi Direct instead of using cellular services.<br><br>**G7 ThinQ:** |



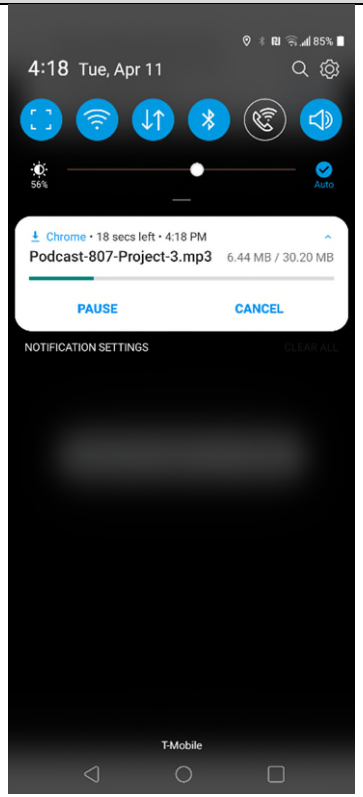
61

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |  <br>**V60 ThinQ:** |

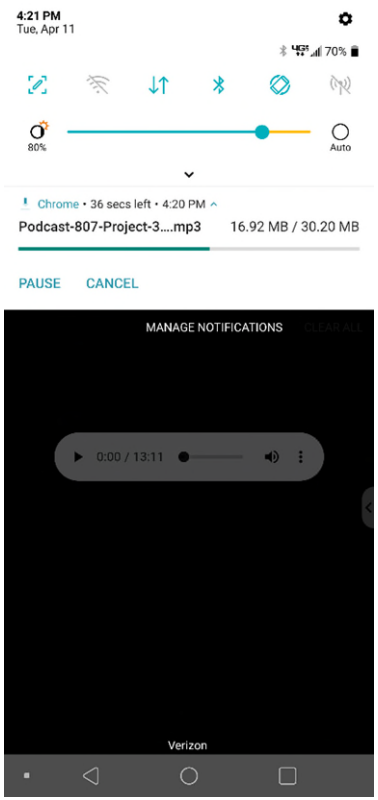
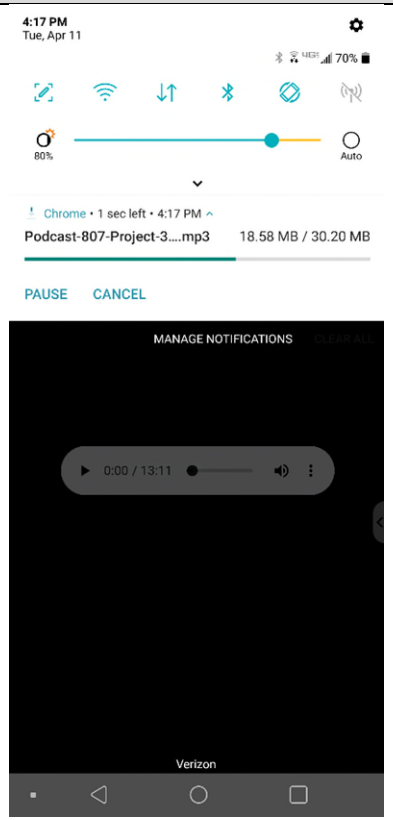


62

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |  <br><br>As an additional example, when a user indicates to turn Wi-Fi on while acquiring information from the Internet using a cellular connection (*e.g.*, the user turns Wi-Fi on while a song is downloading in background over cellular connection or the user selects a particular Wi-Fi network while using cellular data services), the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize using the Wi-Fi communication chip over the cellular connection for receiving a video (*e.g.*, via MMS or e-mail).<br>**G7ThinQ:** |

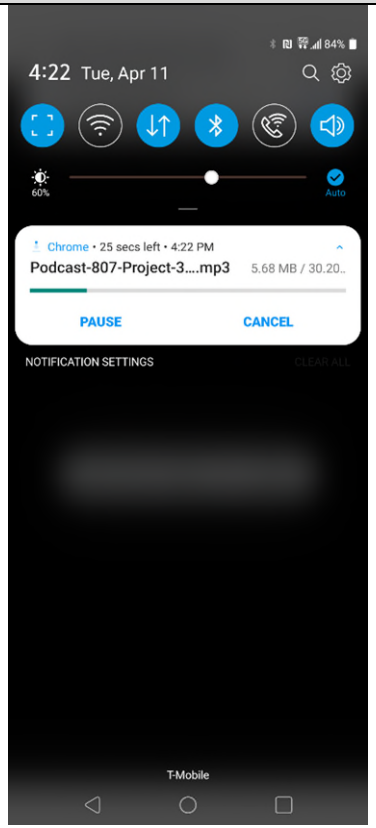
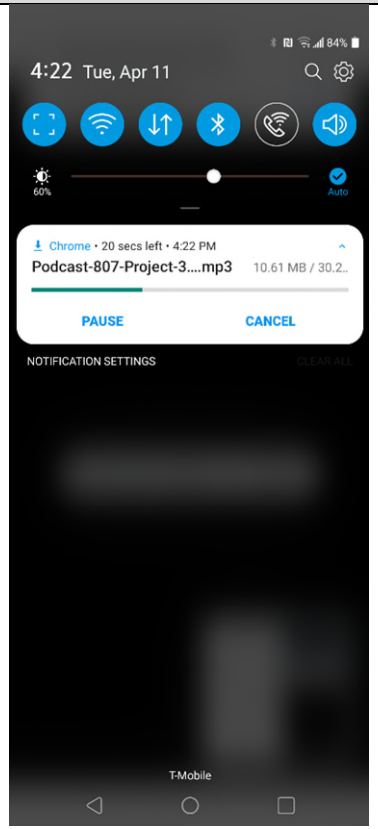


63

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |   <br>**V60 ThinQ:** |

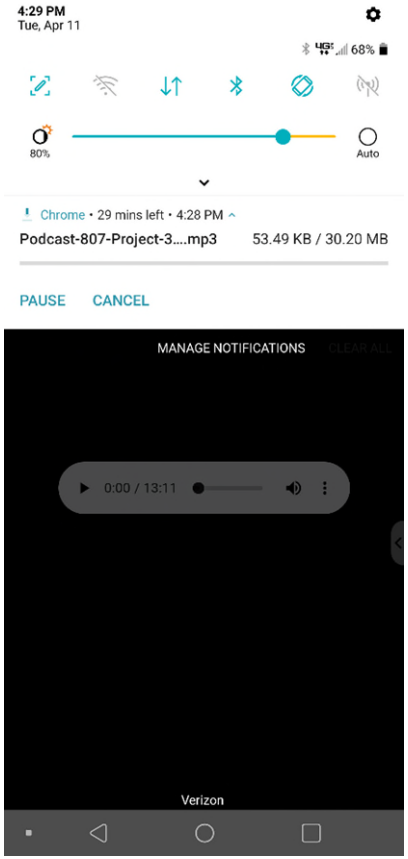
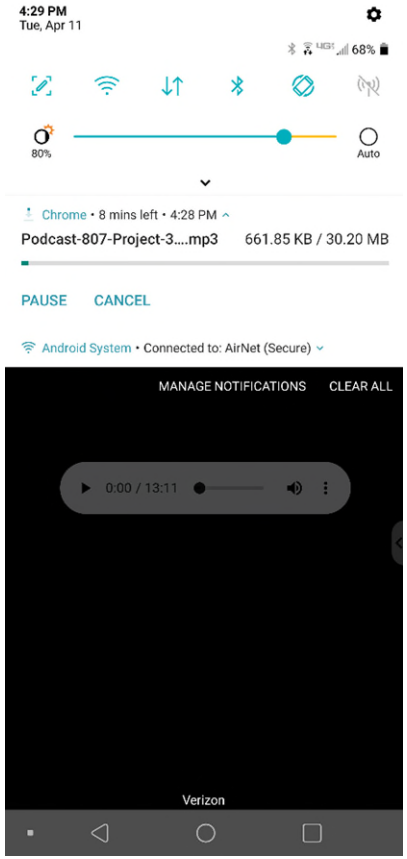
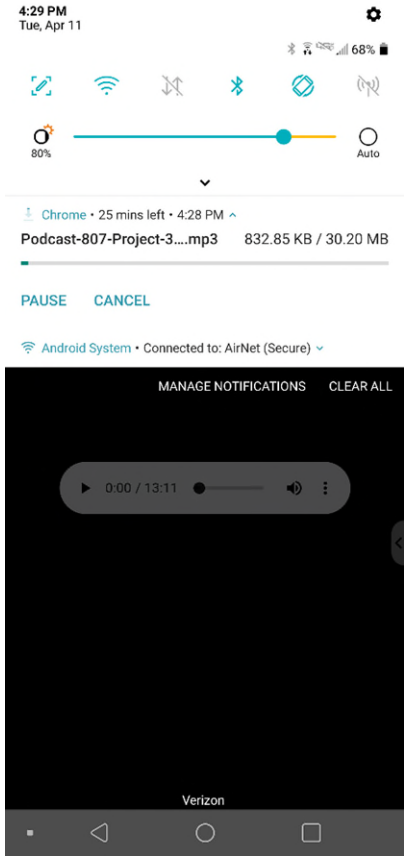


