

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

EMPIRE TECHNOLOGY)	
DEVELOPMENT LLC)	
)	
Plaintiff,)	
)	
v.)	C.A. No. _____
)	
SAMSUNG ELECTRONICS CO., LTD.,)	DEMAND FOR JURY TRIAL
SAMSUNG ELECTRONICS AMERICA,)	
INC.)	
)	
Defendants.)	

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Empire Technology Development LLC (“Empire”) brings this action and makes the following allegations of patent infringement of U.S Patent Nos. 8,798,120 (the “120 Patent”) and 8,565,331 (the “331 Patent”) (collectively, “patents-in-suit”) against Defendant Samsung Electronics Co., Ltd. (“SEC”) and Defendant Samsung Electronics America, Inc. (“SEA” and, collectively with SEC, “Defendants” or “Samsung”) as follows:

THE PARTIES

1. Empire is a limited liability company organized and existing under the laws of the state of Delaware.
2. SEC is a foreign corporation organized and existing under the laws of the Republic of Korea with its principal place of business at 129 Samsung-Ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea.
3. SEA is a wholly owned subsidiary corporation of SEC and is incorporated and existing under the laws of New York, with its principal place of business at 85 Challenger Road,

Ridgefield Park, New Jersey 07660. SEA may be served with process through its registered agent with the Texas Secretary of State, CT Corporation System, 1999 Bryan Street, Suite 900, Dallas, Texas 75201.

4. SEA oversees domestic sales and distribution of Samsung's consumer electronics products, including the products accused of infringement in this case.

5. SEA conducts business operations within this District through its office located at 6625 Excellence Way, Plano, Texas 75023 and a retail store located at 2601 Preston Road, Frisco, Texas 75034.

JURISDICTION AND VENUE

6. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 1, *et seq.* This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a) because this is a civil action arising under the Patent Act.

7. This Court has personal jurisdiction over Defendants in this action because Defendants have committed acts within this District giving rise to this action and have established minimum contacts with this District such that the exercise of jurisdiction would not offend traditional notions of fair play and substantial justice. Defendants have purposefully directed activities at the United States, in particular, directing the Infringing Products for sale to customers and distributors within the United States (including within this District) and engaging in sales and marketing efforts to generate and support such sales. Defendants have committed acts of infringement, such as by supplying to distributors and consumer device retailers the Infringing Products in this District. Defendants, directly and through subsidiaries, intermediaries, and third parties, have committed and continue to commit acts of infringement in this District by, among

other things, making, using, offering to sell, selling, and importing products that infringe the patents-in-suit.

8. Venue is proper in this District under 28 U.S.C. §§ 1391 and 1400(b). Defendant SEC is a foreign corporation. Venue is proper as to a foreign defendant in any district. 28 U.S.C. § 1391(c)(3).

9. Defendant SEA has regular and established places of business in this District, including locations at 6625 Excellence Way, Plano, Texas 75023 and 2601 Preston Road, Frisco, Texas 75034. On information and belief, SEA deems its Plano location a “flagship” campus and announced SEA’s move to the Plano location by explaining, among other things:

Long committed to the North Texas community, Samsung’s move to Plano further demonstrates the company’s dedication to Texas and being an invested corporate citizen. North Texas is home to Samsung Electronics America’s second biggest employee population in the U.S. across multiple divisions – Customer Care, Mobile, Mobile R&D and Engineering. In all, more than 1,000 regional employees from two current locations in Richardson and Plano will be relocated to the new location. Over time, the space will accommodate growth and foster greater innovation for the brand.

<https://news.samsung.com/us/samsung-electronics-america-open-flagship-north-texas-campus/>.

10. Defendant SEA employs full-time personnel such as sales personnel and engineers in this District.

11. Defendant SEA has committed acts of infringement in this District by commercializing, marketing, selling, distributing, testing, and servicing the Infringing Products.

THE ASSERTED PATENTS

12. On August 5, 2014, the United States Patent and Trademark Office duly issued U.S. Patent No. 8,798,120, entitled “METHODS AND COMMUNICATION SYSTEMS HAVING ADAPTIVE MODE SELECTION.” A true and correct copy of the ’120 Patent is attached hereto as Exhibit A.

13. The '120 Patent is directed to devices and methods for adaptive power adjustment of wireless transmissions, e.g., from a smartphone operating in a 5G cellular network.

14. On October 22, 2013, the United States Patent and Trademark Office duly issued U.S. Patent No. 8,565,331, entitled "INSERTING AND DECODING REPLICATED DATA SYMBOLS IN WIRELESS COMMUNICATIONS." A true and correct copy of the '331 Patent is attached hereto as Exhibit B.

15. The '331 Patent is directed to methods and devices for decoding a signal transmitted over a communications channel.

BACKGROUND OF THE ACTION

16. In 2009, researchers at the University of Texas devised ways to adaptively manage power when a cell phone transmits into a cellular network. This 2009 research later became the '120 Patent.

17. The adaptive-power-control inventions embodied in the '120 Patent benefit today's smartphones in at least three valuable ways.

18. First, adaptive control of transmission power prolongs battery life in smartphones. This is one of the core features that impacts buying decisions and is a feature that is continuously marketed by smartphone manufacturers.

19. Second, adaptive control allows transmission at very high-power levels (for very short periods). Such high-power transmissions allow a device in a crowded network to access the best aspects of 5G-network technology and thereby dramatically improve performance.

20. Third, adaptive power control allows smartphones to access 5G's benefits without creating a safety concern for the human user. FCC regulations strictly limit transmission-power

levels to avoid overexposing a human head and body to elevated levels of radio frequency transmissions at close range.

21. The '120 Patent's technology is important in the smartphone market, both today and during the future existence of at least 5G. The size of data transmissions from phones has increased with consumer demands driven by, e.g., social media. Smartphone manufacturers have only recently implemented sophisticated technology to adaptively control the power of transmissions from phones operating in cellular networks.

22. Researchers at the University of Texas also devised ways to improve channel estimation by inserting and decoding replicated data while maintain high data rates in cellular communications. This research later became the '331 Patent.

23. Channel estimation is important in achieving reliable communication with high data rates in multiantenna systems.

24. The '331 Patent's technology is important in the smartphone market, both today and during the future existence of at least 5G. The size of data transmissions from phones has increased with consumer demands driven by, e.g., social media. Smartphone manufacturers have only relatively recently implemented sophisticated technology for decoding replicated data in channel estimation for communications in cellular networks.

25. The inventors of the patents-in-suit worked at the University of Texas at the time of the inventions and assigned all of their right, title and interest in and to patents-in-suit to the Board of Regents of The University of Texas System.

26. Plaintiff's predecessor, then called Invention Development Management Company, LLC, financially and otherwise promoted and enabled the innovation and patenting that led to the patents-in-suit.

27. Partially in recognition of those contributions, The Board of Regents of The University of Texas System granted an exclusive license that transfers all substantial rights in, to and under, *inter alia*, the patents-in-suit pursuant to a Master License Agreement effective as of June 26, 2009.

28. Empire is the exclusive licensee under the Master License Agreement by virtue of an assignment of this Master License Agreement to Empire pursuant to an Assignment and Assumption Agreement effective as of June 5, 2017.

29. Empire is the exclusive licensee of, and has all substantial rights in, to and under, the patents-in-suit, including the exclusive right to take all actions necessary to enforce the patents-in-suit, including the filing of this patent infringement lawsuit. Empire has the right to seek and recover all damages for past, present, and future infringement of the patents-in-suit and to seek injunctive relief as appropriate under the law.

