IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

SOL IP, LLC, Plaintiff, v. QUALCOMM INC., and QUALCOMM TECHNOLOGIES, INC., Defendants.	)	C.A. No.: 6:21-cv-270 **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Sol IP, LLC ("Sol IP") files this Complaint for Patent Infringement under 35 U.S.C. § 271 against Defendants Qualcomm Inc. and Qualcomm Technologies, Inc. (collectively, "Qualcomm").

Plaintiff hereby state on information and belief as follows:

BACKGROUND

1. This lawsuit asserts causes of action for patent infringement arising under the patent laws of the United States, Title 35, United States Code, of Sol IP's patents referenced in Counts One through Twenty-Eight herein, including U.S. Patent No. 8,311,031 ("the '031 patent"), U.S. Patent No. 8,582,686 ("the '686 patent"); U.S. Patent No. 8,593,936 ("the '936 patent"), U.S. Patent No. 9,088,395 ("the '395 patent"), U.S. Patent No. 9,496,976 ("the '976 patent"), U.S. Patent No. 9,888,435 ("the '435 patent"), U.S. Patent No. 9,900,067 ("the '067 patent"), U.S. Patent No. 10,009,896 ("the '896 patent"), U.S. Patent No. 10,080,204 ("the '204 patent"), U.S. Patent No. 10,090,894 ("the '894 patent"), U.S. Patent No. 10,148,477 ("the '477 patent"), U.S. Patent No. 10,206,207 ("the '207 patent"), U.S. Patent No. 10,231,211 ("the '211 patent"), U.S.

Patent No. 10,244,559 ("the '559 patent"), U.S. Patent No. 10,271,349 ("the '349 patent"), U.S. Patent No. 10,383,041 ("the '041 patent"), U.S. Patent No. 10,405,277 ("the '277 patent"), U.S. Patent No. 10,462,776 ("the '776 patent"), U.S. Patent No. 10,601,474 ("the '474 patent"), U.S. Patent No. 10,687,351 ("the '351 patent"), U.S. Patent No. 10,749,722 ("the '722 patent"), U.S. Patent No. 10,841,056 ("the '056 patent"), U.S. Patent No. 10,863,439 ("the '439 patent"), U.S. Patent No. 10,893,525 ("the '525 patent"), U.S. Patent No. 10,931,337 ("the '337 patent"), U.S. Patent No. 10,932,298 ("the '298 patent"), U.S. Patent No. 10,938,534 ("the '534 patent"), and U.S. Patent No. RE48,101 ("the RE'101 patent") (collectively, "the Asserted Patents").

2. Sol IP holds an exclusive license to more than 600 patents and patent applications fundamental to a variety of core technologies relating to wireless telecommunications.

3. The Asserted Patents referenced in Counts One through Twenty-Eight herein were invented by researchers at the Electronics and Telecommunications Research Institute ("ETRI").

4. ETRI is a South Korean government-funded research institution based in Daejeon, South Korea. ETRI is the national leader in South Korea in the research and development of information technologies.

5. Since its inception in 1976, ETRI has developed new technologies in 4M DRAM (dynamic random access memory), LCDs (liquid crystal displays), large-scale computer storage, CDMA (code-division multiple access) communications, 3G CDMA2000, 3G WCDMA (wideband CDMA), 4G WiBro (wireless broadband), 4G LTE (Long-Term Evolution) cellular communications, 5G NR (New Radio) cellular communications, and WLAN (wireless local area networking, or Wi-Fi).

6. ETRI employs over 2,200 research and technical staff, of whom 91% hold post-graduate degrees and 49% have earned technological doctorate degrees. Over the last five years,

ETRI has applied for nearly 14,000 patents, contributed more than 5,300 proposals adopted by various international and domestic standards organizations, and published over 1,300 articles in peer-reviewed technology publications. ETRI actively contributed to the development of advanced telecommunications platforms including 3G CDMA2000, 3G WCDMA, LTE, and 5G NR. ETRI has invested heavily into inventing standardized telecommunications technologies, supporting its thousands of research engineers and spending around $600 million annually on research and development. As a result, ETRI has developed one of the industry's strongest intellectual-property portfolios, which includes more than 21,000 patents and patent applications worldwide.

7. ETRI has a long history of innovative technical contributions, including its patents relating to LTE, LTE-Advanced, 5G NR, and Wi-Fi technology. Some of ETRI's other accomplishments include: introducing the first domestic all-digital telephone exchange in 1986,[1] introducing the world's first commercial CDMA network in 1996,[2] introducing the CDMA2000 network in 1999,[3] introducing the world's first 4G WiBro network in 2004,[4] establishing core technology for the LTE system in 2007,[5] and introducing the world's first LTE-Advanced system in 2010.[6]

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[1] *First Domestic Switchboard TDX*, ETRI 40TH ANNIVERSARY, https://www.etri.re.kr/40th/eng/sub04_3.html (last visited Jan. 28, 2021).
[2] *World's First Commercialization of CDMA*, ETRI 40TH ANNIVERSARY, https://www.etri.re.kr/40th/eng/sub04_8.html (last visited Jan. 28, 2021).
[3] *Wideband CDMA Communication System*, ETRI 40TH ANNIVERSARY, https://www.etri.re.kr/40th/eng/sub04_11.html (last visited Jan. 28, 2021); *Overview*, ETRI, https://www.etri.re.kr/engcon/sub1/sub1_02.etri (last visited Jan. 28, 2021).
[4] *Mobile Internet System and Standard WiBro*, ETRI 40TH ANNIVERSARY, https://www.etri.re.kr/40th/eng/sub04_20.html (last visited Jan. 28, 2021).
[5] *LTE-Advanced Mobile Telecommunication System*, ETRI 40TH ANNIVERSARY, https://www.etri.re.kr/40th/eng/sub04_31.html (last visited Jan. 28, 2021); *Overview*, ETRI, https://www.etri.re.kr/engcon/sub1/sub1_02.etri (last visited Jan. 28, 2021).
[6] *Overview*, ETRI, https://www.etri.re.kr/engcon/sub1/sub1_02.etri (last visited Jan. 28, 2021).

8. Sol IP holds an exclusive license to the Asserted Patents from ETRI, which transferred to Sol IP all substantial rights in those patents.

9. Prior to filing this Complaint, Sol IP provided Qualcomm with notice of the Asserted Patents or, to the extent a patent had not yet issued at the time the notice was provided, the application number resulting in such patent or from which such patent was later derived, along with details of Qualcomm's infringement of such patent or application. For over five years, Sol IP attempted to engage in negotiations with Qualcomm to try to resolve this dispute.

10. Despite these efforts, Qualcomm has refused to license the Asserted Patents on mutually agreeable terms. Sol IP, therefore, brings this lawsuit against Qualcomm seeking this Court's protection of its valuable intellectual property rights.

PARTIES

11. Sol IP realleges and incorporates each of preceding paragraphs 1–10.

12. Sol IP is an intellectual-property licensing company organized and existing as a limited liability company under the laws of Virginia with a principal place of business at 8287 Spring Leaf Court, Vienna, Virginia 22182.

13. Qualcomm Inc. is a corporation organized and existing under the laws of the State of Delaware. Qualcomm Inc. may be served with process through its registered agent, Prentice Hall Corporation System, at 211 E. 7th Street, Suite 620, Austin, TX 78701.

14. Qualcomm Technologies, Inc. ("QTI") is a corporation organized and existing under the laws of the State of Delaware. QTI may be served with process through its registered agent, Corporation Service Company d/b/a CSC-Lawyers Incorporating Service Company, at 211 E. 7th Street, Suite 620, Austin, TX 78701.

15. QTI is a wholly owned subsidiary of Qualcomm Inc. and operates, along with its subsidiaries, substantially all of Qualcomm's engineering, research and development functions, and substantially all of its products and services businesses.[7]

16. Qualcomm Inc. and QTI together comprise one of the world's largest manufacturers of integrated circuits for the wireless industry. Qualcomm Inc. and QTI are part of the same corporate structure. Qualcomm's website states that "[r]eferences to 'Qualcomm' may mean Qualcomm Incorporated, or subsidiaries or business units within the Qualcomm corporate structure, as applicable."[8]

17. Qualcomm Inc. and QTI share the same management, common ownership, advertising platforms, facilities, distribution and sales channels, and accused product lines and products. Qualcomm Inc. and QTI operate as a unitary business venture and are jointly and severally liable for the acts of patent infringement alleged herein.

18. Qualcomm Inc. and QTI together are doing business, either directly or through their agents, on an ongoing basis in this district and elsewhere in the United States and have a regular and established place of business in this district.

JURISDICTION AND VENUE

19. Sol IP realleges and incorporates each of preceding paragraphs 1–18.

20. This patent infringement action arises under the United States Patent Laws, Title 35 U.S.C. §§ 1, et seq. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

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[7] Qualcomm Inc., 10-K – Annual Report, at 14 (Nov. 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

[8] Wireless Technology & Innovation, QUALCOMM, www.qualcomm.com (last visited Jan. 28, 2021).

21. This Court has personal jurisdiction over Qualcomm consistent with the requirements of the Due Process Clause of the United States Constitution and the Texas Long Arm Statute.

22. Qualcomm has established minimum contacts with Texas such that the exercise of personal jurisdiction over Qualcomm will not offend traditional notions of fair play and substantial justice.

23. Qualcomm has regularly and systematically transacted business in Texas, directly or through subsidiaries or intermediaries, and/or committed acts of patent infringement in Texas as alleged herein.

24. Qualcomm (i) has a regular and established place of business in the State of Texas and in this district; (ii) has purposefully availed itself of the rights and benefits of the laws of Texas and this district; (iii) has engaged in substantial business in Texas and this district, directly or through subsidiaries or intermediaries, both generally and with respect to the allegations in this Complaint, including committing one or more acts of patent infringement in Texas and this district; and (iv) has maintained continuous and systematic contacts in Texas and this district.

25. Qualcomm recruits for employment for its established place of business in this district to design and develop products that infringe the Asserted Patents.[9]

[9] *See, e.g.*, *Systems Engineering Internship* (Summer 2021), QUALCOMM, https://qualcomm.wd5.myworkdayjobs.com/en-US/External/job/San-Diego/Systems-Engineering-Internship--Summer-2021-_3001377 (last visited Jan. 28, 2021); *Embedded Software Engineering Internship (Summer 2021)*, QUALCOMM, https://qualcomm.wd5.myworkdayjobs.com/en-US/External/job/San-Diego/Embedded-Software-Engineering-Internship--Summer-2021-_3001371 (last visited Jan. 28, 2021).

26. Qualcomm partners with local companies in this district who offer, sell, and recommend Qualcomm products and/or incorporate one or more of the products identified in this Complaint into their own products that would later be purchased by others within this district.

27. Qualcomm has purposefully availed itself of the benefits of doing business in Texas and this district by designing, distributing, promoting, marketing, selling, offering for sale, and/or importing one or more of the products identified in this Complaint and deriving substantial revenue from such activities by placing those products into the stream of commerce with the expectation that they will be purchased by consumers within this district and/or that they would be incorporated into other products that would later be purchased by consumers within this district. Qualcomm has established distribution and sales channels in the United States, including in this district, for the products identified in this Complaint.

28. Venue is proper against Qualcomm under 28 U.S.C. §§ 1391 and 1400(b) because Qualcomm has committed acts of infringement in the Western District of Texas and has a regular and established place of business in this district.

29. Qualcomm has committed acts of infringement in this district by using, selling, offering for sale, and/or importing products that infringe the Asserted Patents identified in this Complaint into this district, or by inducing others to infringe and/or contributing to the infringement of the Asserted Patents in this district, including through its design, development, and testing of products that infringe the Asserted Patents in this district.[10]

[10] *See, e.g.*, *Systems Engineering Internship* (Summer 2021), QUALCOMM, https://qualcomm.wd5.myworkdayjobs.com/en-US/External/job/San-Diego/Systems-Engineering-Internship--Summer-2021-_3001377 (last visited Jan. 28, 2021); *Embedded Software Engineering Internship (Summer 2021)*, QUALCOMM, https://qualcomm.wd5.myworkdayjobs.com/en-US/External/job/San-Diego/Embedded-Software-Engineering-Internship--Summer-2021-_3001371 (last visited Jan. 28, 2021).