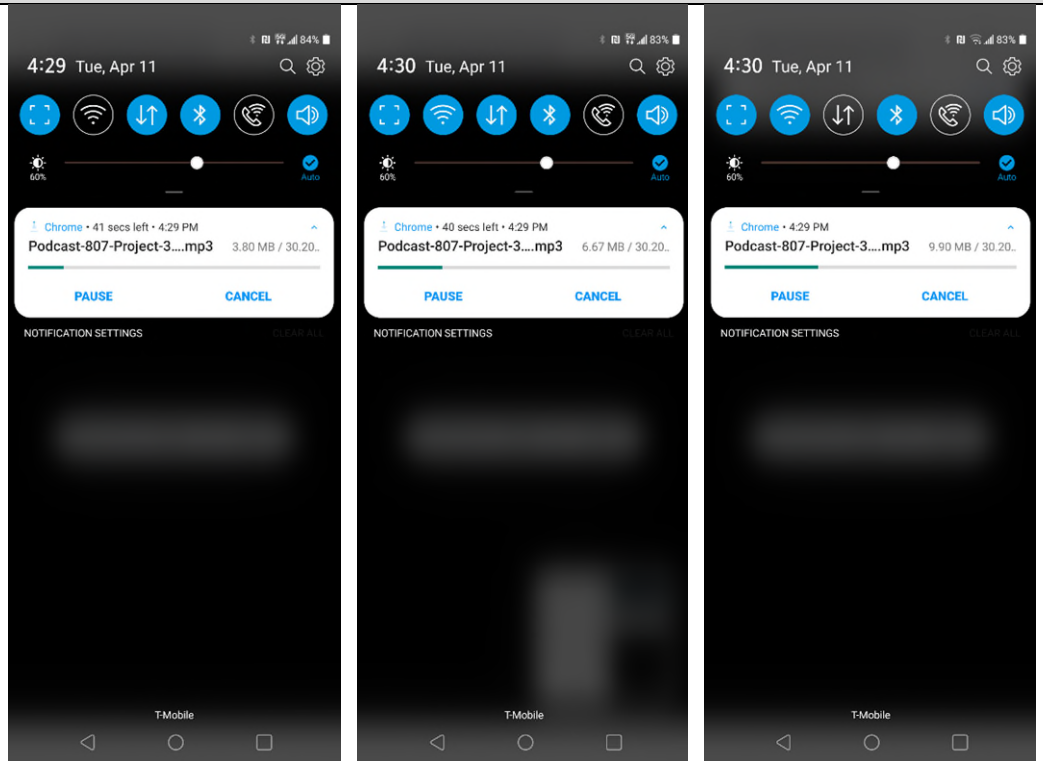
64

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |   <br>As an additional example, when a user indicates to turn Wi-Fi on while acquiring information from the Internet using a cellular connection (*e.g.*, the user turns Wi-Fi on while a song is downloading in background over cellular connection or the user selects a particular Wi-Fi network while using cellular data services) and the user turns cellular data off, the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize using the Wi-Fi communication chip over the cellular connection for receiving a video (*e.g.*, via MMS or e-mail). |



65

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **G7 ThinQ:**<br>  <br><br>  <br><br>  <br><br>**V60 ThinQ:** |

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |  <br>In the alternative, in each of the 284 Accused Products, the controller is further configured to control the assignment such that the assignment between the cellular communication chip and the external video processing apparatus is prioritized more than the assignment between the Wi-Fi communication chip and the internet or the home network when a user issues an indication to transmit digital video information by the cellular communication chip while acquiring information from the internet or the home network by the Wi-Fi communication chip. |

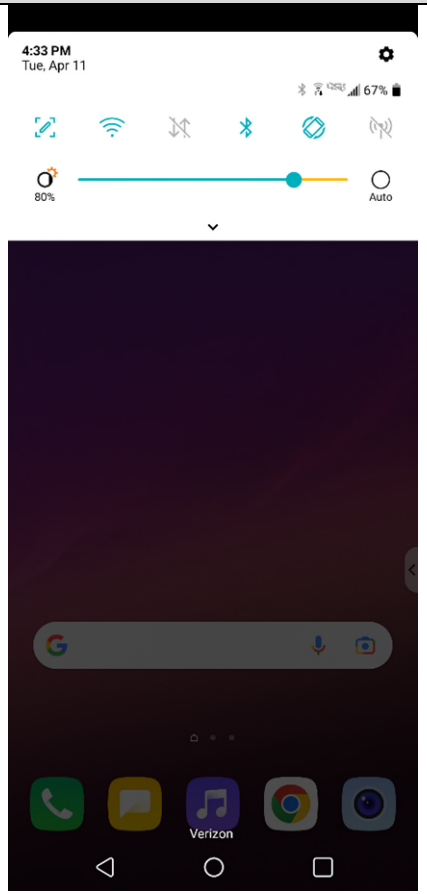
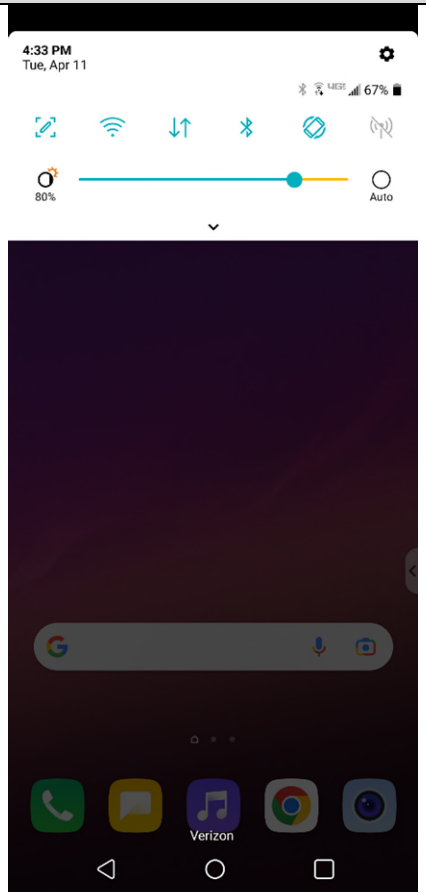