30. For example, the Master License Agreement grants to Empire the right to all of the following:

causes of action and enforcement rights of any kind (whether such claims, causes of action or enforcement rights are known or unknown; currently pending, filed, to be filed; or otherwise) under the Patents and/or under or on account of any of the Patents for past, current and future infringement of the Patents, including without limitation, all rights to (i) pursue and collect damages, profits and awards of whatever nature recoverable....

31. Section 6.1 of the Master License Agreement states, in pertinent part, as follows:

Licensee and its Affiliates will have the exclusive right, but not the obligation, to, in Licensee's own name and at Licensee's expense (or in the name and expense of an Affiliate of Licensee), institute, prosecute, and control any action or proceeding with respect to Infringement of the Patents...

32. In addition, Section 6.2 of the Master License Agreement states, in pertinent part, as follows:

This Agreement transfers to Licensee all substantial rights under the Patents and, as a result, Licensee has the right to bring any future action or proceeding to enforce claims under the Patents in its own name, without naming Licensor as a party thereto.

COUNT I

(Infringement of U.S. Patent No. 8,798,120)

33. Empire incorporates herein by reference paragraphs 1 through 32 above as if set forth in full.

34. Defendants design, manufacture, use, sell, and/or offer for sale in the United States products comprising adaptive control of transmission power.

35. Samsung released the Galaxy S20 series in the U.S. on March 6, 2020, marking Samsung's first known infringement. The S20 series includes the Galaxy S20 models (*e.g.*, SM-G980, SM-G980F, SM-G980F/DS, SM-G981, SM-G981F, SM-G981F/DS, SM-G981B/DS, SM-G981U, SM-G981U1, and SM-G981N), Galaxy S20+ models (*e.g.*, SM-G985, SM-G985F, SM-G985F/DS, SM-G986, SM-G986F, SM-G986F/DS, SM-G986U, SM-G986U1, SM-G9860, SM-G986B/DS, and SM-G986N), the Galaxy S20 Ultra models (*e.g.*, SM-G988, SM-G988U, SM-G988U1, SM-G9880, SM-G988B/DS, and SM-G988N), and the Galaxy S20 FE models (*e.g.*, SM-G781B, SM-G781U, SM-G781U1, SM-G781W, SM-G7810 and SM-G781N).

36. Samsung released the Galaxy S21 series in the U.S. on January 29, 2021. The S21 series includes the Galaxy S21 models (*e.g.*, SM-G991B, SM-G991B/DS, SM-G991U, SM-G991U1, SM-G991W, SM-G991N, and SM-G9910), Galaxy S21+ models (*e.g.*, SM-G996B, SM-G996B/DS, SM-G996U, SM-G996U1, SM-G996W, SM-G996B, and SM-G9960), the Galaxy S21 Ultra models (*e.g.*, SM-G998B, SM-G998B/DS, SM-G998U, SM-G998U1, SM-G998W, SM-G998B, and SM-G9980), and the Galaxy S21 FE models (*e.g.*, SM-G990B, SM-G990B/DS,

SM-G990U, SM-G990U1, SM-G990W, SM-G990E, SM-G9900, SM-G990B2, SM-G990U2, SM-G990W2).

37. Samsung released the Galaxy S22 series in the U.S. on February 25, 2022. The S22 series includes the Galaxy S22 models (*e.g.*, SM-S901B, SM-S901B/DS, SM-S901U, SM-S901U1, SM-S901W, SM-S901N, SM-S9010, and SM-S901E), Galaxy S22+ models (*e.g.*, SM-S906B, SM-S906B/DS, SM-S906U, SM-S906U1, SM-S906W, SM-S906N, SM-S9060, and SM-S906E) and the Galaxy S22 Ultra models (*e.g.*, SM-S908B, SM-S908B/DS, SM-S908U, SM-S908U1, SM-S908W, SM-S908N, SM-S9080, and SM-S908E).

38. Samsung released the Galaxy S23 series in the U.S. on February 17, 2023. The S23 series includes the Galaxy S23 models (*e.g.*, SM-S911B, SM-S911B/DS, SM-S911U, SM-S911U1, SM-S911W, SM-S911N, SM-S9110, SM-S911E, SM-S911E/DS), Galaxy S23+ models (*e.g.*, SM-S916B, SM-S916B/DS, SM-S916U, SM-S916U1, SM-S916W, SM-S916N, SM-S9160, SM-S916E, SM-S916E/DS) and the Galaxy S23 Ultra models (*e.g.*, SM-S918B, SM-S918B/DS, SM-S918U, SM-S918U1, SM-S918W, SM-S918N, SM-S9180, SM-S918E, SM-S918E/DS).

39. Samsung's products that include, *e.g.*, transmitters with Qualcomm's Smart Transmit™, Smart Transmit™ 2.0, or Smart Transmit™ 3.0 technology infringe at least claim 25. At least all 5G-compatible Samsung phones identified above that include Qualcomm's Smart Transmit™, Smart Transmit™ 2.0, or Smart Transmit™ 3.0 technology infringe the '120 patent, including the Galaxy S20 series, S21 series, S22 series, and S23 series phones made in the United States, used in the United States, sold in the United States, offered for sale in the United States, or imported into the United States (the "'120 Patent Infringing Products").

40. The Galaxy S20, Galaxy S21, Galaxy S22, and Galaxy S23 series feature Samsung technologies and equipment operatively connected to and/or working with Smart Transmit technology and, thus, infringe the '120 Patent.

41. Defendants have infringed and continue to infringe the '120 Patent, including at least claim 25 of the '120 Patent, pursuant to 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, by making, using, offering to sell, selling, exporting from, and/or importing into the United States the '120 Patent Infringing Products, without authority or license.

42. Defendants indirectly infringe the '120 Patent, including at least claim 25 of the '120 Patent, pursuant to 35 U.S.C. § 271(b), by (among other things) and with specific intent or willful blindness, actively aiding and abetting infringement by others, such as Defendants' partners, customers, and end-users, in this District and elsewhere in the United States. For example, Defendants' partners, customers, and end-users directly infringe through their use of the inventions claimed in the '120 Patent. Defendants induce this direct infringement through its affirmative acts of manufacturing, selling, distributing, and/or otherwise making available the '120 Patent Infringing Products, and providing instructions, documentation, and other information to customers and end-users instructing them to use the '120 Patent Infringing Products in an infringing manner, including (i) instruction, technical support and services, (ii) training, marketing, product manuals, and advertisements, and (iii) software and mobile applications providing the foregoing and enabling customers and end-users to use the '120 Patent Infringing Products in an infringing manner. As a result of Defendants' inducement, Defendants' partners, customers and end-users use the '120 Patent Infringing Products in the way that Defendants intend and that directly infringes the '120 Patent. At least SEA has known of the '120 Patent, and that the '120 Patent Infringing Products infringe the '120 Patent, or have been willfully blind to such

infringement, since at least June 2019. Despite this knowledge of the '120 Patent and that the '120 Patent Infringing Products infringe the '120 Patent, Defendants have continued to perform these affirmative acts with the intent, or willful blindness, that the induced acts directly infringe the '120 patent.