30. Qualcomm has a regular and established place of business in this district at 9600 N. Mopac Expressway, Suite 900, Stonebridge Plaza II, Austin, Texas, 78759, as stated on its website.[11] Qualcomm has either previously admitted or not challenged that venue is proper in this district and that it has a place of business in this district at its Austin office.[12] Qualcomm also has regular, physical presence at its Austin office and employs full-time personnel, including its Vice President of Technology and Vice President of Engineering,[13] who have regular, physical presence at its Austin office.

ACCUSED STANDARDS AND INSTRUMENTALITIES

31. Sol IP realleges and incorporates each of preceding paragraphs 1–30.

32. The 3rd Generation Partnership Project ("3GPP") is a consortium of seven telecommunications-standard-development organizations, also known as organizational partners, from around the world. These 3GPP organization partners include, among others, the Alliance for Telecommunications Industry Solutions ("ATIS"), which represents North America; the European

[11] Qualcomm's Texas Offices, QUALCOMM, https://www.qualcomm.com/company/facilities/offices?country=USA&region=TX (last visited Jan. 28, 2021).

[12] Defendants Qualcomm Incorporated's and Qualcomm Technologies, Inc.'s Answer, Affirmative Defenses, and Counterclaims to Plaintiff's Original Complaint for Patent Infringement at ¶ 44, *American Patents, LLC v. Mediatek Inc.*, 6:18-cv-00339-ADA (WD. Tex. filed Feb. 08, 2019), ECF No. 60; Qualcomm Incorporated's and Qualcomm Technologies, Inc.'s Answer and Affirmative Defenses to Plaintiff's Original Complaint for Patent Infringement at ¶ 54, *Liberty Patents, LLC v. Broadcom Inc.*, 6:20-cv-00970-ADA (WD Tex. filed Jan. 19, 2021), ECF No. 65.

[13] *See, e.g.*, *Qualcomm Employee Profile Search*, LINKEDIN, https://www.linkedin.com/company/qualcomm/people/?facetGeoRegion=us%3A64 (follow "Austin, Texas Area" hyperlink under "Where they live") (last visited Jan. 28, 2021); VP Technology at Qualcomm, https://www.linkedin.com/in/lucian-codrescu-1a0774a/ (last visited Jan. 28, 2021); VP Engineering at Qualcomm, https://www.linkedin.com/in/allanlester/ (last visited Jan. 28, 2021).

Telecommunications Standards Institute ("ETSI"), which represents Europe; and the Telecommunications Technology Association ("TTA"), which represents Korea.[14]

33. 3GPP maintains and develops globally applicable technical specifications for mobile systems, including the specifications for implementation and use of wireless communications for high-speed data referred to as the LTE standards.

34. Implementation and use of the LTE standards, including but not limited to wireless communications for high-speed data compliant with the LTE specifications as detailed in the 3GPP specification series TS 36.101–36.978, have increased in recent years and continue to increase at a rapid pace.

35. 3GPP uses a system of parallel "releases" to provide developers with a stable platform for the implementation of features at a given point, which then allows for the addition of new functionality in subsequent releases.[15] In 2008, 3GPP Release 8 was finalized and formed the basis for the deployment of the LTE standards.[16] Subsequent enhancements to the LTE standards were incorporated into later releases. Release 10 was the basis for the deployment of an advanced form of LTE called LTE-Advanced ("LTE-A"), which maintained backwards compatibility to the earlier releases.[17] The "main new functionalities" introduced in Release 10 are "Carrier Aggregation (CA)," "enhanced use of multi-antenna [MIMO] techniques," and "support for Relay

[14] *See, e.g.*, *About 3GPP Home*, 3GPP, https://www.3gpp.org/about-3gpp/about-3gpp (last visited Jan. 28, 2021); *Partners*, 3GPP, https://www.3gpp.org/about-3gpp/partners (last visited Jan. 28, 2021).
[15] *Releases*, 3GPP, https://www.3gpp.org/specifications/releases (last visited Jan. 28, 2021).
[16] *LTE*, 3GPP, https://www.3gpp.org/technologies/keywords-acronyms/98-lte (last visited Jan. 28, 2021); *see also Overview of LTE 3GPP releases*, CABLEFREE (Dec. 2015), https://www.cablefree.net/wirelesstechnology/4glte/overview-of-lte-3gpp-releases/.
[17] *LTE-Advanced*, 3GPP, https://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced (last visited Jan. 13, 2021).

Nodes (RN)."[18] Release 11 further provided enhancements to LTE Advanced features, including enhanced downlink control channel (ePDCCH), coordinated multipoint (CoMP) transmission and reception, and user equipment (UE) signaling for discontinuous reception (DRX) to optimize battery consumption.[19]

36. 3GPP also maintains and develops the industry standards for 5G, the fifth generation of broadband wireless technology. 3GPP's work on the first global set of 5G standards finalized in 2018 with the Release 15 specifications.[20]

37. Implementation and use of the new global wireless 5G standards, including but not limited to wireless communications for higher multi-Gbps data speeds compliant with the 5G specifications as detailed in the 3GPP specification series TS 38.101–38.921, have increased in recent years and continue to increase at a rapid pace.

38. These 3GPP technical specifications, including 3GPP Release 8, Release 10, Release 11, Release 15, and others, are officially transposed and published by the respective organizational partners, as a part of their standards series.[21] For North America, the 3GPP technical specifications for LTE and 5G are officially published by ATIS.[22] Accordingly, references to

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[18] *LTE-Advanced*, 3GPP, https://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced (last visited Jan. 13, 2021); *see also Overview of LTE 3GPP releases*, CABLEFREE (Dec. 2015), https://www.cablefree.net/wirelesstechnology/4glte/overview-of-lte-3gpp-releases/.

[19] Takehiro Nakamura, *LTE Release 12 and Beyond* 5-6 (3GPP TSG-RAN 2013) https://www.3gpp.org/IMG/pdf/lte_africa_2013_3gpp_lte_release_12.pdf; *see also Overview of LTE 3GPP releases*, CABLEFREE (Dec. 2015), https://www.cablefree.net/wirelesstechnology/4glte/overview-of-lte-3gpp-releases/.

[20] *Release 15*, 3GPP, https://www.3gpp.org/release-15 (last visited Jan. 28, 2021).

[21] *Official Publications*, 3GPP, https://www.3gpp.org/specifications/63-official-publications (last visited Jan. 28, 2021).

[22] *Official Publications*, 3GPP, https://www.3gpp.org/specifications/63-official-publications (last visited Jan. 28, 2021).

3GPP TS ("technical specifications") in this Complaint should be understood to include the corresponding ATIS documents.

39. The Institute of Electrical and Electronics Engineers ("IEEE") is a technical professional organization that develops "industry standards in a broad range of technologies," including the IEEE 802.11 family of standards for wireless local area networks, also branded as Wi-Fi.[23] The IEEE has issued numerous releases of the IEEE 802.11 standard, including the original IEEE 802.11 in 1997, IEEE 802.11a and 802.11b in 1999, IEEE 802.11g in 2003, IEEE 802.11n in 2009, IEEE 802.11ac in 2013, and IEEE 802.11ax (the initial draft being released in 2016). Devices that support the 802.11ac standard are also known as Wi-Fi 5 devices, and devices that supports the 802.11ax standard are known as Wi-Fi 6 devices.[24]

40. Qualcomm states that it is a "global leader in the development and commercialization of foundational technologies for the wireless industry," including cellular wireless technologies, such as LTE and 5G, and non-cellular wireless technologies, such as Wi-Fi.[25]

41. Qualcomm designs, develops, uses, sells, offers for sale, and/or imports integrated circuits and system software having LTE, 5G, and Wi-Fi capabilities "for use in mobile devices, wireless networks, broadband gateway equipment, consumer electronic devices, [and] other devices used in IoT [(Internet of things)] and automotive systems for telematics and

[23] *IEEE Standards*, IEEE, https://www.ieee.org/standards/index.html (last visited Jan. 28, 2021); *accord About IEEE P802.11 and How to Participate*, IEEE 802 LAN/MAN STANDARDS COMMITTEE, https://www.ieee802.org/11/abt80211.html (last visited Jan. 28, 2021); *Discover Wi-Fi*, WI-FI ALLIANCE, https://www.wi-fi.org/discover-wi-fi (last visited Jan. 28, 2021).
[24] *Discover Wi-Fi*, WI-FI ALLIANCE, https://www.wi-fi.org/discover-wi-fi (last visited Jan. 28, 2021).
[25] Qualcomm Inc., 10-K – Annual Report, at 5 (Nov. 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

infotainment"[26] in the United States. For example, Qualcomm sells its integrated circuits and system software for LTE and 5G technologies to downstream companies "who offer, sell, and recommend Qualcomm products"[27] and/or manufacturers that use and incorporate Qualcomm products to provide cellular connectivity in a broad range of devices, "from low-tier, entry-level devices primarily for emerging regions to premium-tier devices, including mobile devices (primarily smartphones), tablets, laptops, data modules, handheld wireless computers and gaming devices, other consumer electronics, other IoT devices and applications, automotive systems for telematics and infotainment, access points and routers, broadband gateway equipment, data cards and infrastructure equipment and sensor hubs."[28] Qualcomm also sells its integrated circuits and system software for Wi-Fi technologies to downstream companies "who offer, sell, and recommend Qualcomm products"[29] and/or manufacturers that use and incorporate Qualcomm products to provide Wi-Fi connectivity for devices such as "mobile devices, tablets, laptops, other consumer electronics, other IoT applications and automotive telematics and infotainment systems."[30]

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[26] *See* Qualcomm Inc., *10-K – Annual Report* 6 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

[27] *Qualcomm Advantage Network: Member Directory*, QUALCOMM, https://www.qualcomm.com/support/qan/member-directory?facetRegions=United+States (last visited Jan. 28, 2021).

[28] Qualcomm Inc., 10-K – Annual Report, at 10 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

[29] *Qualcomm Advantage Network: Member Directory*, QUALCOMM, https://www.qualcomm.com/support/qan/member-directory?facetRegions=United+States (last visited Jan. 28, 2021).

[30] Qualcomm Inc., 10-K – Annual Report, at 11 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

42. Qualcomm's integrated circuit products include the "Qualcomm® Snapdragon™ family of highly-integrated, system-based solutions [which] include the Snapdragon mobile, compute, and automotive platforms. Each platform consists of application processors and wireless connectivity capabilities, including [Qualcomm's] cellular modem that provides core baseband modem functionality for voice and data communications, noncellular wireless connectivity (such as Wi-Fi and Bluetooth) and global positioning functions."[31] Qualcomm's LTE and 5G "cellular modems" and Wi-Fi "wireless connectivity integrated circuits" may be sold as part of the "highly integrated core system-on-chip (SoC)" or "sold as individual components."[32]

43. Each of Qualcomm's Snapdragon platforms includes at least one cellular modem that supports LTE features in accordance with at least 3GPP Release 8 and/or 5G features in accordance with at least 3GPP Release 15.[33] For example, the Snapdragon 888 5G Mobile Platform includes a Snapdragon X60 5G Modem-RF System, which supports LTE and 5G NR.[34]

44. Each of Qualcomm's cellular modems includes at least one internal or external memory. For example, the Snapdragon X60 5G Modem-RF System[35] includes at least one internal or external memory:

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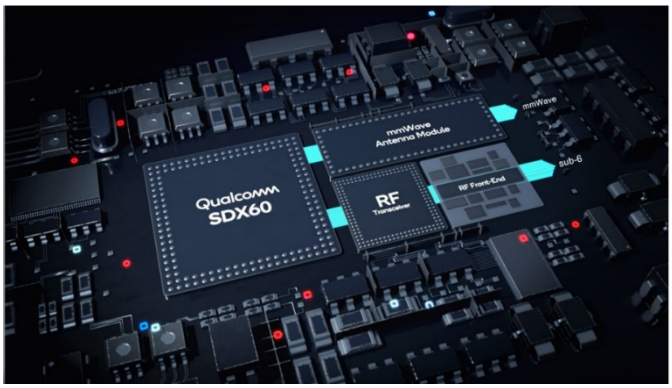
[31] Qualcomm Inc., 10-K – Annual Report, at 10 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

[32] Qualcomm Inc., 10-K – Annual Report, at 10-11 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

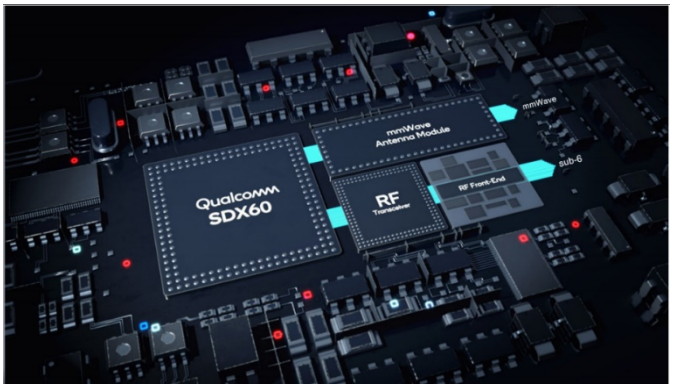
[33] Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[34] Qualcomm Technologies, Inc., Qualcomm® Snapdragon™ 888 5G Mobile Platform Product Brief (2020), https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-888-mobile-platform-product-brief.pdf.