67

| **U.S. Patent No. 10,244,284** | **Exemplary Evidence of Infringement** |
|---|---|
| | Specifically, upon information and belief, under certain conditions the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize the assignment between the cellular communication chip and the external video processing apparatus more than the assignment between the Wi-Fi communication chip and the internet or the home network when a user issues an indication to transmit digital video information by the cellular communication chip while acquiring information from the internet or the home network by the Wi-Fi communication chip.<br><br>For example, upon information and belief, when a user indicates to turn cellular data on while acquiring information from a home network (*e.g.*, the device is connected to a network router where the router is not connected to the Internet but is communicating with the device), the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize using the cellular communication chip over Wi-Fi for transmitting a video (*e.g.*, via MMS or e-mail).<br><br>**G7 ThinQ:** |



68

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |     |

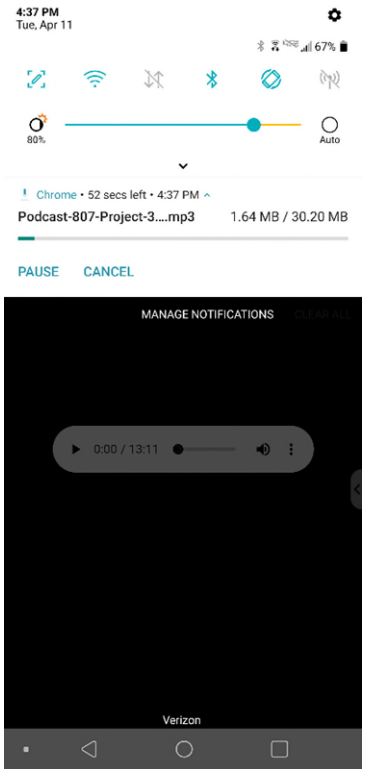
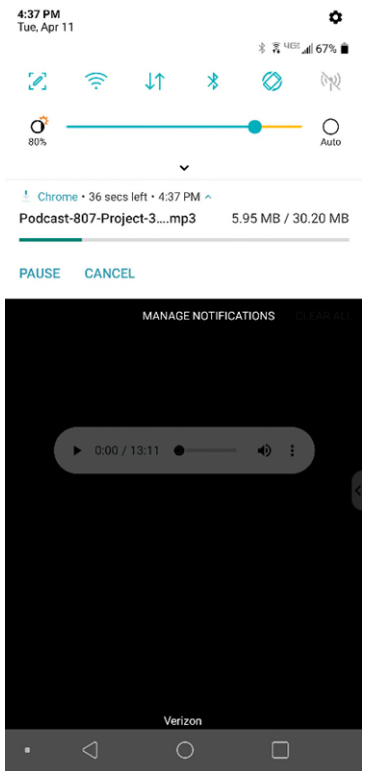


69

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **V60 ThinQ:**<br> <br>As an additional example, when a user indicates to turn cellular data on while acquiring information from the Internet (*e.g.*, the device is downloading a song using Wi-Fi or accessing the Internet), the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize using the cellular communication chip over Wi-Fi for receiving a video (*e.g.*, via MMS or e-mail) under certain conditions (*e.g.*, the cellular connection provides better service). |

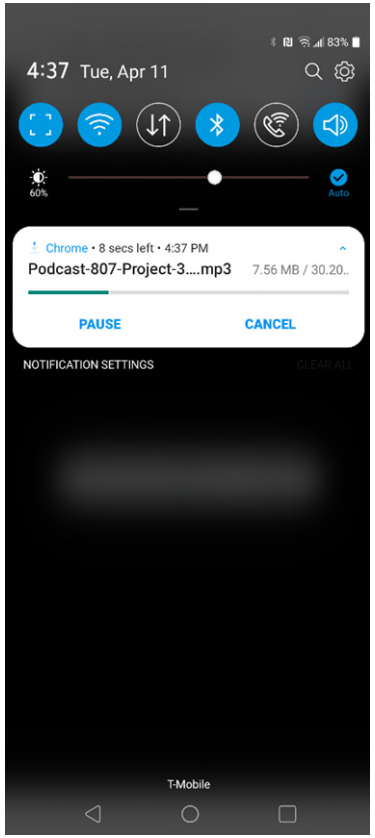


70

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **G7 ThinQ:**<br>  <br><br>  <br> |

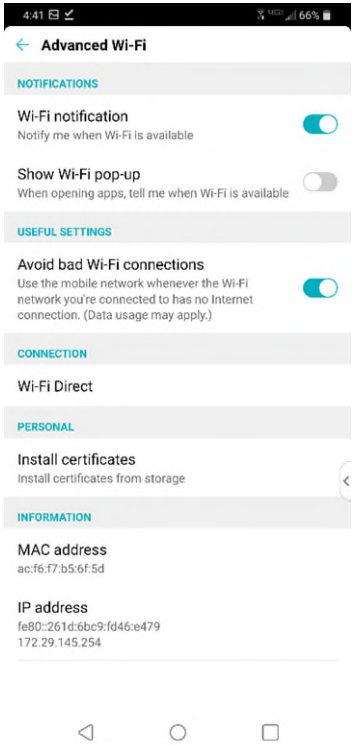


71

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **V60 ThinQ:**<br>  <br><br>As an additional example, when a user indicates to "Avoid bad Wi-Fi connections" while acquiring information from the Internet (*e.g.*, the device is downloading a song using Wi-Fi or accessing the Internet) and the user turns cellular on, the controller (*e.g.*, CPU) of each of the 284 Accused Products |



72

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | executes software to prioritize using the cellular communication chip over Wi-Fi for receiving a video (*e.g.*, via MMS or e-mail) under certain conditions (*e.g.*, if the Wi-Fi connection is bad).<br>  <br><br>G7 ThinQ functionality ("Avoid bad Wi-Fi connections") |



73

# LG G7 ThinQ - Auto Switch Between Wi-Fi & Mobile Data Networks

To automatically switch from a weak or unstable Wi-Fi network to the Verizon Wireless cellular network to preserve a consistent data connection, view this info.

**NOTE**

- When enabled, this advanced setting allows the device to switch from a weak or unstable Wi-Fi network to the Verizon Wireless cellular network to preserve consistent data throughput.
- This function is not enabled by default; the device prompts the user to enable the feature the first time they experience poor Wi-Fi connectivity.

**CAUTION**

When connected to the Verizon Wireless cellular network, data overage charges may apply (depending upon data plan). For data usage info, refer to the My Verizon website.

1. From a Home screen, navigate: **Settings** › **Network & internet** › **Wi-Fi**.
   → These instructions apply to Home mode only.
   → If presented with a Wi-Fi tutorial screen, tap **Close**.
2. Tap the **Menu icon** (upper-right).
3. Tap **Advanced Wi-Fi**.
4. Tap **Avoid bad Wi-Fi connections** to turn on or off .