43. Defendants also indirectly infringe the '120 patent, including at least claim 25 of the '120 Patent, pursuant to 35 U.S.C. § 271(c), by contributing to direct infringement committed by others, such as customers and end-users, in this District and elsewhere in the United States. Defendants' affirmative acts of selling and offering to sell, in this District and elsewhere in the United States, the '120 Patent Infringing Products and causing the '120 Patent Infringing Products to be manufactured, used, sold, and offered for sale, contribute to Defendants' customers' and end-users' use of the '120 Patent Infringing Products, such that the '120 Patent is directly infringed. The '120 Patent Infringing Products are a material part of the invention of the '120 Patent, are not a staple article or commodity of commerce, have no substantial non-infringing use, and are known by Defendants to be especially made or adapted for use in the infringement of the '120 Patent. At least SEA has known of the '120 Patent, and that the '120 Patent Infringing Products infringe the '120 Patent, or have been willfully blind to such infringement, since at least June 2019. Despite this knowledge of the '120 Patent and that the '120 Patent Infringing Products infringe the '120 Patent, Defendants have continued to perform these affirmative acts with knowledge of the '120 Patent and with intent, or willful blindness, that they cause the direct infringement of the '120 Patent.

44. Claim 25 of the '120 Patent is reproduced below with the addition of labels [a], [b], [c], [d], and [e] corresponding to portions of the claim.

25. A mobile station for use in a communications system comprising:

- [a] a first antenna and a second antenna;
- [b] first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna; second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna; and
- [c] a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and, in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode wherein both the first and second antennas transmit data over a communications channel and a single-input multiple-output (SIMO) mode wherein only one of the first and second antennas transmit data over a communications channel,
- [d] wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry,
- [e] wherein the control signal is based, at least in part, on an idle power consumption of the mobile station.

45. The '120 Patent Infringing Products embody each and every limitation of at least claim 25 of the '120 Patent, literally or under the doctrine of equivalents, as described in the non-limiting examples set forth below concerning Galaxy S20 series and/or Galaxy S21 series smartphones. These non-limiting examples are preliminary and are not intended to limit Empire's right to modify these non-limiting examples or allege that other aspects of the Defendants' mobile devices, or other of Defendants' mobile devices or other products, infringe the identified claim, or any other claims, of the '120 Patent.

“25. A mobile station for use in a communications system comprising:”

46. The '120 Patent Infringing Products are examples of mobile stations for use in a cellular network communication system.

47. For example, the Galaxy S20 is an example of a mobile station for use in a cellular network communication system. Specifically, below is a photograph of a Galaxy S20 mobile station submitted by Samsung to the FCC.

FCC ID: A3LSMG981U, IC: 649E-SMG981U, HVIN: SM-G981W External Photographs

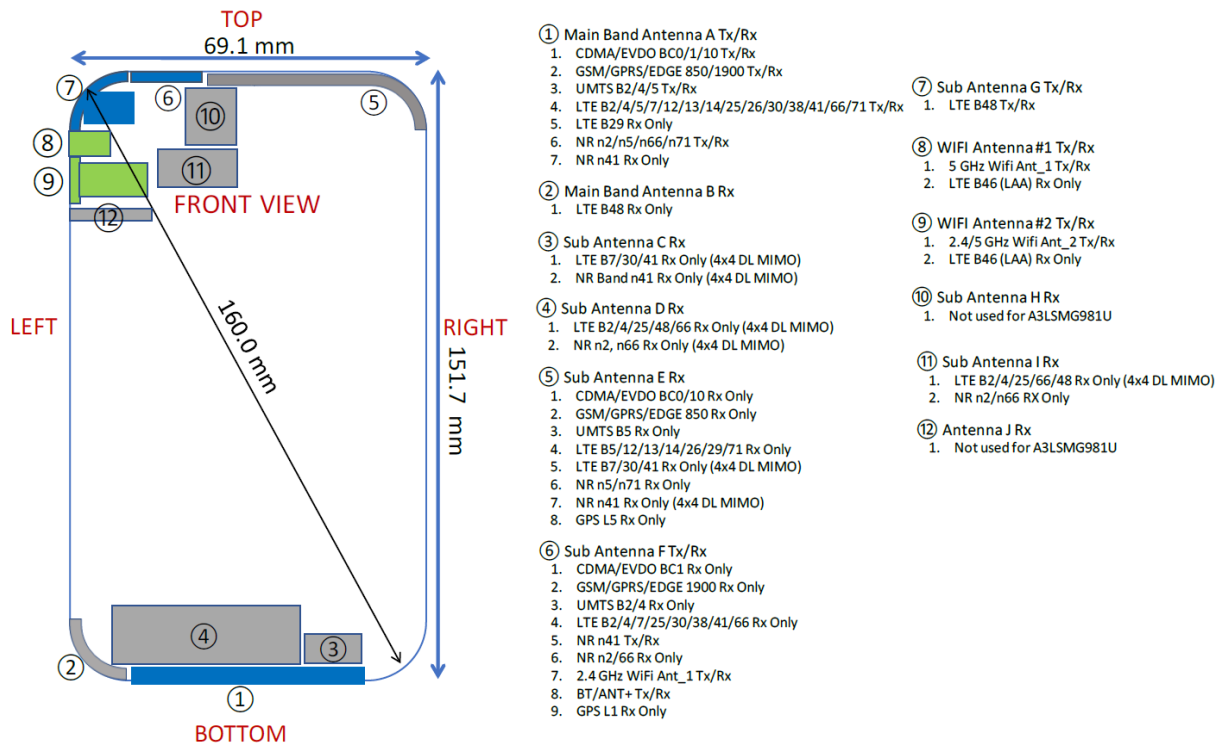


Available at https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&RequestTimeout=500&calledFromFrame=N&application_id=8Twxpjxn25uB8pCHfwZLA%3D%3D&fcc_id=A3LSMG981U (external photos).

“[a] a first antenna and a second antenna;”

48. The '120 Patent Infringing Products include at least a first antenna and a second antenna.

49. For example, Galaxy S20 series smartphones include at least a first antenna and a second antenna. Below is an image from Samsung’s submission to the FCC for a Galaxy S20 model showing antenna locations:



**Figure E-1
DUT Antenna Locations**

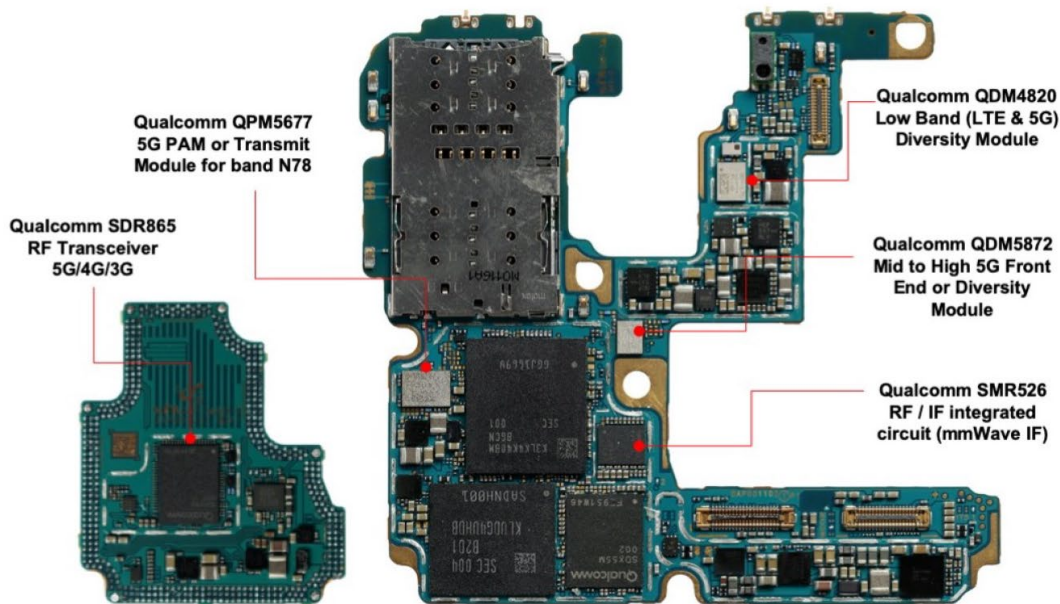
FCC ID: A3LSMG981U		SAR EVALUATION REPORT		Approved by: Quality Manager
Test Dates: 10/23/19 – 12/18/19	DUT Type: Portable Handset			APPENDIX E: Page 2 of 14