[35] Qualcomm Technologies, Inc., Qualcomm® Snapdragon™ X60 5G Modem-RF System (2020), https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-x60-5g-modem-rf-system-product-brief.pdf.

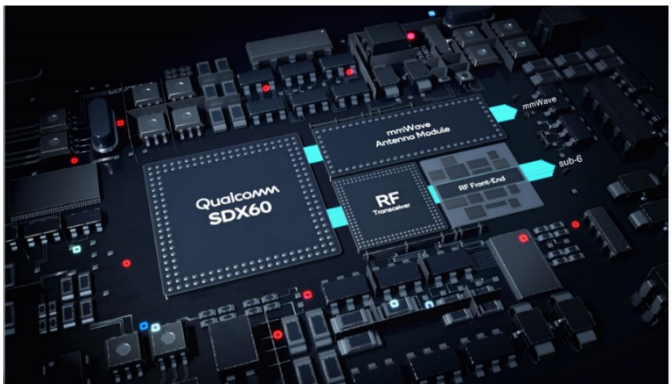


45. Each of Qualcomm's cellular modems includes at least one processor. For example, the Snapdragon X60 5G Modem-RF System[36] includes at least one processor:



46. Each of Qualcomm's cellular modems includes a circuitry. For example, the Snapdragon X60 5G Modem-RF System[37] includes at least one circuitry:

[36] Qualcomm Technologies, Inc., Qualcomm® Snapdragon™ X60 5G Modem-RF System (2020), https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-x60-5g-modem-rf-system-product-brief.pdf.
[37] Qualcomm Technologies, Inc., Qualcomm® Snapdragon™ X60 5G Modem-RF System (2020), https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-x60-5g-modem-rf-system-product-brief.pdf.

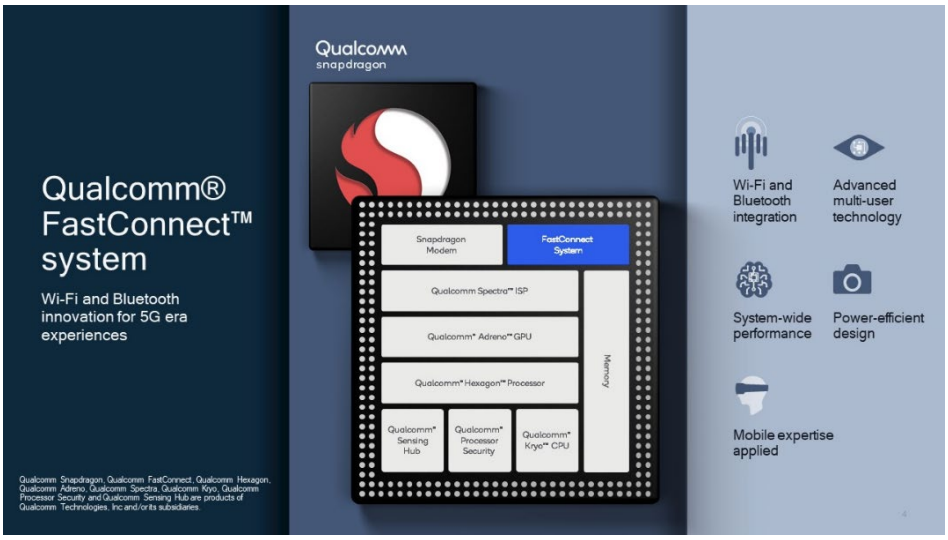


47. Each of Qualcomm's Snapdragon platforms includes at least one Wi-Fi subsystem that supports Wi-Fi 5 features in accordance with at least the IEEE 802.11ac standard and/or Wi-Fi 6 features in accordance with at least the IEEE 802.11ax standard. For example, the Snapdragon 888 5G Mobile Platform includes a FastConnect 6900 System, which supports Wi-Fi 6 (802.11ax) and Wi-Fi 5 (802.11ac).[38]

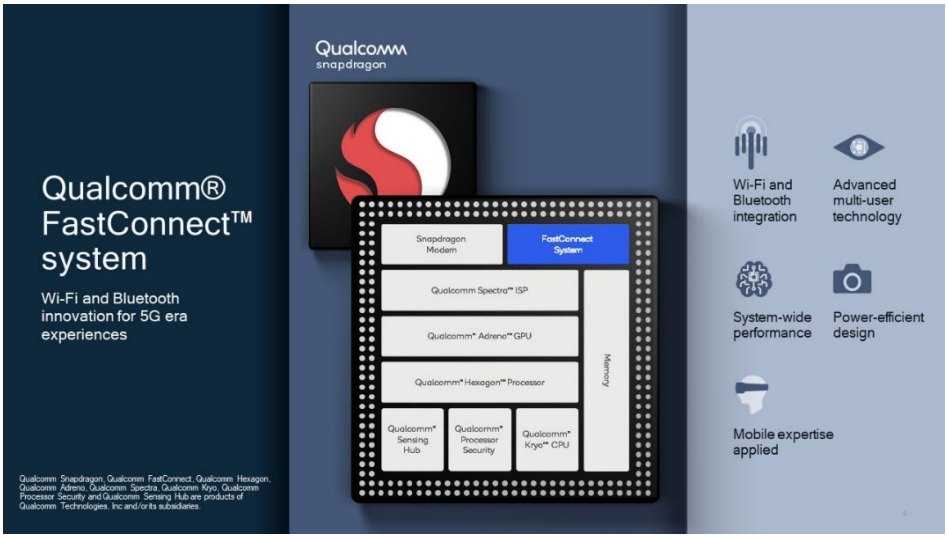
48. Each of Qualcomm's Wi-Fi subsystems includes at least one internal or external memory. For example, the Qualcomm FastConnect system[39] includes at least one internal or external memory:

[38] Qualcomm Technologies, Inc., Qualcomm® Snapdragon™ 888 5G Mobile Platform Product Brief (2020), https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-888-mobile-platform-product-brief.pdf.

[39] Qualcomm® FastConnect™ System, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-fastconnect-system-on-the-snapdragon-platform.jpg.



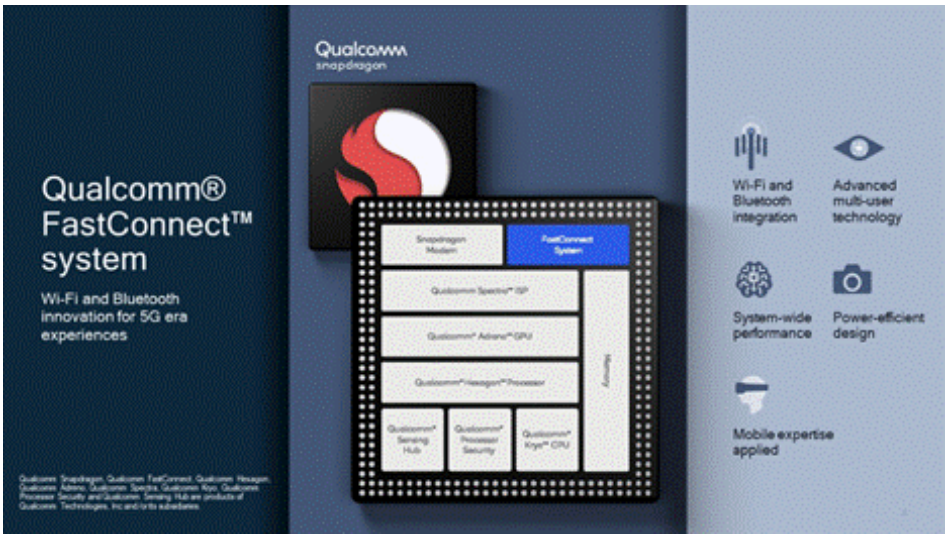
49. Each of Qualcomm's Wi-Fi subsystems includes at least one processor. For example, the Qualcomm FastConnect system[40] includes at least one processor:



50. Each of Qualcomm's Wi-Fi subsystems includes a circuitry. For example, the Qualcomm FastConnect system[41] includes at least one circuitry:

[40] Qualcomm® FastConnect™ System, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-fastconnect-system-on-the-snapdragon-platform.jpg.

[41] Qualcomm® FastConnect™ System, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-fastconnect-system-on-the-snapdragon-platform.jpg.



51. "Accused LTE Devices" refer to Qualcomm's integrated circuits and system software[42] that support LTE features in accordance with at least 3GPP Release 8, excluding any devices subject to a license, covenant not to sue, or standstill for the applicable Asserted Patents. An exemplary list of the Accused LTE Devices is included in Exhibit A.

52. "Accused 5G Devices" refer to Qualcomm's integrated circuits and system software[43] that support 5G features in accordance with at least 3GPP Release 15, excluding any devices subject to a license, covenant not to sue, or standstill for the applicable Asserted Patents. An exemplary list of the Accused 5G Devices is included in Exhibit A.

53. "Accused AC Devices" refer to Qualcomm's integrated circuits and system software[44] that support Wi-Fi 5 features in accordance with at least the IEEE 802.11ac standard,

[42] Qualcomm Inc., 10-K – Annual Report, at 10 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.
[43] Qualcomm Inc., 10-K – Annual Report, at 10 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.
[44] Qualcomm Inc., 10-K – Annual Report, at 11 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

excluding any devices subject to a license, covenant not to sue, or standstill for the applicable Asserted Patents. An exemplary list of the Accused AC Devices is included in Exhibit A.

54. "Accused AX Devices" refer to Qualcomm's integrated circuits and system software[45] that support Wi-Fi 6 features in accordance with at least the IEEE 802.11ax standard, excluding any devices subject to a license, covenant not to sue, or standstill for the applicable Asserted Patents. An exemplary list of the Accused AX Devices is included in Exhibit A.

55. The Accused LTE Devices and Accused 5G Devices provide cellular connectivity for at least "mobile devices (primarily smartphones), tablets, laptops, data modules, handheld wireless computers and gaming devices, other consumer electronics, other IoT devices and applications, automotive systems for telematics and infotainment, access points and routers, broadband gateway equipment, data cards and infrastructure equipment and sensor hubs."[46]

56. The Accused AC Devices and Accused AX Devices provide Wi-Fi connectivity for at least "mobile devices, tablets, laptops, other consumer electronics, other IoT applications and automotive telematics and infotainment systems."[47]

NOTICE OF THE ASSERTED PATENTS

57. Sol IP realleges and incorporates each of preceding paragraphs 1–56.

[45] Qualcomm Inc., 10-K – Annual Report, at 11 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

[46] Qualcomm Inc., 10-K – Annual Report, at 10 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

[47] Qualcomm Inc., 10-K – Annual Report, at 11 (November 4, 2020), https://investor.qualcomm.com/sec-filings/annual-reports/content/0001728949-20-000067/0001728949-20-000067.pdf.

58. Qualcomm has been on notice of the Asserted Patents, has been invited to take a license to the Asserted Patents, and has declined to license the Asserted Patents on commercially reasonable terms.

59. As early as November 17, 2017, Sol IP sent two letters (the "2017 LTE Notice Letter" and "2017 Wi-Fi Notice Letter"; collectively, the "2017 Notice Letters") to Qualcomm regarding licensing of Sol IP's patent portfolio. The 2017 Notice Letters provided corresponding lists of ETRI LTE Patents and ETRI Wi-Fi Patents.