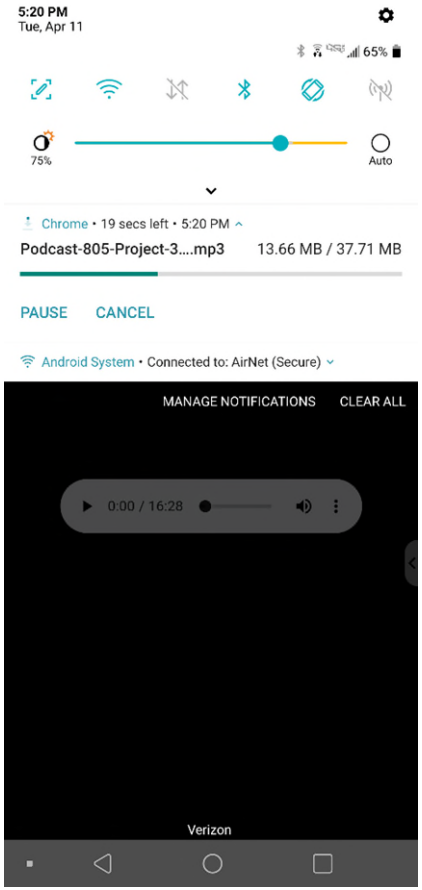
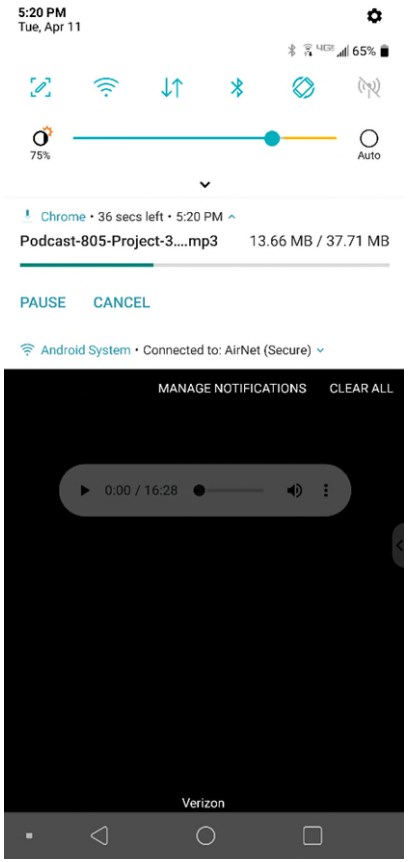
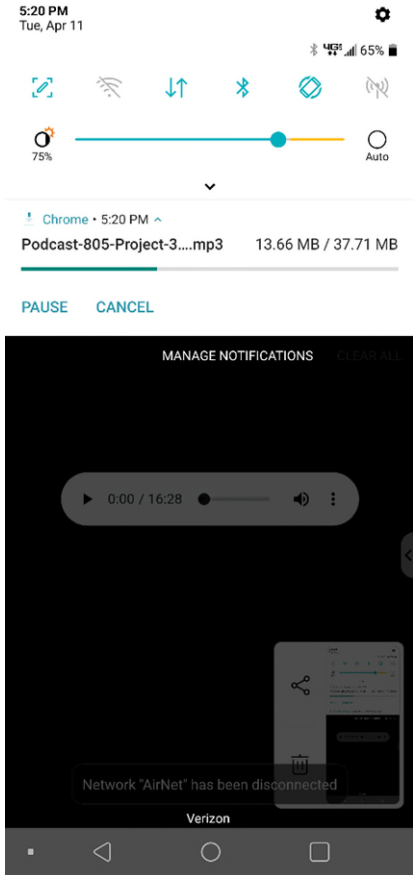


74

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | *See* https://www.verizon.com/support/knowledge-base-218218/<br><br>As an additional example, when a user indicates to "Avoid bad Wi-Fi connections" while acquiring information from the home network (*e.g.*, the device is connected to a router that does not have LAN connectivity) and the user turns cellular on, the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize using the cellular communication chip over Wi-Fi for receiving a video (*e.g.*, via MMS or e-mail) under certain conditions (*e.g.*, if the Wi-Fi connection is bad).<br><br>As an additional example, when a user indicates to turn cellular data on while acquiring information from the Internet (*e.g.*, the device is downloading a song using Wi-Fi or accessing the Internet) and the user turns Wi-Fi off, the controller (*e.g.*, CPU) of each of the 284 Accused Products executes software to prioritize using the cellular communication chip over Wi-Fi for transmitting a video (*e.g.*, via MMS or e-mail). |

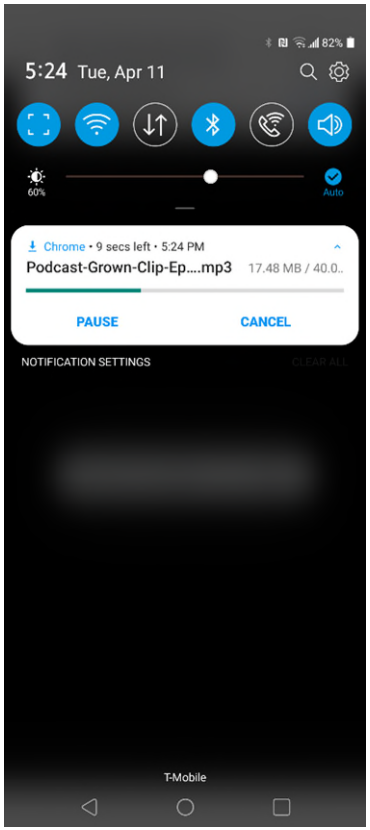
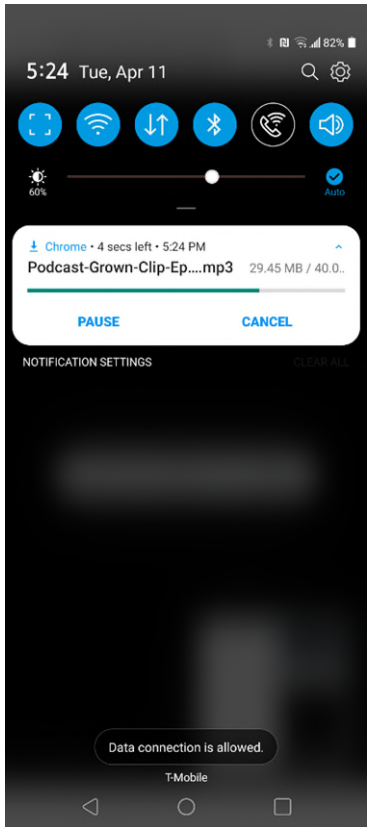
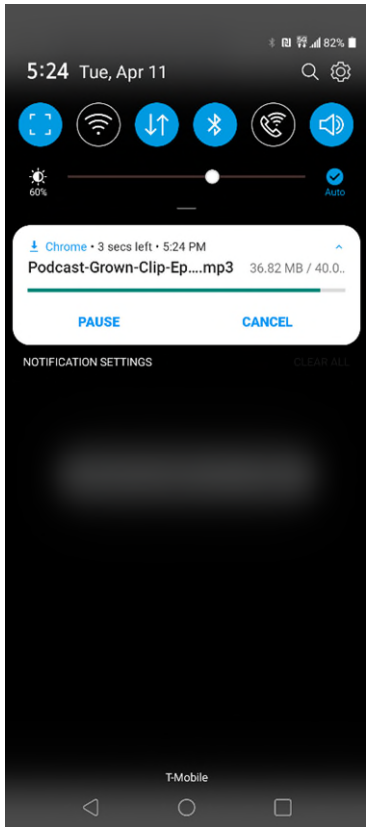


75

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **G7 ThinQ:**       |



76

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **V60 ThinQ:**<br>  <br><br>  <br><br>  <br><br>*See also* Appendix 10 showing that the remaining 284 Accused Products include processing circuits that control the assignment such that the radio communication with the external apparatus is prioritized more than the other assignment. |