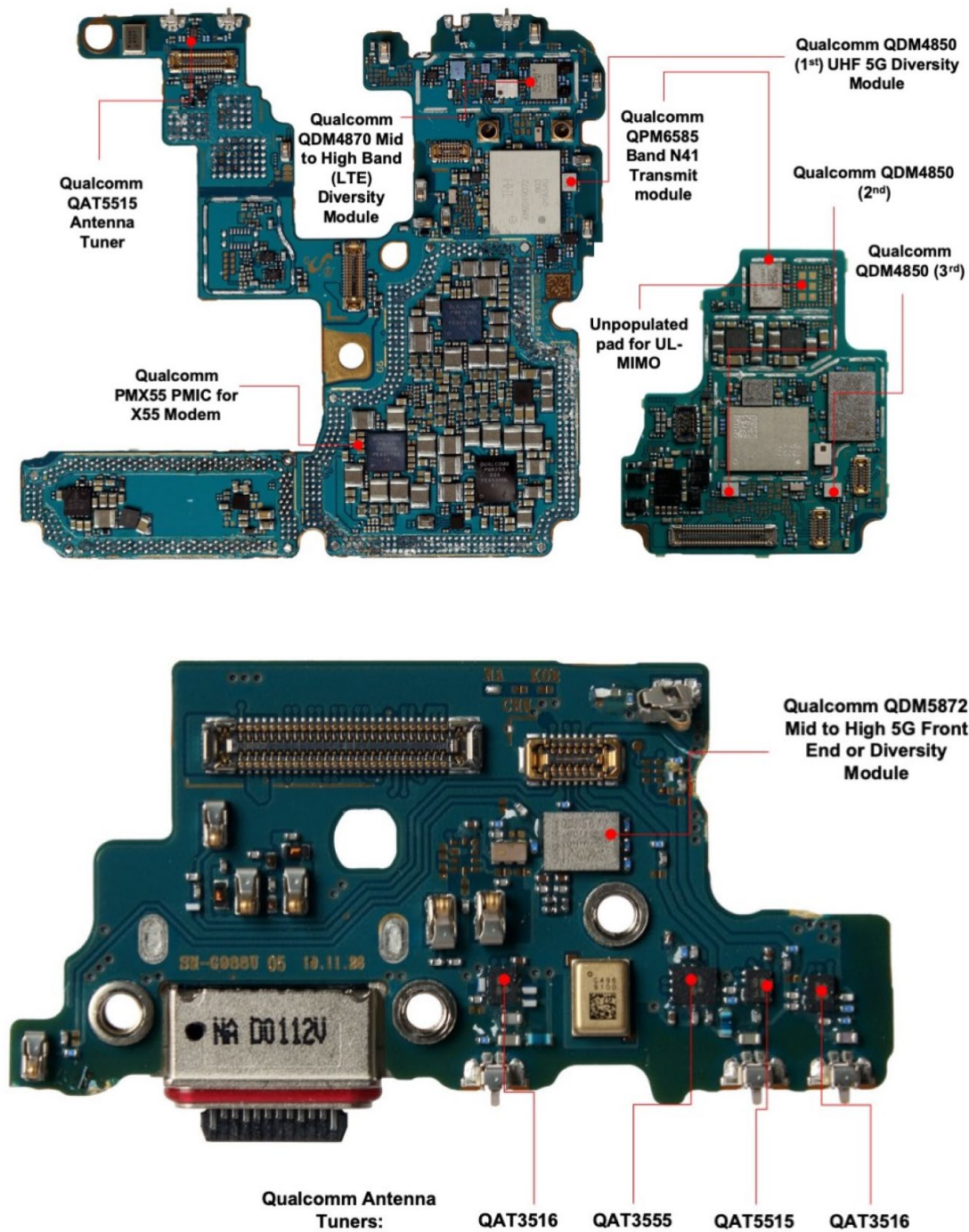
Available at https://apps.fcc.gov/oetcf/eas/reports/ViewExhibitReport.cfm?mode=Exhibits&RequestTimeout=500&calledFromFrame=N&application_id=8Twpxjxn25uB8pCHfwZLA%3D%3D&fcc_id=A3LSMG981U (Test Setup Photos).

“[b] first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna; second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna; and”

50. The '120 Patent Infringing Products include first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna and second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna.

51. For example, the Galaxy S20 Ultra includes first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna and second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna. More specifically, e.g., the three annotated images below show modules and circuitry for processing signals in the Galaxy S20 Ultra.





<https://omdia.tech.informa.com/OM006104/Criticality-of-5G-Modem-to-RF-Integration-A-look-inside-Samsung-Galaxy-S20-Ultra#c66138ec-595f-4a26-a02a-3e0acbf3e83e>.

52. One of Defendants’ suppliers, Qualcomm, states that its “second-generation RF front-end (RFFE) solutions for 5G multi-mode mobile devices ... represent a comprehensive RF

solution designed to work with the new Qualcomm® Snapdragon™ X55 5G modem, delivering a comprehensive modem-to-antenna system for high-performance 5G mobile devices supporting both sub-6 GHz and millimeter wave (mmWave) bands.” These RFFE solutions comprise power amplifiers and diversity modules that include the following:

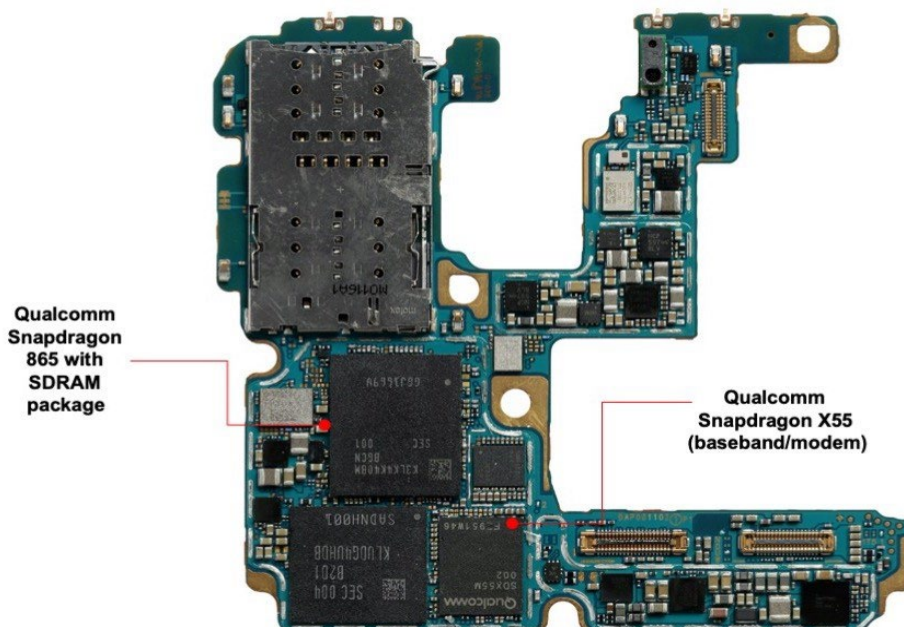
- PA modules which pair with QET6100 to support 100 MHz 5G envelope tracking. QPM6585, QPM5677 and QPM5679 for bands n41, n77/78 and n79 respectively.
- Mid/High-band 5G/4G PA module QPM5670 features integrated LNA, switch, filters and 5G hexaplexer.
- Low-band 5G/4G PA module QPM5621 with integrated LNA, switch and filters, and support for low-band/low-band carrier aggregation and dual connectivity.
- Diversity module family QDM58xx, featuring integrated 5G/4G LNA, switch and filters for receive diversity and MIMO support for sub-6 GHz bands.