60. The 2017 LTE Notice Letter stated: "We believe that your company is infringing the ETRI LTE Patents by making, using, offering for sale, selling, or importing LTE and/or LTE-Advanced products, commonly marketed as products with 4G/LTE connectivity. We believe that all LTE and/or LTE Advanced products made, used, offered for sale, sold, or imported by your company use one or more claimed inventions of each of ETRI LTE Patents and thus infringe the ETRI LTE Patents." An attachment to the 2017 LTE Notice Letter lists, among others, the patents referenced in this Complaint by patent number or, to the extent a patent had not yet issued when the 2017 LTE Notice Letter was prepared, the application number resulting in such patent or from which such patent was later derived. The 2017 LTE Notice Letter further states that Sol IP "hereby offer a license under the ETRI LTE Patents on fair, reasonable, and non-discriminatory terms, and are willing to negotiate the details with your company."

61. The 2017 Wi-Fi Notice Letter stated: "We believe that all Wi-Fi-compliant Products made, used, offered for sale, sold, or imported by your company use one or more claimed inventions of each of ETRI Wi-Fi Patents and thus infringe the ETRI Wi-Fi Patents." An attachment to the 2017 Wi-Fi Notice Letter lists, among others, the patents referenced in this Complaint by patent number or, to the extent a patent had not yet issued when the 2017 Wi-Fi

Notice Letter was prepared, the application number resulting in such patent or from which such patent was later derived. The 2017 Wi-Fi Notice Letter further states that Sol IP "offer a license under the ETRI Wi-Fi Patents on fair, reasonable, and non-discriminatory terms, and are willing to negotiate the details with your company."

62. Sol IP subsequently sent a letter to Qualcomm on August 1, 2020 (the "2020 Notice Letter") to follow up with Qualcomm. The 2020 Notice Letter states that Sol IP "would like to resume our discussion with your company on our previous offer to license under the ETRI LTE Patents and the ETRI WiFi Patents." The 2020 Notice Letter includes lists of ETRI LTE Patents and ETRI Wi-Fi Patents, which identify, among others, the patents referenced in this Complaint by patent number or, to the extent a patent had not yet issued when the list was prepared, the application number resulting in such patent or from which such patent was later derived.

63. On August 13, 2020, Sol IP sent a letter to Qualcomm (the "2020 5G Notice Letter").

64. The 2020 5G Notice Letter states: "We believe that all 5G-compliant products made, used, offered for sale, sold, or imported by your company, Qualcomm Inc., and its direct and/or indirect subsidiaries, . . . infringe at least one or more of claims of the exemplary ETRI 5G Patents" identified in the letter's attachment. The attachment to the 2020 5G Notice Letter lists, among others, the patents referenced in this Complaint by patent number or, to the extent a patent had not yet issued when the list was prepared, the application number resulting in such patent or from which such patent was later derived. The 2020 5G Notice Letter further states that Sol IP "hereby offer a license under the ETRI 5G Patents on fair, reasonable, and non-discriminatory terms, and are willing to negotiate the details with your company."

65. To date, Qualcomm has not agreed to license the ETRI LTE, Wi-Fi, and 5G Patents on fair, reasonable, and non-discriminatory terms.

66. As a member of TTA, ETRI declared that the intellectual property rights reflected in the Asserted Patents or their applications or patent families may be or may become standard-essential.

67. Qualcomm is a 3GPP member organization or is affiliated with a 3GPP member organization. Through its membership in 3GPP, Qualcomm received notice of the Asserted Patents when ETRI declared each patent or its application or patent family to organizational partners of 3GPP.

68. Sol IP and its predecessors in interest to the Asserted Patents complied with any requirements of 35 U.S.C. § 287, such that Sol IP may recover pre-notice damages.

COUNT ONE
INFRINGEMENT OF U.S. PATENT NO. 10,206,207

69. Sol IP realleges and incorporates each of preceding paragraphs 1–68.

70. On February 12, 2019, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,206,207 ("the '207 patent"), titled "Error Control Method, Medium Access Control (MAC) Frame Designing Method, and Terminal Registration Method in Wireless Communication System, and Recording Medium." A true and correct copy of the '207 patent is attached as Exhibit 1.

71. Sol IP is the exclusive licensee of the '207 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

72. The '207 patent is valid and enforceable.

73. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '207 patent, including at least claim 7, by using, selling, offering

for sale, and/or importing into the United States the Accused LTE Devices and Accused 5G Devices that practice the subject matter claimed in the '207 patent without authority, either literally and/or under the doctrine of equivalents.

74. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 7 of the '207 patent.

75. The preamble of claim 7 of the '207 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused LTE Device is a communication apparatus.

76. Claim 7 of the '207 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

77. Claim 7 of the '207 patent recites "a processor operably coupled to the memory." Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 8. *See supra* para. 45.

78. Claim 7 of the '207 patent recites that the processor is configured to "cause the apparatus to receive a first signal in a subframe from a transmitter, the first signal comprising first information and second information." As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 6.7, 6.8, and 6.8.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive a physical downlink control channel (PDCCH) in a subframe from a base station. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.7, 6.8, 6.8.1. As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 8, TS 36.212 Section 5.3.3.1.2, the PDCCH includes information about resource block

assignment and information about modulation and coding scheme. *See, e.g.*, 3GPP TS 36.212 V8.8.0 § 5.3.3.1.2.

79. Claim 7 of the '207 patent recites that the processor is configured to "determine that an identifier is used to generate the first signal." As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 7.1, each Accused LTE Device includes one or more processors configured to determine that a cell radio network temporary identifier (C-RNTI) is used to generate the PDCCH. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 7.1.

80. Claim 7 of the '207 patent recites that the processor is configured to, "after determining that the identifier is used to generate the first signal, cause the apparatus to obtain data in the subframe at least based on the first information and the second information, wherein the first information indicates radio resources in the subframe allocated to the data, and the second information indicates a number of bits allocated to the radio resources." As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 7.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to obtain data on a physical downlink shared channel (PDSCH) in the subframe at least based on the information about resource block assignment and the information about modulation and coding scheme (e.g., modulation and coding scheme (MCS) index). *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 7.1. As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 7.1.6.1, the information about resource block assignment indicates physical resource blocks allocated to the data. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 7.1.6.1. As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 8, TS 36.213 Sections 7.1.7-7.1.7.2.1, the information about modulation and coding scheme indicates the transport block size allocated to the physical resource blocks. *See, e.g.*, 3GPP TS 36.213 V8.8.0 §§ 7.1.7-7.1.7.2.1.

81. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused 5G Devices, which are configured to implement at least the features of 3GPP Release 15, thereby infringing at least claim 7 of the '207 patent.

82. The preamble of claim 7 of the '207 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused 5G Device is a communication apparatus.

83. Claim 7 of the '207 patent recites "a memory." Each Accused 5G Device includes one or more memories. *See supra* para. 44.

84. Claim 7 of the '207 patent recites "a processor operably coupled to the memory." Each Accused 5G Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 15. *See supra* para. 45.

85. Claim 7 of the '207 patent recites that the processor is configured to "cause the apparatus to receive a first signal in a subframe from a transmitter, the first signal comprising first information and second information." As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 15, TS 38.212 Sections 7.3.1.2.1 and 7.3.1.2.2 and TS 38.211 Section 4.3, each Accused 5G Device includes one or more processors configured to cause the apparatus to receive a downlink control information (DCI) for scheduling of PDSCH in a subframe from a base station. *See, e.g.*, 3GPP TS 38.212 V15.4.0 §§ 7.3.1.2.1, 7.3.1.2.2; 3GPP TS 38.211 V15.4.0 § 4.3. As recited in claim 7 of the '207 patent and in accordance with at least 3GPP Release 15, TS 38.212 Sections 7.3.1.2.1 and 7.3.1.2.2, DCI format 1_0 or 1_1 each includes information about time and frequency domain resource assignments and information about modulation and coding scheme. *See, e.g.*, 3GPP TS 38.212 V15.4.0 §§ 7.3.1.2.1, 7.3.1.2.2.

86. Claim 7 of the ’207 patent recites that the processor is configured to “determine that an identifier is used to generate the first signal.” As recited in claim 7 of the ’207 patent and in accordance with at least 3GPP Release 15, TS 38.212 Sections 7.3.1.2.1 and 7.3.1.2.2, each Accused 5G Device includes one or more processors configured to determine that a C-RNTI is used for generating DCI format 1_0 or DCI format 1_1. *See, e.g.*, 3GPP TS 38.212 V15.4.0 §§ 7.3.1.2.1, 7.3.1.2.2.

87. Claim 7 of the ’207 patent recites that the processor is configured to, “after determining that the identifier is used to generate the first signal, cause the apparatus to obtain data in the subframe at least based on the first information and the second information, wherein the first information indicates radio resources in the subframe allocated to the data, and the second information indicates a number of bits allocated to the radio resources.” As recited in claim 7 of the ’207 patent and in accordance with at least 3GPP Release 15, 3GPP TS 38.214 Section 5.1, each Accused 5G Device includes one or more processors configured to cause the apparatus to obtain data on the PDSCH in the downlink subframe as indicated by the DCI, which includes information about time and frequency domain resource assignments and information about modulation and coding scheme. *See, e.g.*, 3GPP TS 38.214 V15.4.0 § 5.1. As recited in claim 7 of the ’207 patent and in accordance with at least 3GPP Release 15, TS 38.331 Section 6.3.2, the time and frequency domain resource assignments indicate radio resources in the subframe allocated to the data. *See, e.g.*, 3GPP TS 38.331 V15.4.0 § 6.3.2 (PDSCH-TimeDomainResourceAllocationList). As recited in claim 7 of the ’207 patent and in accordance with at least 3GPP Release 15, TS 38.214 Sections 5.1.3 and 5.1.3.2, the number of information bits allocated to the radio resources is obtained using the information about modulation and coding

scheme (e.g., I_{MCS}) in the DCI to determine the modulation order (Q_m), target code rate (R), and other parameters (i.e., *NRE*, *v*). *See, e.g.*, 3GPP TS 38.214 V15.4.0 §§ 5.1.3, 5.1.3.2.

88. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the '207 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '207 patent.

89. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 7 of the '207 patent.

90. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 7 of the '207 patent.

91. Qualcomm advertises, markets, and sells the Accused LTE Devices and Accused 5G Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices and Accused 5G Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '207 patent.

92. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices and Accused 5G Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[48] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[49]

93. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices and Accused 5G Devices.[50] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[51] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

94. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices in the United States.[52]

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[48] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[49] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[50] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[51] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[52] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

95. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the ’207 patent and how those steps induce infringement of the ’207 patent.

96. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the ’207 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices by others in an infringing manner, knowing that its Accused LTE Devices and Accused 5G Devices are especially made or adapted for use in infringement of the ’207 patent.

97. The Accused LTE Devices and Accused 5G Devices are configured to implement specific, intended features of 3GPP Release 8 and 3GPP Release 15, respectively. The Accused LTE Devices and Accused 5G Devices implementing such specific, intended features are a material part of the inventions of the ’207 patent and are not staple articles of commerce.

98. As shown in paragraphs 74–80, each of the Accused LTE Devices is configured to implement the functionalities for processing a PDCCH in a subframe as recited in claim 7 of the ’207 patent and is not suitable for substantial non-infringing uses.

99. As shown in paragraphs 81–87, each of the Accused 5G Devices is configured to implement the functionalities for processing a DCI as recited in claim 7 of the ’207 patent and is not suitable for substantial non-infringing uses.

100. Qualcomm has been on notice of the patent application number resulting in the ’207 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the ’207 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE

Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm's knowledge of the '207 patent, knowledge of infringement of the '207 patent, intent to encourage others to infringe the '207 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '207 patent by others in the United States.

101. Qualcomm has also been on notice since at least as early as August 13, 2020, when it received the 2020 5G Notice Letter, "that all 5G-compliant products made, used, offered for sale, sold, or imported by [Qualcomm] . . . infringe at least one or more of claims of the exemplary ETRI 5G Patents," including the '207 patent. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused 5G Devices after receiving the 2020 5G Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '207 patent, knowledge of infringement of the '207 patent, intent to encourage others to infringe the '207 patent through use of the Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '207 patent by others in the United States.