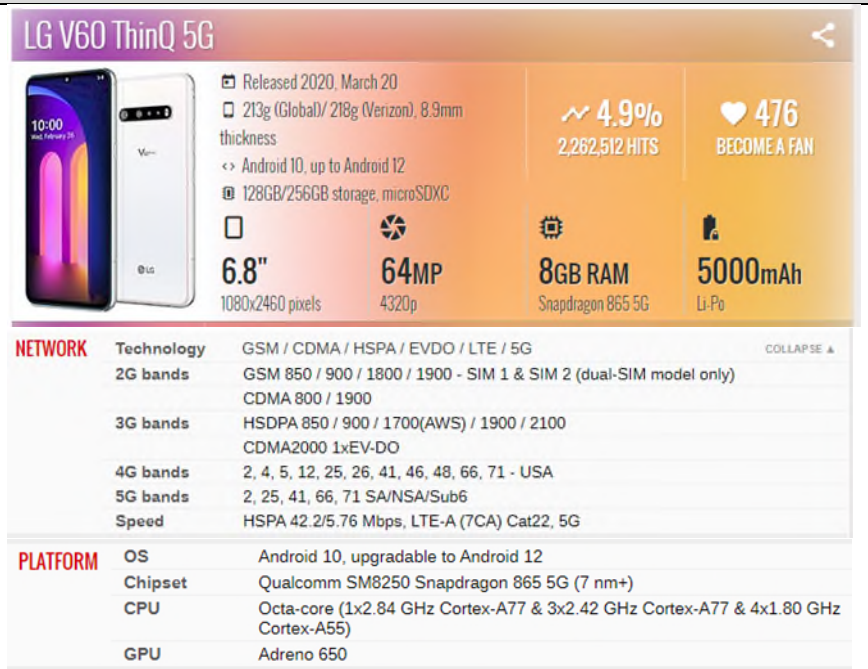


77

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **<u>Doctrine of Equivalents:</u>**<br>To the extent LG Electronics ’284 Products argues that this limitation is not literally met in each of the 284 Accused Products, 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 LG Electronics argues that each of the 284 Accused Products does not have a controller, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling assignment such that the assignment between the first radio communication circuit and the external video processing apparatus is prioritized more than the assignment between the second radio communication circuit and the internet or the home network. 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, each of the 284 Accused Products includes an application processor/CPU executes the operating system and software for various applications to control cellular and Wi-Fi functionalities and prioritizing one connection over the other. The performance of this function achieves substantially the same result, for example, prioritizing of one connection when a user issues an indication to transmit digital video information by the first radio communication circuit while acquiring information from the internet or the home network by the second radio communication circuit. |
| **[19]** The method of claim 18, wherein the first radio communication circuit and the second radio communication circuit are different from each other in frequency bandwidth. | In each of the 284 Accused Products, the first radio communication circuit and the second radio communication circuit are different from each other in frequency bandwidth.<br>Under either alternative discussed with respect to claim 18, described above, in each of the 284 Accused Products the cellular communication chip and Wi-Fi communication chip are different from each other in frequency bandwidth.<br><br>**LG V60 ThinQ 5G:** |



78

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| |  <br>LG V60 ThinQ 5G tech specs; https://www.gsmarena.com/lg_v60_thinq_5g-10103.php.<br><br>**AIDA 64 Report- Wi-Fi** |





79

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | << Wi-Fi >><br>State: Enabled<br>SSID: <unknown ssid><br>BSSID: 02:00:00:00:00:00<br>Hidden SSID: Yes<br>IPv4 Address: 172.29.66.26<br>IPv6 Address: fe80::a24f:85ff:fedf:3b78<br>Signal Strength: -66 dBm (Very Good)<br>Link Speed: 576 Mbps<br>Frequency: 5180 MHz<br>Gateway: 172.29.64.1<br>DNS1: 209.244.0.3<br>DNS2: 8.8.4.4<br>DHCP Lease Duration: 24 hours<br>5 GHz Band: Supported<br>Wi-Fi Aware: Supported<br>Wi-Fi Direct: Supported |



80

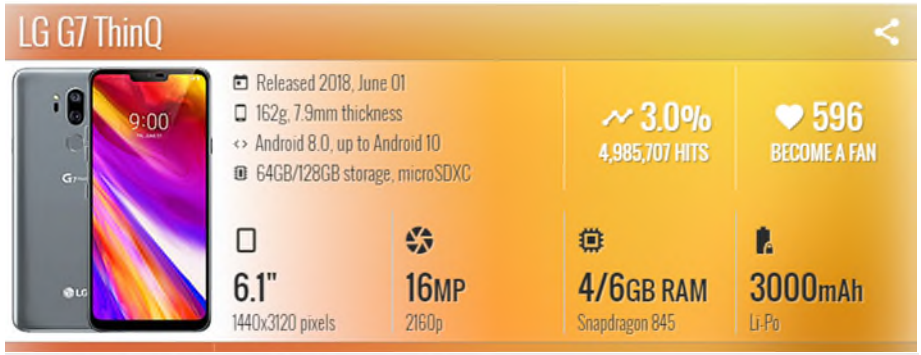
**1.1 Device Overview**

Saved to this PC

| Band & Mode | Operating Modes | Tx Frequency |
|---|---|---|
| CDMA/EVDO BC10 (§90S) | Voice/Data | 817.90 - 823.10 MHz |
| CDMA/EVDO BC0 (§22H) | Voice/Data | 824.70 - 848.31 MHz |
| PCS CDMA/EVDO | Voice/Data | 1851.25 - 1908.75 MHz |
| 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 17 | Voice/Data | 706.5 - 713.5 MHz |
| LTE Band 13 | Voice/Data | 779.5 - 784.5 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 48 | Voice/Data | 3552.5 - 3697.5 MHz |
| LTE Band 41 | Voice/Data | 2498.5 - 2687.5 MHz |
| NR Band n71 | Data | 665.5 - 695.5 MHz |
| NR Band n66 | Data | 1712.5 - 1777.5 MHz |
| NR Band n25 | Data | 1852.5-1912.5 MHz |
| NR Band n2 | Data | 1852.5-1907.5 MHz |
| NR Band n41 | Data | 2506.02 - 2679.99 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 |
| Bluetooth | Data | 2402 - 2480 MHz |
| NFC | Data | 13.56 MHz |
| WMC | Data | 500 Hz - 4kHz |



81

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | LG V60 ThinQ 5G FCC SAR Report, available at https://apps.fcc.gov/eas/GetApplicationAttachment.html?id=4633217<br><br>**LG G7 ThinQ:**<br>  <br><br>NETWORK — COLLAPSE ▲<br>Technology: GSM / CDMA / HSPA / LTE<br>2G bands: GSM 850 / 900 / 1800 / 1900 - SIM 1 & SIM 2 (dual-SIM model only)<br>CDMA 800 / 1900 - USA<br>3G bands: HSDPA 850 / 900 / 1900 / 2100 - Global<br>HSDPA 850 / 900 / 1700(AWS) / 1900 / 2100 - USA<br>HSDPA 850 / 1700(AWS) / 1900 / 2100 - G710AWM<br>4G bands: 1, 3, 4, 5, 7, 8, 12, 17, 20, 28, 32, 38, 40, 42, 46 - Global<br>2, 4, 5, 7, 13, 20, 28, 46, 66 - USA (G710ULM)<br>1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 25, 26, 40, 41 - USA (G710PM)<br>1, 3, 5, 7, 8, 28, 38, 39, 40, 41 - G710EMW, G710EAW<br>1,2,3,4,5,7,8,12,13,17,20,25,29,30,38,41,46,66 - G710AWM<br>Speed: HSPA 42.2/5.76 Mbps, LTE-A (3CA) Cat16 1024/150 Mbps or Cat15 800/150 Mbps (region dependant)<br>PLATFORM<br>OS: Android 8.0 (Oreo), upgradable to Android 10<br>Chipset: Qualcomm SDM845 Snapdragon 845 (10 nm)<br>CPU: Octa-core (4x2.8 GHz Kryo 385 Gold & 4x1.7 GHz Kryo 385 Silver)<br>GPU: Adreno 630<br>LG G7 ThinQ tech specs, https://www.gsmarena.com/lg_g7_thinq-9115.php. |