<https://www.qualcomm.com/news/releases/2019/02/qualcomm-announces-second-generation-5g-rf-front-end-solutions-sleeker-more>

“[c] a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and, in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode wherein both the first and second antennas transmit data over a communications channel and a single-input multiple-output (SIMO) mode wherein only one of the first and second antennas transmit data over a communications channel,”

53. The '120 Patent Infringing Products include a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and, in accordance with the control signal, to select between a MIMO mode wherein both the first and second antennas transmit data over a communications channel and a SIMO mode wherein only one of the first and second antennas transmit data over a communications channel.

54. For example, the Galaxy S20 models includes a controller coupled to the first and second circuitry and configured to receive a control signal and, in accordance with the control signal, to select between a MIMO mode wherein both the first and second antennas transmit data over a communications channel and a SIMO mode wherein only one of the first and second antennas transmit data over a communications channel. Specifically, the annotated image below shows a Qualcomm Snapdragon 865 and Qualcomm Snapdragon x55 modem in the Galaxy S20 Ultra:



<https://omdia.tech.informa.com/OM006104/Criticality-of-5G-Modem-to-RF-Integration-A-look-inside-Samsung-Galaxy-S20-Ultra#c66138ec-595f-4a26-a02a-3e0acbf3e83e>.

55. For example, the '120 Patent Infringing Products include a controller that is configured to select between a MIMO mode wherein both the first and second antennas transmit data over a communications channel and a SIMO mode wherein only one of the first and second antennas transmit data over a communications channel at least because they are compatible with LTE Release 12:

Uplink Transmission modes in LTE Release 12			
Transmission modes	Description	DCI (Main)	Comment
1	Single transmit antenna	0	single antenna port (port 10)
2	Closed-loop spatial multiplexing	4	2 or 4 antennas (ports 20 and 21) (ports 40,41,42,43)

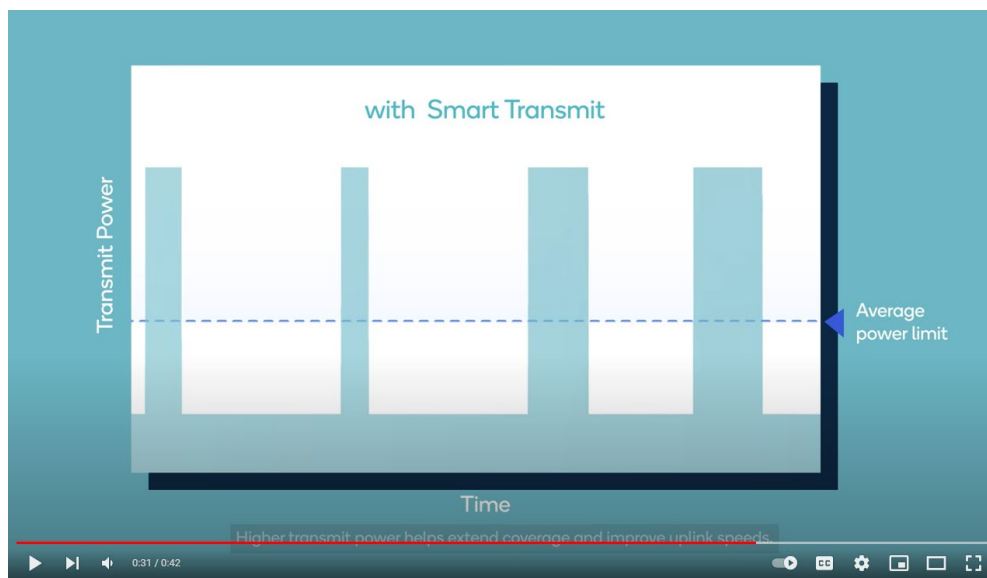
Table 6: The two uplink transmission modes in LTE Release 12.

https://cdn.rohde-schwarz.com/pws/dl_downloads/dl_application/application_notes/lma186/lma186_2e_LTE_TMs_and_beamforming.pdf (annotated).

“[d] wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry,”

56. Qualcomm’s Smart Transmit technology incorporated into the ’120 Patent Infringing Products, including the Galaxy S20 series, includes a control signal based, at least in part, on a power consumption of the first and second circuitry.

57. For example, with Smart Transmit technology, transmit power may exceed the average power limit at certain times and transmit power may be less than the average power limit at other times, as shown below.



<https://www.youtube.com/watch?v=KUh7NllpSZw>.

58. Qualcomm states that “Qualcomm Smart Transmit technology takes advantage of modem-to-antenna system awareness to optimize uplink speeds while complying with RF transmitter power limits. Higher transmit power helps extend coverage and improve uplink speeds.” <https://www.youtube.com/watch?v=KUh7NllpSZw>.

59. As another example, a Samsung submission to the FCC describes Smart Transmit as follows:

The Smart Transmit algorithm controls and manages the instantaneous transmit power (Tx) to maintain the time-averaged Tx power (in turn, time-averaged RF exposure) in compliance with FCC limits.... If time-averaged transmit power approaches the P_{limit} , then the modem needs to limit instantaneous transmit power to ensure the time-averaged transmit power does not exceed the P_{limit} ... The wireless device can instantaneously transmit at high transmit powers and exceed the P_{limit} ... level for a short duration before limiting the power to maintain the time-averaged transmit power under P_{limit} .”

<https://fccid.io/A3LSMN976V/RF-Exposure-Info/Smart-Transmit-Summary-Report-4354628>.

60. As a further example, Qualcomm stated as follows:

Qualcomm Smart Transmit uses advanced techniques to intelligently manage transmit power across multiple antenna groups, enabling significantly extended coverage, improved uplink speeds, and lower latency — especially important to meet the high expectations for today’s 5G devices and networks, all while ensuring devices remain compliant with regulatory requirements.

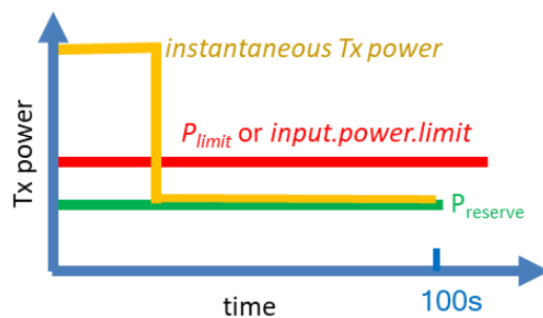
<https://www.qualcomm.com/news/onq/2022/02/16/meet-inventor-behind-qualcomm-smart-transmit-breakthrough-technology-optimizes>.

“[e] wherein the control signal is based, at least in part, on an idle power consumption of the mobile station.”

61. Qualcomm’s Smart Transmit technology incorporated into the ’120 Patent Infringing Products, including the Galaxy S20 series, includes a control signal based, at least in part, on a transmission power of the transceiver during an idle time.