102. Qualcomm has known of the '207 patent and/or its application even before it received the 2017 LTE Notice Letter, 2020 Notice Letter, 2020 5G Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '207 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices or Accused 5G Devices, have been with Qualcomm's knowledge of the '207 patent, knowledge of infringement of the '207 patent, intent to encourage

others to infringe the ’207 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’207 patent by others in the United States.

103. Qualcomm’s infringement of the ’207 patent has been and continues to be deliberate and with willful disregard of the ’207 patent.

COUNT TWO
INFRINGEMENT OF U.S. PATENT NO. 10,231,211

104. Sol IP realleges and incorporates each of preceding paragraphs 1–103.

105. On March 12, 2019, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,231,211 (“the ’211 patent”), titled “Method for Paging Information in Cellular System.” A true and correct copy of the ’211 patent is attached as Exhibit 2.

106. Sol IP is the exclusive licensee of the ’211 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

107. The ’211 patent is valid and enforceable.

108. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’211 patent, including at least claim 29, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices and Accused 5G Devices that practice the subject matter claimed in the ’211 patent without authority, either literally and/or under the doctrine of equivalents.

109. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 29 of the ’211 patent.

110. The preamble of claim 29 of the ’211 patent recites “[a] communication apparatus.” To the extent the preamble limits the claim, each Accused LTE Device is a communication apparatus.

111. Claim 29 of the ’211 patent recites “a memory.” Each Accused LTE Device includes one or more memories. *See supra* para. 44.

112. Claim 29 of the ’211 patent recites “at least one processor coupled to the memory.” Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 8. *See supra* para. 45.

113. Claim 29 of the ’211 patent recites that the processor is configured to “cause the apparatus to receive first information through a control channel in a subframe, wherein the subframe comprises the control channel and a shared channel and at least a portion of the first information indicates physical layer radio resources.” As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 7.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive a processed downlink control information (DCI) through a physical downlink control channel (PDCCH). *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 7.1. As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 8, TS 36.300 Section 5, a subframe of a physical layer downlink comprises a PDCCH and a physical downlink shared channel (PDSCH). *See, e.g.*, 3GPP TS 36.300 V8.12.0 § 5. As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 8, TS 36.212 Sections 5.3.3, 5.3.3.1, and 5.3.3.2, and TS 36.321 Section 5.5, at least a portion of the fields within the processed DCI indicates PDSCH resources for paging messages. *See, e.g.*, 3GPP TS 36.321 V8.10.0 § 5.5, 3GPP TS 36.212 V8.8.0 §§ 5.3.3, 5.3.3.1, 5.3.3.2.

114. Claim 29 of the ’211 patent recites that the processor is configured to “determine that an identifier is used in the first signal, wherein the identifier indicates that paging information is transmitted through the shared channel in the subframe.” As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 8, TS 36.321 Section 7.1, each Accused LTE Device includes one or more processors configured to determine that a paging radio network temporary identifier (P-RNTI) is used in the processed DCI, wherein the P-RNTI indicates that the paging message is transmitted through PDSCH. *See, e.g.*, 3GPP TS 36.321 V8.10.0 § 7.1.

115. Claim 29 of the ’211 patent recites that the processor is configured to “cause the apparatus to obtain, without determining whether or not the paging information is intended for the apparatus, the paging information transmitted through the shared channel in the subframe in response to the identifier being used in the first information, wherein the paging information is obtained based on the physical layer radio resources indicated by the portion of the first information.” As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 7.1 and TS 36.321 Section 7.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to obtain, without determining whether or not the paging message is intended for the apparatus, paging message on the PDSCH in response to the P-RNTI being used in the processed DCI. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 7.1; 3GPP TS 36.321 V8.10.0 § 7.1; *see also* 3GPP TS 36.331 V8.16.0 § 6.2.2 (The paging message is used for the notification of one or more UEs.). As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 7.1 and TS 36.212 Section 5.3.3.1.3, the paging message is obtained based on the PDSCH resources for paging messages indicated within the processed DCI with cyclic redundancy check (CRC) scrambled by the P-RNTI. *See, e.g.*, 3GPP TS 36.212 V8.8.0 § 5.3.3.1.3; 3GPP TS 36.213 V8.8.0 § 7.1.

116. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused 5G Devices, which are configured to implement at least the features of 3GPP Release 15, thereby infringing at least claim 29 of the ’211 patent.

117. The preamble of claim 29 of the ’211 patent recites “[a] communication apparatus.” To the extent the preamble limits the claim, each Accused 5G Device is a communication apparatus.

118. Claim 29 of the ’211 patent recites “a memory.” Each Accused 5G Device includes one or more memories. *See supra* para. 44.

119. Claim 29 of the ’211 patent recites “at least one processor coupled to the memory.” Each Accused 5G Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 15. *See supra* para. 45.

120. Claim 29 of the ’211 patent recites that the processor is configured to “cause the apparatus to receive first information through a control channel in a subframe, wherein the subframe comprises the control channel and a shared channel and at least a portion of the first information indicates physical layer radio resources.” As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 15, TS 38.212 Section 7.3.1.2.1, each Accused 5G Device includes one or more processors configured to cause the apparatus to receive a control information (DCI format 1_0 with CRC scrambled by P-RNTI) through a PDCCH in a subframe, wherein at least a portion of the DCI format 1_0 indicates frequency and time domain resource assignments. *See, e.g.*, 3GPP TS 38.212 V15.4.0 § 7.3.1.2.1. As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 15, TS 38.214 Section 5.1.2.1.1, a subframe comprises a PDCCH and a PDSCH. *See, e.g.*, 3GPP TS 38.214 V15.4.0 § 5.1.2.1.1.

121. Claim 29 of the ’211 patent recites that the processor is configured to “determine that an identifier is used in the first signal, wherein the identifier indicates that paging information is transmitted through the shared channel in the subframe.” As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 15, TS 38.212 Section 7.3.1.2.1, each Accused 5G Device includes one or more processors configured to determine that the P-RNTI is used for the DCI format 1_0. *See, e.g.*, 3GPP TS 38.212 V15.4.0 § 7.3.1.2.1. As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 15, TS 38.212 Section 7.3.1.2.1, the CRC of the DCI format 1_0 is descrambled using the P-RNTI, and the frequency and time domain resource assignments included in the DCI format 1_0 indicate the PDSCH resources in which the paging information is transmitted. *See, e.g.*, 3GPP TS 38.212 V15.4.0 § 7.3.1.2.1.

122. Claim 29 of the ’211 patent recites that the processor is configured to “cause the apparatus to obtain, without determining whether or not the paging information is intended for the apparatus, the paging information transmitted through the shared channel in the subframe in response to the identifier being used in the first information, wherein the paging information is obtained based on the physical layer radio resources indicated by the portion of the first information.” As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.5 and TS 38.331 Section 6.2.2 (Paging), each Accused 5G Device includes one or more processors configured to cause the apparatus to obtain a paging channel (PCH) (i.e., paging message) without determining whether the PCH is intended for the apparatus. *See, e.g.*, 3GPP TS 38.321 V15.4.0 § 5.5; 3GPP TS 38.331 V15.4.0 Section 6.2.2 (Paging). As recited in claim 29 of the ’211 patent and in accordance with at least 3GPP Release 15, TS 38.212 Section 7.3.1.2.1. and TS 38.214 Section 5.1.2.1.1, the PCH (i.e., paging message) is received on

frequency and time resources indicated by the DCI format 1_0. *See, e.g.*, 3GPP TS 38.212 V15.4.0 § 7.3.1.2.1; 3GPP TS 38.214 V15.4.0 § 5.1.2.1.1.

123. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 29 of the '211 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '211 patent.

124. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 29 of the '211 patent.

125. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 29 of the '211 patent.

126. Qualcomm advertises, markets, and sells the Accused LTE Devices and Accused 5G Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices and Accused 5G Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '211 patent.

127. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices and Accused 5G Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[53] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[54]

128. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices and Accused 5G Devices.[55] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[56] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

129. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices in the United States.[57]

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[53] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[54] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[55] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[56] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[57] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

130. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the ’211 patent and how those steps induce infringement of the ’211 patent.

131. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 29 of the ’211 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices by others in an infringing manner, knowing that its Accused LTE Devices and Accused 5G Devices are especially made or adapted for use in infringement of the ’211 patent.

132. The Accused LTE Devices and Accused 5G Devices are configured to implement specific, intended features of 3GPP Release 8 and 3GPP Release 15, respectively. The Accused LTE Devices and Accused 5G Devices implementing such specific, intended features are a material part of the inventions of the ’211 patent and are not staple articles of commerce.

133. As shown in paragraphs 109–115, each of the Accused LTE Devices is configured to implement the functionalities for processing a processed DCI as recited in claim 29 of the ’211 patent and is not suitable for substantial non-infringing uses.

134. As shown in paragraphs 116–122, each of the Accused 5G Devices is configured to implement the functionalities for processing a DCI format 1_0 as recited in claim 29 of the ’211 patent and is not suitable for substantial non-infringing uses.

135. Qualcomm has been on notice of the patent application number resulting in the ’211 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the ’211 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE

Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm's knowledge of the '211 patent, knowledge of infringement of the '211 patent, intent to encourage others to infringe the '211 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '211 patent by others in the United States.

136. Qualcomm has also been on notice since at least as early as August 13, 2020, when it received the 2020 5G Notice Letter, "that all 5G-compliant products made, used, offered for sale, sold, or imported by [Qualcomm] . . . infringe at least one or more of claims of the exemplary ETRI 5G Patents," including the '211 patent. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused 5G Devices after receiving the 2020 5G Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '211 patent, knowledge of infringement of the '211 patent, intent to encourage others to infringe the '211 patent through use of the Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '211 patent by others in the United States.

137. Qualcomm has known of the '211 patent and/or its application even before it received the 2017 LTE Notice Letter, 2020 Notice Letter, 2020 5G Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '211 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices or Accused 5G Devices, have been with Qualcomm's knowledge of the '211 patent, knowledge of infringement of the '211 patent, intent to encourage

others to infringe the ’211 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’211 patent by others in the United States.

138. Qualcomm’s infringement of the ’211 patent has been and continues to be deliberate and with willful disregard of the ’211 patent.

COUNT THREE
INFRINGEMENT OF U.S. PATENT NO. 10,244,559

139. Sol IP realleges and incorporates each of preceding paragraphs 1–138.

140. On March 26, 2019, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,244,559 (“the ’559 patent”), titled “Method for Transmitting Up Link Control Signal in Mobile Communication System.” A true and correct copy of the ’559 patent is attached as Exhibit 3.

141. Sol IP is the exclusive licensee of the ’559 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

142. The ’559 patent is valid and enforceable.

143. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’559 patent, including at least claim 30, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices and Accused 5G Devices that practice the subject matter claimed in the ’559 patent without authority, either literally and/or under the doctrine of equivalents.

144. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 30 of the ’559 patent.

145. The preamble of claim 30 of the '559 patent recites "[a]n apparatus for a user equipment (UE)." To the extent the preamble limits the claim, each Accused LTE Device is an apparatus for a user equipment (UE).

146. Claim 30 of the '559 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

147. Claim 30 of the '559 patent recites "at least one processor operably coupled to the memory." Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 8. *See supra* para. 45.

148. Claim 30 of the '559 patent recites that the processor is configured to "cause the UE to transmit a random access preamble." As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 8, TS 36.300 Section 10.1.5 and TS 36.321 Section 5.1.3, each Accused LTE Device includes one or more processors configured to cause the UE to transmit a random access preamble. See, e.g., 3GPP TS 36.300 V8.12.0 § 10.1.5; 3GPP TS 36.321 V8.12.0 § 5.1.3.

149. Claim 30 of the '559 patent recites that the processor is configured to "cause the UE to receive first information, wherein the first information comprises information on resource block location assignment." As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 8, TS 36.300 Section 10.1.5, each Accused LTE Device includes one or more processors configured to cause the UE to receive a physical downlink control channel (PDCCH). *See, e.g.*, 3GPP TS 36.300 V8.12.0 § 10.1.5. As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 8, TS 36.212 Section 5.3.3.1.3, the PDCCH includes resource block assignment. *See, e.g.*, 3GPP TS 36.212 V8.8.0 § 5.3.3.1.3.