82

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **AIDA 64 Report- Wi-Fi**<br><br><< Wi-Fi >><br>State: Enabled<br>SSID: <unknown ssid><br>BSSID: 02:00:00:00:00:00<br>Hidden SSID: Yes<br>IPv4 Address: 172.29.66.214<br>IPv6 Address: fe80::aef6:f7ff:feb5:6f5d<br>Signal Strength: -62 dBm (Very Good)<br>Link Speed: 520 Mbps<br>Frequency: 5180 MHz<br>Network ID: 2<br>Gateway: 172.29.64.1<br>DNS1: 209.244.0.3<br>DNS2: 8.8.4.4<br>DHCP Lease Duration: 24 hours<br>5 GHz Band: Supported<br>Wi-Fi Aware: Not Supported<br>Wi-Fi Direct: Supported<br><br>*See also* Technical Specifications showing similar networking functionality for additional 284 Accused Products available at the websites included in the table below:<br><br>**Accused Product** — **Specification**<br>LG V60 ThinQ 5G — https://www.lg.com/us/cell-phones/lg-lmv600amaattcb-att-v60-thinq-5g#<br>LG G7 ThinQ — https://www.lg.com/us/cell-phones/lg-G710ULM---LRA |



83

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement | |
|---|---|---|
| | LG G6 | https://www.lg.com/levant_en/mobile-phones/lg-G6-platinum |
| | LG G5 | https://www.lg.com/us/cell-phones/lg-VS987-Titan-g5 |
| | LG K92 5G | https://www.lg.com/us/cell-phones/lg-lmk920tm0aucltn-usc-k92-5g |
| | LG G8 ThinQ | https://www.lg.com/us/cell-phones/lg-LMG820UM1-att-g8-thinq |
| | LG V30S ThinQ | https://www.lg.com/us/cell-phones/lg-US998R-Unlocked-Matte-v30s |
| | LG Q6 | https://www.lg.com/us/cell-phones/lg-US700-Unlocked-q6 |



84

**1.1 Device Overview**

| Band & Mode | Operating Modes | Tx Frequency |
|---|---|---|
| CDMA/EVDO BC10 (§90S) | Voice/Data | 817.90 - 823.10 MHz |
| CDMA/EVDO BC0 (§22H) | Voice/Data | 824.70 - 848.31 MHz |
| PCS CDMA/EVDO | Voice/Data | 1851.25 - 1908.75 MHz |
| 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 12 | Voice/Data | 699.7 - 715.3 MHz |
| LTE Band 17 | Voice/Data | 706.5 - 713.5 MHz |
| LTE Band 13 | Voice/Data | 779.5 - 784.5 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 41 | Voice/Data | 2498.5 - 2687.5 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 |
| Bluetooth | Data | 2402 - 2480 MHz |
| NFC | Data | 13.56 MHz |
| WMC | Data | 500 Hz - 4 kHz |



85

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | LG G7 ThinQ FCC SAR Test Report, available at https://apps.fcc.gov/eas/GetApplicationAttachment.html?id=3820678<br><br>Technical specifications, User Guides, and/or AIDA 64 reports of the remaining 284 Accused Products also include similar disclosures about networking functionality.<br><br>**Cellular Frequency Bandwidth:**<br><br>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:<br><br>• 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),<br>• 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)<br>• over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP<br>• up to ongoing development in 3GPP of the 5th generation (5G)<br><br>https://www.etsi.org/technologies/mobile<br><br>**2G:** |



86

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **Global System for Mobile communication (GSM)**<br>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.<br><br>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.<br><br>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+.<br><br>**Enhanced Data rates for Global Evolution (EDGE)**<br>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.<br><br>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. |



87

| U.S. Patent No. 10,244,284 | 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.<br>https://www.etsi.org/technologies/mobile/2g<br><br>**3G: UMTS**<br>UMTS is offering greater spectral efficiency than GSM™ and has 2 modes:<br>• 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;<br>• 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.<br>In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111):<br>• **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h<br>• **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h<br>• **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h |



88

| U.S. Patent No. 10,244,284 | 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:<br>• high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308<br>• 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<br>• higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11)<br>• Multiple Input Multiple Output Antennas (MIMO) in Rel-7<br>• 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<br>• MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s<br>• 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11)<br>• 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s<br>• Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s<br>https://www.etsi.org/technologies/mobile/3g<br><br>**4G LTE:** |



89

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **LONG TERM EVOLUTION (LTE)**<br><br>Rel-8/Rel-9<br><br>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).<br><br>Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA.<br><br>The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913:<br><br>• Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink<br>• Increased bitrates at the edge of cells assuming current site locations<br>• Improved spectrum efficiency e.g. 2-4 x Rel-6<br>• Reduced latency<br>• Scaleable bandwidth for a greater flexibility in frequency allocations<br>• Reduced capital and operational expenditure including backhaul<br>• Acceptable system and terminal complexity, cost and power consumption<br>• Support for inter-working with existing 3G systems and non-3GPP specified systems<br>• Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence)<br>• Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h). |



90

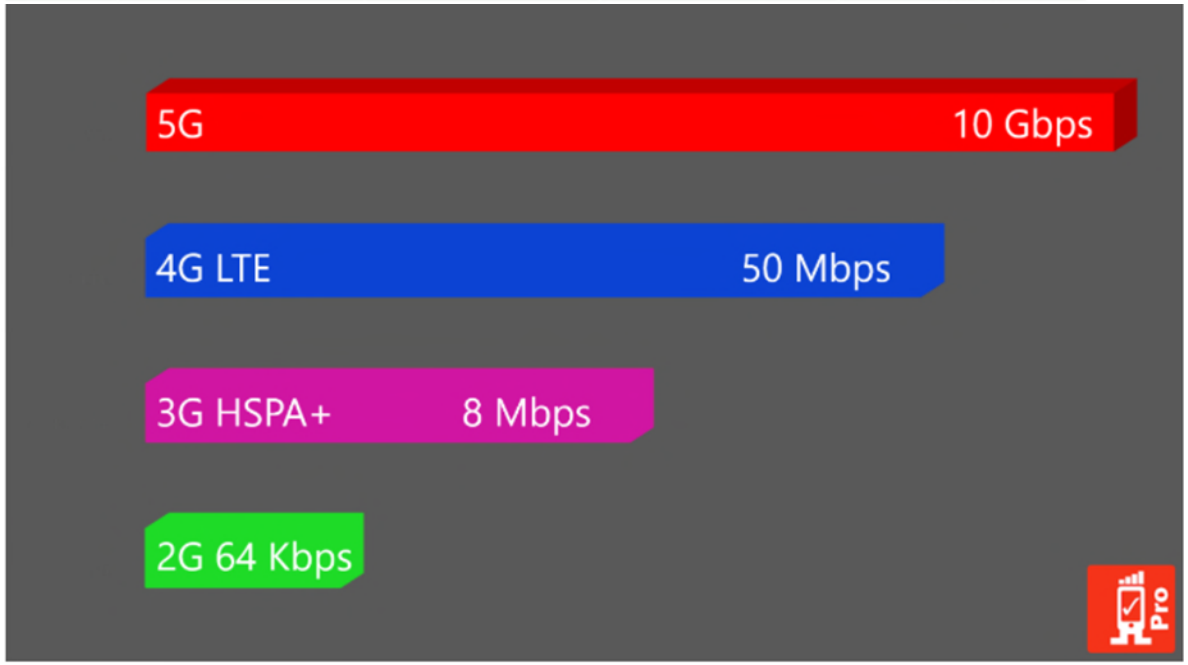
| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | • while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system<br>• while 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)<br>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)<br>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<br>• 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<br>• 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<br><br>All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example:<br>• RAN Aspects of RAN Sharing Enhancements for LTE<br>• Radiated requirements for the verification of multi-antenna reception perf. of UEs<br>• UE core requirements for uplink 64 QAM<br>• LTE DL 4 Rx antenna ports<br>https://www.etsi.org/technologies/mobile/4g |