62. For example, a Samsung submission to the FCC describes Smart Transmit as follows:

To avoid dropping the radio link, Smart Transmit algorithm starts the power limiting enforcement earlier in time to back off the Tx power to a reserve level (denoted as $P_{reserve}$), so the wireless device can maintain the radio link at a minimum reserve power level for as long as needed, and at the same time ensure the time-averaged Tx power over any defined time window is less than P_{limit} at all times (see Figure [3.2]).



(b)

Figure 3-2 Transmit with reserve power to support continuous transmission at a minimum power level ($P_{reserve}$)

<https://fccid.io/A3LSMN976V/RF-Exposure-Info/Smart-Transmit-Summary-Report-4354628>.

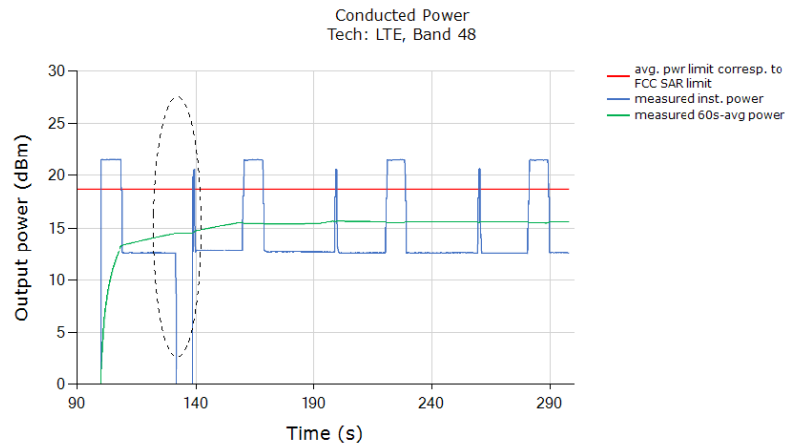
63. Samsung submitted a “RF Exposure Evaluation Report” to the FCC in connection with its Galaxy S20 smartphone, i.e., one of the ’120 Patent Infringing Products. This report includes the results of a “Call Drop Test Case” in which “the transmitting power kept the same $P_{reserve}$ level” greater than zero dBm as shown in the plot below “after the call was re-established”:

9.2 Call Drop Test Case

This test was measured LTE Band 48, Antenna F, DSI=3, and with callbox requesting maximum power. The call drop was manually performed when the DUT is transmitting at $P_{reserve}$ level as shown in the plot below (dotted black region). The measurement setup is shown in Figure 6-1. The detailed test procedure is described in Section 4.3.2.

Call drop test result:

Plot 1: Measured Tx power (dBm) versus time shows that the transmitting power kept the same $P_{reserve}$ level of LTE Band 48 after the call was re-established:



<https://fcc.report/FCC-ID/A3LSMG981V/4728830>.

64. Defendants’ infringement is willful, as at least SEC had knowledge of the ’120 Patent before developing the ’120 Patent Infringing Products. For example, U.S. Patent No. 9,344,175 (the “’175 Patent”) issued to SEC in 2016 and lists the ’120 Patent as a cited reference. On or about January 14, 2016, the United States Patent and Trademark Office’s examiner brought the ’120 Patent to SEC’s attention. The ’175 Patent is entitled, “Method and Apparatus for Determining Number of Antennas in Multiple Input Multiple Output (MIMO) Communications System,” and had been filed on June 14, 2013 (more than two years after the United States Patent and Trademark Office published US 2010/0284449 A1). Each of the ’120 Patent Infringing Products includes a MIMO communications system.

65. Furthermore, Empire, as exclusive licensee, contacted one or more of the Defendants about a portfolio of patents including the ’120 Patent. Neither company licensed or

otherwise obtained rights to the patent, either as a standalone asset or as one of many patents in the portfolio.

66. Without permission from or compensation to Empire, Defendants have sold—and continue to sell—very substantial numbers of '120 Patent Infringing Products in the U.S. based on the pioneering technology in the '120 Patent.

67. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '120 Patent. Empire has satisfied all statutory obligations required to collect pre-filing damages for the full period allowed by law for the infringement of the '120 Patent.

68. As a result of Defendants' infringement of the '120 Patent, Empire has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Defendants' infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants together with interest and costs as fixed by the Court.

COUNT II

(Infringement of U.S. Patent No. 8,565,331)

69. Empire incorporates herein by reference paragraphs 1 through 68 above as if set forth in full.

70. Defendants design, manufacture, use, sell, and/or offer for sale in the United States products with 5G-compatible modems that use channel estimation.

71. Samsung's products that operate within, e.g., a 5G cellular network infringe at least claim 1 of the '331 Patent. On information and belief, all 5G-compatible Samsung phones infringe the '331 Patent, including for example the Galaxy S20 series, S21 series, S22 series, and S23 series phones (the "'331 Patent Infringing Products," and together with the '120 Patent Infringing Products, the "Infringing Products").

72. Defendants have infringed and continue to infringe the '331 Patent, including at least claim 1 of the '331 Patent, pursuant to 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, by making, using, offering to sell, selling, exporting from, and/or importing into the United States the '331 Patent Infringing Products, without authority or license.

73. Defendants indirectly infringe the '331 Patent, including at least claim 1 of the '331 Patent, pursuant to 35 U.S.C. § 271(b), by (among other things) and with specific intent or willful blindness, actively aiding and abetting infringement by others, such as Defendants' partners, customers and end-users, in this District and elsewhere in the United States. For example, Defendants' partners, customers, and end-users directly infringe through their use of the inventions claimed in the '331 Patent. Defendants induce this direct infringement through its affirmative acts of manufacturing, selling, distributing, and/or otherwise making available the '331 Patent Infringing Products, and providing instructions, documentation, and other information to customers and end-users instructing them to use the '331 Patent Infringing Products in an infringing manner, including (i) instruction, technical support and services, (ii) training, marketing, product manuals, and advertisements, and (iii) software and mobile applications providing the foregoing and enabling customers and end-users to use the '331 Patent Infringing Products in an infringing manner. As a result of Defendants' inducement, Defendants' partners, customers, and end-users use the '331 Patent Infringing Products in the way that Defendants intend and that directly infringes the '331 Patent. At least SEA has known of the '331 Patent, and that the '331 Patent Infringing Products infringe the '331 Patent, or are willfully blind to such infringement, since at least June 2019. Despite this knowledge of the '331 Patent and that the '331 Patent Infringing Products infringe the '331 Patent, Defendants have continued to perform these

affirmative acts with the intent, or willful blindness, that the induced acts directly infringe the '331 Patent.

74. Defendants also indirectly infringe the '331 Patent, including at least claim 1 of the '331 Patent, pursuant to 35 U.S.C. § 271(c), by contributing to direct infringement committed by others, such as customers and end-users, in this District and elsewhere in the United States. Defendants' affirmative acts of selling and offering to sell, in this District and elsewhere in the United States, the '331 Patent Infringing Products and causing the '331 Patent Infringing Products to be manufactured, used, sold, and offered for sale, contribute to Defendants' customers' and end-users' use of the '331 Patent Infringing Products, such that the '331 Patent is directly infringed. The '331 Patent Infringing Products are a material part of the invention of the '331 Patent, are not a staple article or commodity of commerce, have no substantial non-infringing use, and are known by Defendants to be especially made or adapted for use in the infringement of the '331 Patent. At least SEA has known of the '331 Patent, and that the '331 Patent Infringing Products infringe the '331 Patent, or are willfully blind to such infringement, since at least June 2019. Despite this knowledge of the '331 Patent and that the '331 Patent Infringing Products infringe the '331 Patent, Defendants have continued to perform these affirmative acts with knowledge of the '331 Patent and with intent, or willful blindness, that they cause the direct infringement of the '331 Patent.