150. Claim 30 of the ’559 patent recites that the processor is configured to “determine that a first identifier is used to generate at least a part of the first information.” As recited in claim 30 of the ’559 patent and in accordance with at least 3GPP Release 8, TS 36.321 Section 5.1.4 and TS 36.213 Section 7.1, each Accused LTE Device includes one or more processors configured to determine that a random access radio network temporary identifier (RA-RNTI) is used to generate at least a part of the PDCCH. *See, e.g.*, 3GPP TS 36.321 V8.12.0 § 5.1.4; 3GPP TS 36.213 V8.8.0 § 7.1.

151. Claim 30 of the ’559 patent recites that the processor is configured to “cause the UE to obtain data at least based on the information on resource block assignment in response to the first identifier being used to generate at least the part of the first information, wherein: the data comprises a first bit and a first random access response, and the first bit indicates whether the data further comprises a second bit and a second random access response.” As recited in claim 30 of the ’559 patent and in accordance with at least 3GPP Release 8, TS 36.213 Sections 7.1 and 7.1.6, each Accused LTE Device includes one or more processors configured to cause the UE to obtain data based on the resource block assignment in response to the RA-RNTI being used to generate at least a part of the PDCCH. *See, e.g.*, 3GPP TS 36.213 V8.8.0 §§ 7.1, 7.1.6. As recited in claim 30 of the ’559 patent and in accordance with at least 3GPP Release 8, TS 36.321 Sections 6.1.5, 6.2.2, and 6.2.3, the data comprises a first extension field and a first medium access control (MAC) random access response. *See, e.g.*, 3GPP TS 36.321 V8.12.0 §§ 6.1.5, 6.2.2, 6.2.3. As recited in claim 30 of the ’559 patent and in accordance with at least 3GPP Release 8, TS 36.321 Sections 6.1.5 and 6.2.2, the first extension field indicates whether the data further comprises a second extension field and a second MAC random access response. 3GPP TS 36.321 V8.12.0 §§ 6.1.5, 6.2.2.

152. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused 5G Devices, which are configured to implement at least the features of 3GPP Release 15, thereby infringing at least claim 30 of the '559 patent.

153. The preamble of claim 30 of the '559 patent recites "[a]n apparatus for a user equipment (UE)." To the extent the preamble limits the claim, each Accused 5G Device is an apparatus for a user equipment (UE).

154. Claim 30 of the '559 patent recites "a memory." Each Accused 5G Device includes one or more memories. *See supra* para. 44.

155. Claim 30 of the '559 patent recites "at least one processor operably coupled to the memory." Each Accused 5G Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 15. *See supra* para. 45.

156. Claim 30 of the '559 patent recites that the processor is configured to "cause the UE to transmit a random access preamble." As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.1.3, each Accused 5G Device includes one or more processors configured to cause the UE to transmit a random access preamble. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.1.3.

157. Claim 30 of the '559 patent recites that the processor is configured to "cause the UE to receive first information, wherein the first information comprises information on resource block location assignment." As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 15, TS 38.213 Section 8.2, each Accused 5G Device includes one or more processors configured to cause the UE to receive a PDCCH. *See, e.g.*, 3GPP TS 38.213 V15.12.0 § 8.2. As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 15,

TS 38.212 Section 7.3.1.2.1, the PDCCH includes time and frequency domain resource assignments. *See, e.g.*, 3GPP TS 38.212 V15.10.0 § 7.3.1.2.1.

158. Claim 30 of the '559 patent recites that the processor is configured to "determine that a first identifier is used to generate at least a part of the first information." As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 15, TS 38.213 Section 8.2 and TS 38.212 Section 7.3.2, each Accused 5G Device includes one or more processors configured to determine that a random access radio network temporary identifier (RA-RNTI) is used to generate at least a part of the PDCCH. *See, e.g.*, 3GPP TS 38.213 V15.12.0 § 8.2; 3GPP TS 38.212 V15.10.0 § 7.3.2.

159. Claim 30 of the '559 patent recites that the processor is configured to "cause the UE to obtain data at least based on the information on resource block assignment in response to the first identifier being used to generate at least the part of the first information, wherein: the data comprises a first bit and a first random access response, and the first bit indicates whether the data further comprises a second bit and a second random access response." As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 15, TS 38.213 Section 8.2 and TS 38.214 Section 5.1, each Accused 5G Device includes one or more processors configured to cause the UE to obtain data based on the resource block assignment in response to the RA-RNTI being used to generate at least a part of the PDCCH. *See, e.g.*, 3GPP TS 38.213 V15.12.0 § 8.2; TS 38.214 V15.11.0 § 5.1. As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 15, TS 38.321 Sections 6.1.5, 6.2.2, and 6.2.3, the data comprises a first extension field and a first MAC random access response. *See, e.g.*, 3GPP TS 38.321 V15.11.0 §§ 6.1.5, 6.2.2, 6.2.3. As recited in claim 30 of the '559 patent and in accordance with at least 3GPP Release 15, TS 38.321 Sections 6.1.5 and 6.2.2, the first extension field indicates whether the data further

comprises a second extension field and a second MAC random access response. *See, e.g.*, 3GPP TS 38.321 V15.11.0 §§ 6.1.5, 6.2.2.

160. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 30 of the '559 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '559 patent.

161. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 30 of the '559 patent.

162. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 30 of the '559 patent.

163. Qualcomm advertises, markets, and sells the Accused LTE Devices and Accused 5G Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices and Accused 5G Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '559 patent.

164. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices and Accused 5G Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[58] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[59]

165. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices and Accused 5G Devices.[60] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[61] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

166. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices in the United States.[62]

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[58] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[59] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[60] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[61] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[62] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

167. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '559 patent and how those steps induce infringement of the '559 patent.

168. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 30 of the '559 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices by others in an infringing manner, knowing that its Accused LTE Devices and Accused 5G Devices are especially made or adapted for use in infringement of the '559 patent.

169. The Accused LTE Devices and Accused 5G Devices are configured to implement specific, intended features of 3GPP Release 8 and 3GPP Release 15, respectively. The Accused LTE Devices and Accused 5G Devices implementing such specific, intended features are a material part of the inventions of the '559 patent and are not staple articles of commerce.

170. As shown in paragraphs 144–151, each of the Accused LTE Devices is configured to implement the functionalities for performing a random access procedure as recited in claim 30 of the '559 patent and is not suitable for substantial non-infringing uses.

171. As shown in paragraphs 152–159, each of the Accused 5G Devices is configured to implement the functionalities for performing a random access procedure as recited in claim 30 of the '559 patent and is not suitable for substantial non-infringing uses.

172. Qualcomm has been on notice of the patent application number resulting in the '559 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the '559 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE

Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm's knowledge of the '559 patent, knowledge of infringement of the '559 patent, intent to encourage others to infringe the '559 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '559 patent by others in the United States.

173. Qualcomm has also been on notice since at least as early as August 13, 2020, when it received the 2020 5G Notice Letter, "that all 5G-compliant products made, used, offered for sale, sold, or imported by [Qualcomm] . . . infringe at least one or more of claims of the exemplary ETRI 5G Patents," including the '559 patent. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused 5G Devices after receiving the 2020 5G Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '559 patent, knowledge of infringement of the '559 patent, intent to encourage others to infringe the '559 patent through use of the Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '559 patent by others in the United States.

174. Qualcomm has known of '559 patent and/or its application even before it received the 2017 LTE Notice Letter, 2020 Notice Letter, 2020 5G Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '559 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices or Accused 5G Devices, have been with Qualcomm's knowledge of the '559 patent, knowledge of infringement of the '559 patent, intent to encourage

others to infringe the '559 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '559 patent by others in the United States.

175. Qualcomm's infringement of the '559 patent has been and continues to be deliberate and with willful disregard of the '559 patent.

COUNT FOUR
INFRINGEMENT OF U.S. PATENT NO. 10,932,298

176. Sol IP realleges and incorporates each of preceding paragraphs 1–175.

177. On February 23, 2021, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,932,298 ("the '298 patent"), titled "Method for Transmitting Up Link Control Signal in Mobile Communication System." A true and correct copy of the '298 patent is attached as Exhibit 4.

178. Sol IP is the exclusive licensee of the '298 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

179. The '298 patent is valid and enforceable.

180. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '298 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices and Accused 5G Devices that practice the subject matter claimed in the '298 patent without authority, either literally and/or under the doctrine of equivalents.

181. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 7 of the '298 patent.

182. The preamble of claim 7 of the '298 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused LTE Device is a communication apparatus.

183. Claim 7 of the '298 patent recites "a circuitry." Each Accused LTE Device includes one or more circuitries that are configured to implement at least the features of 3GPP Release 8. *See supra* para. 46.

184. Claim 7 of the '298 patent recites that the circuitry is configured to "cause the communication apparatus to transmit a random access preamble." As recited in claim 7 of the '298 patent and in accordance with at least 3GPP Release 8, TS 36.300 Section 10.1.5 and TS 36.321 Section 5.1.3, each Accused LTE Device includes one or more circuitries configured to cause the communication apparatus to transmit a random access preamble. *See, e.g.*, 3GPP TS 36.300 V8.12.0 § 10.1.5; 3GPP TS 36.321 V8.12.0 § 5.1.3.

185. Claim 7 of the '298 patent recites that the circuitry is configured to "cause the communication apparatus to receive first information, wherein the first information comprises radio resource information." As recited in claim 7 of the '298 patent and in accordance with at least 3GPP Release 8, TS 36.300 Section 10.1.5, TS 36.321 Section 5.1.4, TS 36.213 Section 7.1, and TS 36.212 Section 5.3.3.1, each Accused LTE Device includes one or more circuitries configured to cause the communication apparatus to receive a downlink control information (DCI) for a random access response, wherein the DCI comprises radio resource information. *See, e.g.*, 3GPP TS 36.300 V8.12.0 § 10.1.5; 3GPP TS 36.321 V8.12.0 § 5.1.4; 3GPP TS 36.213 V8.8.0 § 7.1; 3GPP TS 36.212 V8.8.0 § 5.3.3.1.

186. Claim 7 of the '298 patent recites that the circuitry is configured to "cause the communication apparatus to obtain second information at least based on the radio resource

information, wherein: the second information comprises a first random access response for the communication apparatus; and the second information comprises an indicator which indicates whether the second information comprises a second random access response for another communication apparatus." As recited in claim 7 of the '298 patent and in accordance with at least 3GPP Release 8, TS 36.321 Section 5.1.4 and TS 36.213 Sections 7.1 and 7.1.6, each Accused LTE Device includes one or more circuitries configured to cause the communication apparatus to obtain a random access response based on the radio resource information. *See, e.g.*, 3GPP TS 36.321 V8.12.0 § 5.1.4; 3GPP TS 36.213 V8.8.0 §§ 7.1, 7.1.6. As recited in claim 7 of the '298 patent and in accordance with at least 3GPP Release 8, TS 36.321 Sections 6.1.5, 6.2.2, and 6.2.3, the random access response comprises a first medium access control (MAC) random access response for the communication apparatus. *See, e.g.*, 3GPP TS 36.321 V8.12.0 §§ 6.1.5, 6.2.2, 6.2.3. As recited in claim 7 of the '298 patent and in accordance with at least 3GPP Release 8, TS 36.321 Sections 5.1.4, 6.1.5, and 6.2.2, the random access response comprises an extension field which indicates whether the random access response comprises a second MAC random access response for another communication apparatus. *See, e.g.*, 3GPP TS 36.321 V8.12.0 §§ 5.1.4, 6.1.5, 6.2.2.

187. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused 5G Devices, which are configured to implement at least the features of 3GPP Release 15, thereby infringing at least claim 7 of the '298 patent.

188. The preamble of claim 7 of the '298 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused 5G Device is a communication apparatus.

189. Claim 7 of the ’298 patent recites “a circuitry.” Each Accused 5G Device includes one or more circuitries. *See supra* para. 46.

190. Claim 7 of the ’298 patent recites that the circuitry is configured to “cause the communication apparatus to transmit a random access preamble.” As recited in claim 7 of the ’298 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.1.3, each Accused 5G Device includes one or more circuitries configured to cause the communication apparatus to transmit a random access preamble. *See, e.g.*, 3GPP 38.321 V15.11.0 § 5.1.3.