91

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|

| 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 |




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



92

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **Wi-Fi Frequency Bandwidth:**<br><br>IEEE 802.11 Wi-Fi protocol summary<br><br>Protocol \| Frequency \| Channel Width \| MIMO \| Maximum data rate (theoretical)<br>802.11ax \| 2.4 or 5GHz \| 20, 40, 80, 160MHz \| Multi User (MU-MIMO) \| 2.4 Gbps[1]<br>802.11ac wave2 \| 5 GHz \| 20, 40, 80, 160MHz \| Multi User (MU-MIMO) \| 1.73 Gbps[2]<br>802.11ac wave1 \| 5 GHz \| 20, 40, 80MHz \| Single User (SU-MIMO) \| 866.7 Mbps[2]<br>802.11n \| 2.4 or 5 GHz \| 20, 40MHz \| Single User (SU-MIMO) \| 450 Mbps[3]<br>802.11g \| 2.4 GHz \| 20 MHz \| N/A \| 54 Mbps<br>802.11a \| 5 GHz \| 20 MHz \| N/A \| 54 Mbps<br>802.11b \| 2.4 GHz \| 20 MHz \| N/A \| 11 Mbps<br>Legacy 802.11 \| 2.4 GHz \| 20 MHz \| N/A \| 2 Mbps<br><br>[1] 2 Spatial streams with 1024-QAM modulation.<br>[2] 2 Spatial streams with 256-QAM modulation.<br>[3] 3 Spatial streams with 64-QAM modulation.<br>*See* https://www.intel.com/content/www/us/en/support/articles/000005725/wireless/legacy-intel-wireless-products.html |



93

| U.S. Patent No. 10,244,284 | 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/



94

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | IEEE 802.11AX MODULATION AND CODING SCHEMES FOR SINGLE SPATIAL STREAM<br><br>MCS INDEX / MODULATION TYPE / CODING RATE / DATA RATE (IN MB/S): 20 MHZ CHANNELS (1600 NS GI, 800 NS GI); 40 MHZ CHANNELS (1600 NS GI, 800 NS GI); 80 MHZ CHANNELS (1600 NS GI, 800 NS GI); 160 MHZ CHANNELS (1600 NS GI, 800 NS GI)<br><br>0 BPSK 1/2 8 8.6 16 17.2 34 36.0 68 72<br>1 QPSK 1/2 16 17.2 33 34.4 68 72.1 136 144<br>2 QPSK 3/4 24 25.8 49 51.6 102 108.1 204 216<br>3 16-QAM 1/2 33 34.4 65 68.8 136 144.1 272 282<br>4 16-QAM 3/4 49 51.6 98 103.2 204 216.2 408 432<br>5 64-QAM 2/3 65 68.8 130 137.6 272 288.2 544 576<br>6 64-QAM 3/4 73 77.4 146 154.9 306 324.4 613 649<br>7 64-QAM 5/6 81 86.0 163 172.1 340 360.3 681 721<br>8 256-QAM 3/4 98 103.2 195 206.5 408 432.4 817 865<br>9 256-QAM 5/6 108 114.7 217 229.4 453 480.4 907 961<br>10 1024-QAM 3/4 122 129.0 244 258.1 510 540.4 1021 1081<br>11 1024-QAM 5/6 135 143.4 271 286.8 567 600.5 1134 1201<br><br>*See* https://www.electronics-notes.com/articles/connectivity/Wi-Fi-ieee-802-11/802-11ax-modulation-coding.php<br><br>*See also* Appendix 10 showing that each of remaining 284 Accused Products include multiple radio circuits for communication with different frequency bandwidths. |



95

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **<u>Doctrine of Equivalents:</u>**<br>To the extent LG Electronics argues that this limitation is not literally met in each of the 284 Accused Products, 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 LG Electronics argues that each of the 284 Accused Products does not have radio communication circuits, each of these products include software, hardware, or a combination of the two that perform the equivalent function of having two radio communication circuits that are different from each other in frequency bandwidth. 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, each of the 284 Accused Products includes a Wi-Fi chipset and a cellular chipset that differ in frequency bandwidth. The performance of this function achieves substantially the same result, for example, having two such radio communication circuits that communicate with different frequency bandwidths. |
| **[20]** The method of claim 18, wherein the first radio communication circuit and the second radio communication circuit are different from each other in modulation/demodulation method. | In each of the 284 Accused Products, the first radio communication circuit and the second radio communication circuit are different from each other in modulation/demodulation method.<br>For example, in each of the 284 Accused Products, the cellular communication chip and Wi-Fi communication chip are different from each other in modulation/demodulation method.<br>**Cellular Modulation/Demodulation Method:** |



96

**APPENDIX 4: MAY 16, 2024 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 18, 19, 20 OF U.S. PATENT NO. 10,244,284 TO 284 ACCUSED PRODUCTS**

| U.S. Patent No. 10,244,284 | 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:<br>• 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),<br>• 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)<br>• over the introduction of Long Term Evolution (LTE) and LTE Advanced (4G) in 3GPP<br>• up to ongoing development in 3GPP of the 5th generation (5G)<br>https://www.etsi.org/technologies/mobile<br><br>**2G:** |



97

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **Global System for Mobile communication (GSM)**<br>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.<br><br>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.<br><br>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+.<br><br>**Enhanced Data rates for Global Evolution (EDGE)**<br>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.<br><br>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. 10,244,284 | 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.<br>https://www.etsi.org/technologies/mobile/2g<br><br>**3G: UMTS**<br>UMTS is offering greater spectral efficiency than GSM™ and has 2 modes:<br>• 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;<br>• 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.<br>In terms of maximum user bit rates the requirements of the first UMTS release were (according to ETSI TR 101 111):<br>• **Rural Outdoor**: at least 144 kbit/s (goal to achieve 384 kbit/s), max. speed: 500 km/h<br>• **Suburban Outdoor**: at least 384 kbps (goal to achieve 512 kbit/s), max. speed: 120 km/h<br>• **Indoor/Low range outdoor**: at least 2Mbps, max. speed: 10 km/h |

| U.S. Patent No. 10,244,284 | 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:<br><br>• high-speed download packet access (HSDPA) in Rel-5: see 3GPP TS 25.308<br>• 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<br>• higher order modulations (16QAM in UL in REL-7, 64QAM in DL in Rel-7, in UL in Rel-11)<br>• Multiple Input Multiple Output Antennas (MIMO) in Rel-7<br>• 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<br>• MIMO with 64QAM for HSUPA in Rel-11: up to 34.5 Mbit/s<br>• 4 carrier HSDPA in Rel-10 (non-contiguous in Rel-11)<br>• 8 carrier HSDPA (8C-HSDPA) in Rel-11: up to 336 Mbit/s<br>• Dual carrier HSUPA (DC-HSUPA) in Rel-13: up to 23 Mbit/s<br>https://www.etsi.org/technologies/mobile/3g<br><br>**4G LTE:** |