75. Claim 1 of the '331 Patent is reproduced below with the addition of labels [a], [b], [c], [d], [e], and [f] corresponding to portions of the claim.

1. A method of decoding a signal transmitted over a communications channel, the method comprising:

[a] receiving a pilot symbol over the communications channel;

[b] estimating a channel matrix of the communications channel based, at least in part, on the pilot symbol;

[c] receiving replicated data from multiple data streams transmitted over the communications channel;

[d] decoding the replicated data using the estimated channel matrix;

[e] generating an updated estimate of the channel matrix based, at least in part, on the replicated data; and

[f] decoding subsequently received signals over the communications channel using the updated estimate of the channel matrix.

76. The '331 Patent Infringing Products embody each and every limitation of at least claim 1 of the '331 Patent, literally or under the doctrine of equivalents, as described in the non-limiting examples set forth below. These non-limiting examples are preliminary and are not intended to limit Empire's right to modify these non-limiting examples or allege that other aspects of the Defendants' mobile devices or other devices infringe the identified claim, or any other claims, of the '331 Patent.

“A method of decoding a signal transmitted over a communications channel, the method comprising:”

77. The '331 Patent Infringing Products perform a method of decoding a signal transmitted over a communications channel.

78. For example, the Galaxy S20 includes the “Qualcomm SM8250 Snapdragon 865 5G” chipset, which includes Qualcomm's Snapdragon X55 modem, and decodes a signal transmitted over a communication channel.

https://www.gsmarena.com/samsung_galaxy_s20-10081.php; https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/prod_brief_qcom_sd865_5g.pdf.

79. Qualcomm states that the “Snapdragon X55 is designed to provide comprehensive support for 5G NR TDD and FDD.... ..While driving 5G forward, we also continue to innovate and push 4G LTE boundaries. Snapdragon X55 features cutting-edge LTE features, including 24 spatial streams, 4x4 MIMO, and 1024-QAM.”

<https://www.qualcomm.com/news/onq/2019/02/meet-snapdragon-x55-worlds-most-advanced-commercial-5g-modem>.

“receiving a pilot symbol over the communications channel”

80. The ’331 Patent Infringing Products perform the step of receiving a pilot symbol over the communications channel.

81. For example, the Galaxy S20, which includes a Qualcomm Snapdragon X55 modem, performs the step of receiving a pilot symbol over the communications channel.

82. “Qualcomm inventor Dr. Kiran Mukkavilli” stated as follows:

A good, up-to-date channel estimate is essential to supporting high data rates on wireless channels, and pilot signals are used to estimate that wireless channel, which varies with time. *I came up with a pilot design based on periodic placement and staggering of pilot symbols both in frequency and over time, which became a fundamental structure in OFDM-based cellular systems in 4G and 5G. We then further expanded this pilot design in 5G to dynamically adapt the pilot pattern depending on a user’s environment and mobility conditions....*

<https://www.qualcomm.com/news/onq/2022/09/how-qualcomm-inventor-dr--kiran-mukkavilli-helped-hash-out-the-f> (emphasis added).

“estimating a channel matrix of the communications channel based, at least in part, on the pilot symbol”

83. The ’331 Patent Infringing Products perform the step of estimating a channel matrix of the communications channel based, at least in part, on the pilot symbol.

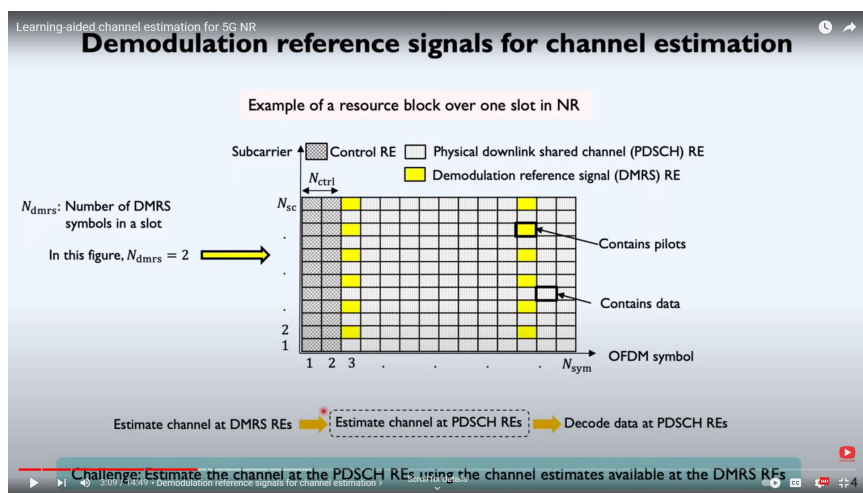
84. For example, the Galaxy S20, which includes a Qualcomm’s Snapdragon X55 modem, performs the step of estimating a channel matrix of the communications channel based, at least in part, on the pilot symbol.

85. “Qualcomm inventor Dr. Kiran Mukkavilli” stated as follows:

A good, up-to-date channel estimate is essential to supporting high data rates on wireless channels, and pilot signals are used to estimate that wireless channel, which varies with time. I came up with a pilot design based on periodic placement and staggering of pilot symbols both in frequency and over time, which became a fundamental structure in OFDM-based cellular systems in 4G and 5G. We then further expanded this pilot design in 5G to dynamically adapt the pilot pattern depending on a user’s environment and mobility conditions...

<https://www.qualcomm.com/news/onq/2022/09/how-qualcomm-inventor-dr--kiran-mukkavilli-helped-hash-out-the-f> (emphasis added).

86. Moreover, as another example, 5G channel matrix estimation is based, at least in part, on a pilot symbol, e.g., see below:



<https://www.youtube.com/watch?v=TZzTsPQJDRo&t=562s>.

87. As yet another example, Qualcomm’s U.S. Patent No. 9,985,802 entitled “Channel Estimation Enhancements” states that a user equipment “apparatus generates a channel estimate based on the received pilot.” U.S. Patent No. 9,985,802 at 20:12-13, Fig. 12.

“receiving replicated data from multiple data streams transmitted over the communications channel”

88. The '331 Patent Infringing Products perform the step of receiving replicated data from multiple data streams transmitted over the communications channel.

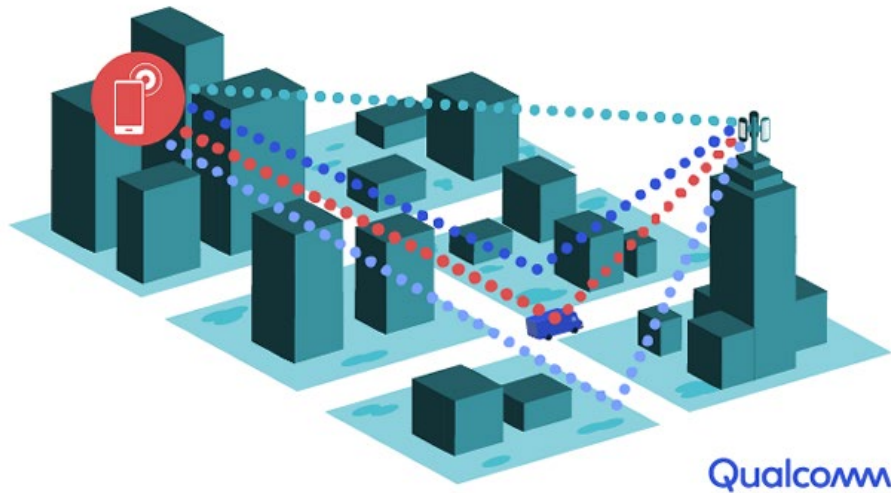
89. For example, the Galaxy S20, which includes a Qualcomm Snapdragon X55 modem, performs the step of receiving replicated data from multiple data streams transmitted over the communications channel.

90. Qualcomm’s Snapdragon X55 modem employs spatial diversity, which Qualcomm describes as follows:

Spatial diversity is one of the fundamental benefits of MIMO technology. In brief, diversity aims at improving the reliability of the system by sending *the same data across different propagation, or spatial, paths*. Spatial diversity evolves into a more complex concept, which is “spatial multiplexing.” Now, not only are the diverse experiences of the over-air-channel utilized for performance improvements, but multiple messages can be transmitted simultaneously without interfering with one another since they are separated in space.

To better visualize the concept of spatial multiplexing, think of a pipeline through which data is flowing between the base station and the phone on a mobile network. Envision a situation with one antenna on the base station and one on the phone – that allows for only so much data to flow. Now, by installing more antennas on either side with proper spatial separation (see illustration below), multiple virtual pipelines can be created in the space between phone and the base station. This creates multiple paths for more data to travel between the base station and mobile.

By nature, this solution is very dynamic. With the continuous movement of the mobile user and changes in the surrounding environment, the mobile phone and the network require more advanced capabilities to continuously coordinate the link and manage the data transmission.



<https://www.qualcomm.com/news/onq/2019/06/how-5g-massive-mimo-transforms-your-mobile-experiences> (emphasis added).

“decoding the replicated data using the estimated channel matrix”

91. The '331 Patent Infringing Products perform the step of decoding the replicated data using the estimated channel matrix.

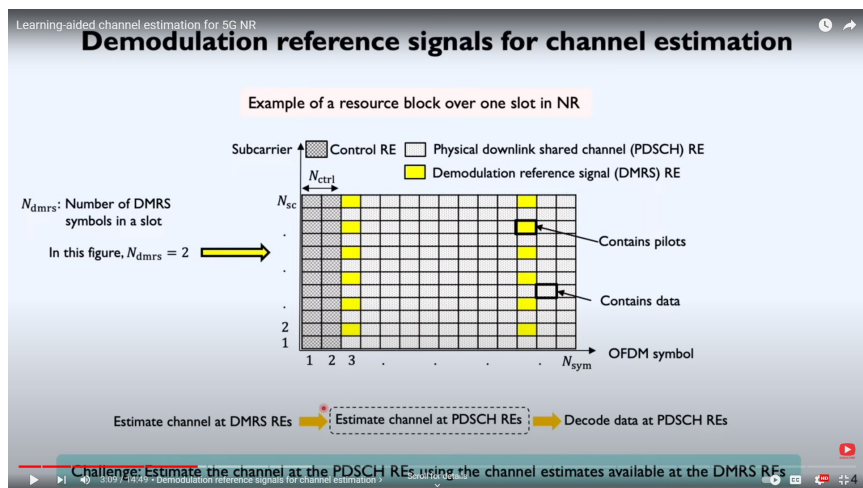
92. For example, the Galaxy S20, which includes a Qualcomm Snapdragon X55 modem, performs the step of decoding replicated data using the estimated channel matrix.

93. “Qualcomm inventor Dr. Kiran Mukkavilli” stated as follows:

A good, up-to-date channel estimate is essential to supporting high data rates on wireless channels, and pilot signals are used to estimate that wireless channel, which varies with time. I came up with a pilot design based on periodic placement and staggering of pilot symbols both in frequency and over time, which became a fundamental structure in OFDM-based cellular systems in 4G and 5G. We then further expanded this pilot design in 5G to dynamically adapt the pilot pattern depending on a user’s environment and mobility conditions...

<https://www.qualcomm.com/news/onq/2022/09/how-qualcomm-inventor-dr--kiran-mukkavilli-helped-hash-out-the-f> (emphasis added).

94. In 5G, the estimated channel matrix is used in decoding data, e.g., see below:



<https://www.youtube.com/watch?v=TZzTsPQJDRo&t=562s>.

95. The “DMRS [demodulation reference signal] is a special type of physical layer signal which functions as a reference signal for decoding PDSCH [physical downlink shared channel].”

https://www.sharetechnote.com/html/5G/5G_PDSCH_DMRS.html.

96. As another example, Qualcomm’s U.S. Patent No. 9,985,802 states that user equipment “decode[s] (e.g., demodulate[s]) received data based on the channel estimate.” U.S. Patent No. 9,985,802 at 10:61-63.

“generating an updated estimate of the channel matrix based, at least in part, on the replicated data”

97. The ’331 Patent Infringing Products perform the step of generating an updated estimate of the channel matrix based, at least in part, on the replicated data.

98. For example, the Galaxy S20, which includes a Qualcomm Snapdragon X55 modem, performs the step of generating an updated estimate of the channel matrix based, at least in part, on the replicated data.

99. Examples of the data within a PDSCH resource block (RB) that are used in generating a channel estimate include (i) PT-RS (phase tracking reference signal) and (ii) data within an RB also used to separate or identify the location(s) of pilots. The PDSCH RB is replicated across at least two streams in a MIMO transmission.

“decoding subsequently received signals over the communications channel using the updated estimate of the channel matrix”

100. The '331 Patent Infringing Products perform the step of decoding subsequently received signals over the communications channel using the updated estimate of the channel matrix.

101. For example, and as explained above with reference to initial decoding based on an initial estimate of the channel matrix, the Galaxy S20, which includes a Qualcomm Snapdragon X55 modem, performs the step of decoding subsequently received signals over the communications channel using the updated estimate of the channel matrix.

102. As another example, Qualcomm's U.S. Patent No. 9,985,802 states that user equipment “decode[s] (e.g., demodulate[s]) received data based on the channel estimate.” U.S. Patent No. 9,985,802 at 10:61-63.

103. Without permission from or compensation to Empire, Defendants have sold—and continue to sell—very substantial numbers of '331 Patent Infringing Products in the U.S. based on the pioneering technology in the '331 Patent.

104. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '331 Patent. Empire has satisfied all statutory obligations required to collect pre-filing damages for the full period allowed by law for the infringement of the '331 Patent.

105. As a result of Defendants' infringement of the '331 Patent, Empire has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Defendants' infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

WHEREFORE, Empire prays for a judgment in its favor and against Defendants and respectfully requests the following relief:

A. A judgment in favor of Empire that Defendants infringe, either literally or under the doctrine of equivalents, the '120 and '331 Patents;

B. Damages for infringement of the '120 and '331 Patents in an amount to be determined at trial;

C. For other monetary relief, including costs, expenses, and pre- and post-judgment interest;

D. A determination that Defendants' infringement of the '120 and '331 Patents has been and is willful, and an award of enhanced damages, up to and including trebling of the damages awarded to Empire under 35 U.S.C. § 284;

E. A determination that this is an exceptional case under 35 U.S.C. § 285 and an award of attorneys' fees and costs to Empire;

F. An order awarding Empire any such other relief as the Court may deem just and proper under the circumstances.

JURY DEMAND

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, Empire hereby demands a jury trial as to all issues so triable.

Dated: September 18, 2023

Respectfully submitted,

/s/ Elizabeth L. DeRieux

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