100

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **LONG TERM EVOLUTION (LTE)**<br><br>Rel-8/Rel-9<br><br>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).<br><br>Note: The terms LTE and E-UTRA are synonymous, however the radio specifications talk rather about E-UTRA.<br><br>The results of this study i.e. the E-UTRA/LTE requirements were documented in Rel-7 3GPP TR 25.913:<br><br>• Significantly increased peak data rates e.g. 100 Mbps in downlink/50 Mbps in uplink<br>• Increased bitrates at the edge of cells assuming current site locations<br>• Improved spectrum efficiency e.g. 2-4 x Rel-6<br>• Reduced latency<br>• Scaleable bandwidth for a greater flexibility in frequency allocations<br>• Reduced capital and operational expenditure including backhaul<br>• Acceptable system and terminal complexity, cost and power consumption<br>• Support for inter-working with existing 3G systems and non-3GPP specified systems<br>• Efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence)<br>• Optimized for low mobile speed but supporting high mobile speed (up to 500 km/h). |



101

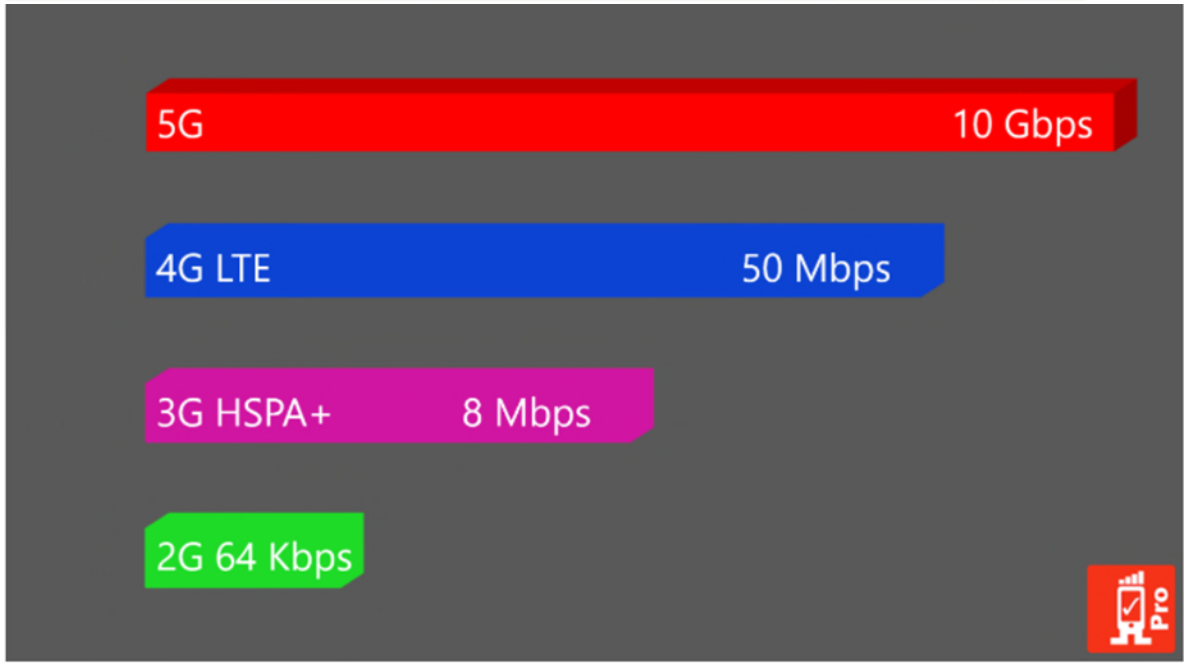
| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | • while UMTS started with a focus on circuit-switched data that was then more and more enhanced via shared channels and HSPA into the direction of a packet switched system, LTE is a pure packet-switched system<br>• while 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)<br>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)<br>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<br>• 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<br>• 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<br><br>All enhancements of LTE of Rel-13 and beyond (if not related to 5G) are running under the trademark "LTE Advanced Pro", for example:<br>• RAN Aspects of RAN Sharing Enhancements for LTE<br>• Radiated requirements for the verification of multi-antenna reception perf. of UEs<br>• UE core requirements for uplink 64 QAM<br>• LTE DL 4 Rx antenna ports<br>https://www.etsi.org/technologies/mobile/4g |



102

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|

| 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 |




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

**Wi-Fi Modulation/Demodulation Method:**



103

| U.S. Patent No. 10,244,284 | 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



104

| U.S. Patent No. 10,244,284 | 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/



105

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | IEEE 802.11AX MODULATION AND CODING SCHEMES FOR SINGLE SPATIAL STREAM<br><br>MCS INDEX, MODULATION TYPE, CODING RATE, DATA RATE (IN MB/S): 20 MHZ CHANNELS (1600 NS GI, 800 NS GI); 40 MHZ CHANNELS (1600 NS GI, 800 NS GI); 80 MHZ CHANNELS (1600 NS GI, 800 NS GI); 160 MHZ CHANNELS (1600 NS GI, 800 NS GI)<br><br>0, BPSK, 1/2, 8, 8.6, 16, 17.2, 34, 36.0, 68, 72<br>1, QPSK, 1/2, 16, 17.2, 33, 34.4, 68, 72.1, 136, 144<br>2, QPSK, 3/4, 24, 25.8, 49, 51.6, 102, 108.1, 204, 216<br>3, 16-QAM, 1/2, 33, 34.4, 65, 68.8, 136, 144.1, 272, 282<br>4, 16-QAM, 3/4, 49, 51.6, 98, 103.2, 204, 216.2, 408, 432<br>5, 64-QAM, 2/3, 65, 68.8, 130, 137.6, 272, 288.2, 544, 576<br>6, 64-QAM, 3/4, 73, 77.4, 146, 154.9, 306, 324.4, 613, 649<br>7, 64-QAM, 5/6, 81, 86.0, 163, 172.1, 340, 360.3, 681, 721<br>8, 256-QAM, 3/4, 98, 103.2, 195, 206.5, 408, 432.4, 817, 865<br>9, 256-QAM, 5/6, 108, 114.7, 217, 229.4, 453, 480.4, 907, 961<br>10, 1024-QAM, 3/4, 122, 129.0, 244, 258.1, 510, 540.4, 1021, 1081<br>11, 1024-QAM, 5/6, 135, 143.4, 271, 286.8, 567, 600.5, 1134, 1201<br><br>*See* https://www.electronics-notes.com/articles/connectivity/Wi-Fi-ieee-802-11/802-11ax-modulation-coding.php<br><br>*See also* Appendix 10 showing that the remaining 284 Accused Products contain radios that conform to specifications with different modulation/demodulation methods. |



106

| U.S. Patent No. 10,244,284 | Exemplary Evidence of Infringement |
|---|---|
| | **<u>Doctrine of Equivalents</u>**<br>To the extent LG Electronics argues that this limitation is not literally met in each of the 284 Accused Products, 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 LG Electronics argues that each of the 284 Accused Products does not have radio communication circuits, each of these products include software, hardware, or a combination of the two that perform the equivalent function of having two radio communication circuits that are different from each other in modulation/demodulation method. 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, each of the 284 Accused Products includes a Wi-Fi chipset and a cellular chipset that differ in modulation/demodulation method. The performance of this function achieves substantially the same result, for example, having two such radio communication circuits that communicate in accordance with different specifications. |



107