191. Claim 7 of the ’298 patent recites that the circuitry is configured to “cause the communication apparatus to receive first information, wherein the first information comprises radio resource information.” As recited in claim 7 of the ’298 patent and in accordance with at least 3GPP Release 15, TS 38.213 Section 8.2 and TS 38.212 Section 7.3.1.2.1, each Accused 5G Device includes one or more circuitries configured to cause the communication apparatus to receive a downlink control information (DCI) for a random access response, wherein the DCI comprises time and frequency domain resource assignments. *See, e.g.*, 3GPP TS 38.213 V15.12.0 § 8.2; 3GPP TS 38.212 V15.10.0 § 7.3.1.2.1.

192. Claim 7 of the ’298 patent recites that the circuitry is configured to “cause the communication apparatus to obtain second information at least based on the radio resource information, wherein: the second information comprises a first random access response for the communication apparatus; and the second information comprises an indicator which indicates whether the second information comprises a second random access response for another communication apparatus.” As recited in claim 7 of the ’298 patent and in accordance with at least 3GPP Release 15, TS 38.213 Section 8.2 and TS 38.214 Sections 5.1 and 5.1.2.2, each Accused 5G Device includes one or more circuitries configured to cause the communication apparatus to

obtain random access response based on the time and frequency domain resource assignments. *See, e.g.*, 3GPP TS 38.213 V15.12.0 § 8.2; 3GPP TS 38.214 V15.11.0 §§ 5.1, 5.1.2.2. As recited in claim 7 of the '298 patent and in accordance with at least 3GPP Release 15, TS 38.321 Sections 6.1.5, 6.2.2, and 6.2.3, the random access response comprises a first MAC random access response for the communication apparatus. *See, e.g.*, 3GPP TS 38.321 V15.11.0 §§ 6.1.5, 6.2.2, 6.2.3. As recited in claim 7 of the '298 patent and in accordance with at least 3GPP Release 15, TS 38.321 Sections 6.1.5, 6.2.2, and 5.1.4, the random access response comprises an extension field which indicates whether the random access response comprises a second MAC random access response for another communication apparatus. *See, e.g.*, 3GPP TS 38.321 V15.11.0 §§ 6.1.5, 6.2.2, 5.1.4.

193. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the '298 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '298 patent.

194. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 7 of the '298 patent.

195. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 7 of the '298 patent.

196. Qualcomm advertises, markets, and sells the Accused LTE Devices and Accused 5G Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices and Accused 5G Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '298 patent.

197. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices and Accused 5G Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[63] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[64]

198. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices and Accused 5G Devices.[65] For example,

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[63] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[64] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[65] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[66] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

199. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices in the United States.[67]

200. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '298 patent and how those steps induce infringement of the '298 patent.

201. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '298 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices by others in an infringing manner, knowing that its Accused LTE Devices and Accused 5G Devices are especially made or adapted for use in infringement of the '298 patent.

202. The Accused LTE Devices and Accused 5G Devices are configured to implement specific, intended features of 3GPP Release 8 and 3GPP Release 15, respectively. The Accused LTE Devices and Accused 5G Devices implementing such specific, intended features are a material part of the inventions of the '298 patent and are not staple articles of commerce.

203. As shown in paragraphs 181–186, each of the Accused LTE Devices is configured to implement the functionalities for performing a random access procedure as recited in claim 7 of the '298 patent and is not suitable for substantial non-infringing uses.

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[66] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[67] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

204. As shown in paragraphs 187–192, each of the Accused 5G Devices is configured to implement the functionalities for performing a random access procedure as recited in claim 7 of the ’298 patent and is not suitable for substantial non-infringing uses.

205. Qualcomm has been on notice of the patent application number resulting in the ’298 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the ’298 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’298 patent, knowledge of infringement of the ’298 patent, intent to encourage others to infringe the ’298 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’298 patent by others in the United States.

206. Qualcomm has also been on notice since at least as early as August 13, 2020, when it received the 2020 5G Notice Letter, “that all 5G-compliant products made, used, offered for sale, sold, or imported by [Qualcomm] . . . infringe at least one or more of claims of the exemplary ETRI 5G Patents,” including the patent application number resulting in the ’298 patent. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused 5G Devices after receiving the 2020 5G Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’298 patent, knowledge of infringement of the ’298 patent, intent to encourage others to infringe the ’298 patent through use of the Accused 5G Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’298 patent by others in the United States.

207. Qualcomm has known of the ’298 patent and/or its application even before it received the 2020 Notice Letter, 2020 5G Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’298 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices or Accused 5G Devices, have been with Qualcomm’s knowledge of the ’298 patent, knowledge of infringement of the ’298 patent, intent to encourage others to infringe the ’298 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’298 patent by others in the United States.

208. Qualcomm’s infringement of the ’298 patent has been and continues to be deliberate and with willful disregard of the ’298 patent.

COUNT FIVE
INFRINGEMENT OF U.S. PATENT NO. 10,405,277

209. Sol IP realleges and incorporates each of preceding paragraphs 1–208.

210. On September 3, 2019, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,405,277 (“the ’277 patent”), titled “Method for Reducing Power Consumption of Terminal in Mobile Communication System Using Multi-Carrier Structure.” A true and correct copy of the ’277 patent is attached as Exhibit 5.

211. Sol IP is the exclusive licensee of the ’277 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

212. The ’277 patent is valid and enforceable.

213. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '277 patent, including at least claim 5, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices and Accused 5G Devices that practice the subject matter claimed in the '277 patent without authority, either literally and/or under the doctrine of equivalents.

214. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 10, thereby infringing at least claim 5 of the '277 patent.

215. The preamble of claim 5 of the '277 patent recites "[a]n apparatus." To the extent the preamble limits the claim, each Accused LTE Device includes an apparatus.

216. Claim 5 of the '277 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

217. Claim 5 of the '277 patent recites "a processor operably coupled to the memory." Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 10. *See supra* para. 45.

218. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to receive a first message comprising first information about a first discontinuous reception cycle from a base station." As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 10, TS 36.331 Sections 6.2.2 and 6.3.2, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive an *RRCConnectionSetup* message comprising information about a long discontinuous reception cycle from a base station. *See, e.g.*, 3GPP TS 36.331 V10.0.0 §§ 6.2.2, 6.3.2.

219. Claim 5 of the ’277 patent recites that the processor is configured to “cause the apparatus to monitor a physical downlink control channel (PDCCH) on a first component carrier based on the first discontinuous reception cycle.” As recited in claim 5 of the ’277 patent and in accordance with at least 3GPP Release 10, TS 36.300 Section 10.1.5.1, TS 36.213 Section 9.1.1, and TS 36.321 Section 5.7, each Accused LTE Device includes one or more processors configured to cause the apparatus to monitor a physical downlink control channel (PDCCH) on a first component carrier based on the long discontinuous reception cycle. *See, e.g.*, 3GPP TS 36.300 V10.0.0 §10.1.5.1; 3GPP TS 36.213 V10.0.0 §9.1.1; 3GPP TS 36.321 V10.0.0 §5.7.

220. Claim 5 of the ’277 patent recites that the processor is configured to “cause the apparatus to receive first control information through the PDCCH on the first component carrier.” As recited in claim 5 of the ’277 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.7 and TS 36.213 Section 9.1.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive downlink control information (DCI) through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 36.213 V10.0.0 § 9.1.1; 3GPP TS 36.321 V10.0.0 §5.7.

221. Claim 5 of the ’277 patent recites that the processor is configured to “cause the apparatus to receive a second message from the base station based on the first control information, the second message related to a second discontinuous reception cycle.” As recited in claim 5 of the ’277 patent and in accordance with at least 3GPP Release 10, TS 36.331 Sections 6.2.2 and 6.3.2, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive an *RRCConnectionReconfiguration* message from the base station based on the DCI, the *RRCConnectionReconfiguration* message being related to a short discontinuous reception cycle. *See, e.g.*, 3GPP TS 36.331 V10.0.0 §§ 6.2.2, 6.3.2.

222. Claim 5 of the ’277 patent recites that the processor is configured to “cause the apparatus to monitor, in response to receiving the second message, the PDCCH on the first component carrier based on the second discontinuous reception cycle.” As recited in claim 5 of the ’277 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.7, each Accused LTE Device includes one or more processors configured to cause the apparatus to monitor, in response to receiving the *RRCConnectionReconfiguration* message, the PDCCH on the first component carrier based on the short discontinuous reception cycle. *See, e.g.*, 3GPP TS 36.321 V10.0.0 § 5.7.

223. Claim 5 of the ’277 patent recites that the processor is configured to “cause the apparatus to receive second control information through the PDCCH on the first component carrier.” As recited in claim 5 of the ’277 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.7 and TS 36.213 Section 9.1.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive second downlink control information through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 36.321 V10.0.0 § 5.7; 3GPP TS 36.213 V10.0.0 § 9.1.1.

224. Claim 5 of the ’277 patent recites that the processor is configured to “cause the apparatus to receive user data through a physical downlink shared channel (PDSCH) on a second component carrier based on the second control information, wherein the second discontinuous reception cycle is shorter than the first discontinuous reception cycle, and wherein the second control information comprises a carrier indicator (CI) indicating the second component carrier.” As recited in claim 5 of the ’277 patent and in accordance with at least 3GPP Release 10, TS 36.213 Sections 7.1 and 9.1.1, TS 36.212 Section 5.3.3.1, and TS 36.331 Section 6.3.4, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive

user data through a physical downlink shared channel (PDSCH) on a second component carrier based on the second downlink control information. *See, e.g.*, 3GPP TS 36.213 V10.0.0 §§ 7.1, 9.1.1; 3GPP TS 36.212 V10.0.0 § 5.3.3.1; 3GPP TS 36.331 V10.0.0 § 6.3.4. As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 10, TS 36.331 Section 6.3.2, the short discontinuous reception cycle is shorter than the long discontinuous reception cycle. *See, e.g.*, 3GPP TS 36.331 V10.0.0 § 6.3.2. As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 10, TS 36.213 Section 7.1 and TS 36.212 Section 5.3.3.1, the second DCI comprises a carrier indicator (CI) indicating the second component carrier. *See, e.g.*, 3GPP TS 36.213 V10.0.0 §7.1; 3GPP TS 36.212 V10.0.0 §5.3.3.1.

225. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused 5G Devices, which are configured to implement at least the features of 3GPP Release 15, thereby infringing at least claim 5 of the '277 patent.

226. The preamble of claim 5 of the '277 patent recites "[a]n apparatus." To the extent the preamble limits the claim, each Accused 5G Device includes an apparatus.

227. Claim 5 of the '277 patent recites "a memory." Each Accused 5G Device includes one or more memories. *See supra* para. 44.

228. Claim 5 of the '277 patent recites "a processor operably coupled to the memory." Each Accused 5G Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 15. *See supra* para. 45.

229. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to receive a first message comprising first information about a first discontinuous reception cycle from a base station." As recited in claim 5 of the '277 patent and in accordance

with at least 3GPP Release 15, TS 38.331 Sections 6.2.2 and 6.3.2, each Accused 5G Device includes one or more processors configured to cause the apparatus to receive an *RRCSetup* message comprising information about a long discontinuous reception cycle from a base station. *See, e.g.*, 3GPP TS 38.331 V15.12.0 §§ 6.2.2, 6.3.2.

230. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to monitor a physical downlink control channel (PDCCH) on a first component carrier based on the first discontinuous reception cycle." As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.7 and TS 38.213 Section 10, each Accused 5G Device includes one or more processors configured to cause the apparatus to monitor a physical downlink control channel (PDCCH) on a first component carrier based on the long discontinuous reception cycle. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7; 3GPP TS 38.213 V15.12.0 § 10.

231. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to receive first control information through the PDCCH on the first component carrier." As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.7 and TS 38.213 Section 10, each Accused 5G Device includes one or more processors configured to cause the apparatus to receive first downlink control information (DCI) through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7; 3GPP TS 38.213 V15.12.0 § 10.

232. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to receive a second message from the base station based on the first control information, the second message related to a second discontinuous reception cycle." As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, TS 38.331 Sections 6.2.2 and

6.3.2, each Accused 5G Device includes one or more processors configured to cause the apparatus to receive an *RRCReconfiguration* message from the base station based on the first DCI, the *RRCReconfiguration* message being related to a short discontinuous reception cycle. *See, e.g.*, 3GPP TS 38.331 V15.12.0 §§ 6.2.2, 6.3.2.

233. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to monitor, in response to receiving the second message, the PDCCH on the first component carrier based on the second discontinuous reception cycle." As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.7, each Accused 5G Device includes one or more processors configured to cause the apparatus to monitor, in response to receiving the *RRCReconfiguration* message, the PDCCH on the first component carrier based on the short discontinuous reception cycle. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7.

234. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to receive second control information through the PDCCH on the first component carrier." As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, TS 38.213 Section 10 and TS 38.321 Section 5.7, each Accused 5G Device includes one or more processors configured to cause the apparatus to receive second downlink control information (DCI) through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7; 3GPP TS 38.213 V15.12.0 § 10.

235. Claim 5 of the '277 patent recites that the processor is configured to "cause the apparatus to receive user data through a physical downlink shared channel (PDSCH) on a second component carrier based on the second control information, wherein the second discontinuous reception cycle is shorter than the first discontinuous reception cycle, and wherein the second control information comprises a carrier indicator (CI) indicating the second component carrier."

As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, 38.214 Section 5.1, TS 38.213 Section 10.1, and TS 38.212 Section 7.3.1, each Accused 5G Device includes one or more processors configured to cause the apparatus to receive user data through a physical downlink shared channel (PDSCH) on a second component carrier based on the second DCI. *See, e.g.*, 3GPP TS 38.214 V15.11.0 § 5.1; 3GPP TS 38.213 V15.12.0 § 10.1; 3GPP TS 38.212 V15.10.0 § 7.3.1. As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, TS 38.331 Section 6.3.2, the short discontinuous reception cycle is shorter than the long discontinuous reception cycle. *See, e.g.*, 3GPP TS 38.331 V15.12.0 § 6.3.2. As recited in claim 5 of the '277 patent and in accordance with at least 3GPP Release 15, TS 38.212 Section 7.3.1, the second DCI comprises a carrier indicator (CI) indicating the second component carrier. *See, e.g.*, 3GPP TS 38.212 V15.10.0 § 7.3.1.

236. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 5 of the '277 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '277 patent.

237. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 5 of the '277 patent.

238. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 5 of the '277 patent.

239. Qualcomm advertises, markets, and sells the Accused LTE Devices and Accused 5G Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices and Accused 5G Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '277 patent.

240. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices and Accused 5G Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[68] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[69]

241. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices and Accused 5G Devices.[70] For example,

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[68] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[69] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[70] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[71] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

242. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices in the United States.[72]

243. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '277 patent and how those steps induce infringement of the '277 patent.

244. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 5 of the '277 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices by others in an infringing manner, knowing that its Accused LTE Devices and Accused 5G Devices are especially made or adapted for use in infringement of the '277 patent.

245. The Accused LTE Devices and Accused 5G Devices are configured to implement specific, intended features of 3GPP Release 10 and 3GPP Release 15, respectively. The Accused LTE Devices and Accused 5G Devices implementing such specific, intended features are a material part of the inventions of the '277 patent and are not staple articles of commerce.

246. As shown in paragraphs 214–224, each of the Accused LTE Devices is configured to implement the functionalities for processing an *RRCConnectionSetup* message related to a long discontinuous reception cycle and an *RRCConnectionReconfiguration* message related to a short

[71] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).
[72] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

discontinuous reception cycle as recited in claim 5 of the '277 patent and is not suitable for substantial non-infringing uses.

247. As shown in paragraphs 225–235, each of the Accused 5G Devices is configured to implement the functionalities for processing an *RRCSetup* message related to a long discontinuous reception cycle and an *RRCReconfiguration* message related to short discontinuous reception cycle as recited in claim 5 of the '277 patent and is not suitable for substantial non-infringing uses.

248. Qualcomm has been on notice of the patent application number resulting in the '277 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020. Additionally, Qualcomm has been on notice of the '277 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm's knowledge of the '277 patent, knowledge of infringement of the '277 patent, intent to encourage others to infringe the '277 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '277 patent by others in the United States.

249. Qualcomm has also been on notice since at least as early as August 13, 2020, when it received the 2020 5G Notice Letter, "that all 5G-compliant products made, used, offered for sale, sold, or imported by [Qualcomm] . . . infringe at least one or more of claims of the exemplary ETRI 5G Patents," including the patent application number resulting in the '277 patent. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United

States any of the Accused 5G Devices after receiving the 2020 5G Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '277 patent, knowledge of infringement of the '277 patent, intent to encourage others to infringe the '277 patent through use of the Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '277 patent by others in the United States.

250. Qualcomm has known of the original patent from which the '277 patent issued even before it received the 2017 LTE Notice Letter, 2020 Notice Letter, 2020 5G Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '277 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices or Accused 5G Devices, have been with Qualcomm's knowledge of the '277 patent, knowledge of infringement of the '277 patent, intent to encourage others to infringe the '277 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '277 patent by others in the United States.

251. Qualcomm's infringement of the '277 patent has been and continues to be deliberate and with willful disregard of the '277 patent.

COUNT SIX
INFRINGEMENT OF U.S. PATENT NO. 10,863,439

252. Sol IP realleges and incorporates each of preceding paragraphs 1–251.

253. On December 8, 2020, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,863,439 ("the '439 patent"), titled "Method for Reducing Power

Consumption of Terminal in Mobile Communication System Using Multi-Carrier Structure." A true and correct copy of the '439 patent is attached as Exhibit 6.

254. Sol IP is the exclusive licensee of the '439 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

255. The '439 patent is valid and enforceable.

256. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '439 patent, including at least claim 6, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices and Accused 5G Devices that practice the subject matter claimed in the '439 patent without authority, either literally and/or under the doctrine of equivalents.

257. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 12, thereby infringing at least claim 6 of the '439 patent.

258. The preamble of claim 6 of the '439 patent recites "[a]n apparatus." To the extent the preamble limits the claim, each Accused LTE Device is an apparatus.

259. Claim 6 of the '439 patent recites "a circuitry." Each Accused LTE Device includes one or more circuitries configured to implement at least the features of 3GPP Release 12. *See supra* para. 46.

260. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive a first message comprising first information about a first discontinuous reception cycle from a base station." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.331 Section 6.3.2, each Accused LTE Device includes one or more circuitries configured to cause the apparatus to receive, from a base station, an

RRCConnectionSetup message comprising information about a first discontinuous reception (DRX) cycle (*shortDRX-Cycle*). *See, e.g.*, 3GPP TS 36.331 V12.9.0 § 6.3.2.

261. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to monitor a physical downlink control channel (PDCCH) on a first component carrier based on the first discontinuous reception cycle." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.300 Section 12 and TS 36.321 Section 5.7, each Accused LTE Device includes one or more circuitries configured to cause the apparatus to monitor a physical downlink control channel (PDCCH) on a first component carrier based on the *shortDRX-Cycle*. *See, e.g.*, 3GPP TS 36.300 V11.3.0 § 12; 3GPP TS 36.321 V12.9.0 § 5.7.

262. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive first control information through the PDCCH on the first component carrier." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.213 Section 9.1.1 and TS 36.321 Section 5.7, each Accused LTE Device includes one or more circuitries configured to cause the apparatus to receive downlink control information (DCI) through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 36.213 V12.0.0 § 9.1.1; 3GPP TS 36.321 V12.9.0 § 5.7.

263. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive a second message from the base station based on the first control information, the second message related to a second continuous reception cycle." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.321 Section 5.7, each Accused LTE Device includes one or more circuitries configured to cause the apparatus to receive a long DRX command medium access control (MAC) control element based on the DCI on PDCCH,

instructing the apparatus to change the DRX operation from the *shortDRX-cycle* to a *longDRX-cycle*. *See, e.g.*, 3GPP TS 36.321 V12.9.0 § 5.7.

264. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to, in response to receiving the second message, monitor the PDCCH on the first component carrier based on the second discontinuous reception cycle." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.321 Section 5.7, each Accused LTE Device includes one or more circuitries configured to cause the apparatus to monitor the PDCCH on the first component carrier based on the *longDRX-cycle* in response to receiving the long DRX command MAC control element. *See, e.g.*, 3GPP TS 36.321 V12.9.0 § 5.7

265. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive second control information through the PDCCH on the first component carrier." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.213 Section 9.1.1 and TS 36.321 Section 5.7, each Accused LTE Device includes one or more circuitries configured to cause the apparatus to receive a second DCI through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 36.213 V12.0.0 § 9.1.1; 3GPP TS 36.321 V12.9.0 § 5.7.

266. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive user data through a physical downlink shared channel (PDSCH) on a second component carrier based on the second control information, wherein the second discontinuous reception cycle is longer than the first discontinuous reception cycle, and wherein the second control information comprises a carrier indicator (CI) indicating the second component carrier." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.213 Section 7.1, each Accused LTE Device includes one or more circuitries configured to cause

the apparatus to receive user data through a physical downlink shared channel (PDSCH) on a second component carrier based on the DCI received over PDCCH. *See, e.g.*, 3GPP TS 36.213 V12.0.0 § 7.1. As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.331 Section 6.3.2, the *longDRX*-Cycle is a mutiple of *shortDRX-Cycle*. *See, e.g.*, 3GPP TS 36.331 V12.0.0 § 6.3.2. As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 12, TS 36.212 Section 5.3.3.1, a DCI comprises a carrier indicator (CI) indicating the second component carrier. *See, e.g.*, 3GPP TS 36.212 V12.9.1 § 5.3.3.1.

267. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused 5G Devices, which are configured to implement at least the features of 3GPP Release 15, thereby infringing at least claim 6 of the '439 patent.

268. The preamble of claim 6 of the '439 patent recites "[a]n apparatus." To the extent the preamble limits the claim, each Accused 5G Device is an apparatus.

269. Claim 6 of the '439 patent recites "a circuitry." Each Accused 5G Device includes one or more circuitries configured to implement at least the features of 3GPP Release 15. *See supra* para. 46.

270. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive a first message comprising first information about a first discontinuous reception cycle from a base station." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 15, TS 38.331 Section 6.3.2, each Accused 5G Device includes one or more circuitries configured to cause the apparatus to receive, from a base station, an *RRCSetup* message comprising information about a first discontinuous reception cycle (*drx-ShortCycle*). *See, e.g.*, 3GPP TS 38.331 V15.12.0 § 6.3.2.

271. Claim 6 of the ’439 patent recites that the circuitry is configured to “cause the apparatus to monitor a physical downlink control channel (PDCCH) on a first component carrier based on the first discontinuous reception cycle.” As recited in claim 6 of the ’439 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.7 and TS 38.213 Section 10, each Accused 5G Device include one or more circuitries configured to cause the apparatus to monitor a PDCCH on a first component carrier based on the *drx-ShortCycle*. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7; 3GPP TS 38.213 V15.12.0 § 10.

272. Claim 6 of the ’439 patent recites that the circuitry is configured to “cause the apparatus to receive first control information through the PDCCH on the first component carrier.” As recited in claim 6 of the ’439 patent and in accordance with at least 3GPP Release 15, TS 36.321 Section 5.7, each Accused 5G Device includes one or more circuitries configured to cause the apparatus to receive first DCI through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 36. 321 V15.11.0 § 5.7.

273. Claim 6 of the ’439 patent recites that the circuitry is configured to “cause the apparatus to receive a second message from the base station based on the first control information, the second message related to a second continuous reception cycle.” As recited in claim 6 of the ’439 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.7, each Accused 5G Device includes one or more circuitries configured to cause the apparatus to receive a long DRX command MAC control element based on the DCI on PDCCH, instructing the apparatus to change the DRX operation from the *shortDRX-cycle* to a *longDRX-cycle*. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7.

274. Claim 6 of the ’439 patent recites that the circuitry is configured to “cause the apparatus to, in response to receiving the second message, monitor the PDCCH on the first

component carrier based on the second discontinuous reception cycle." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.7, each Accused 5G Device includes one or more circuitries configured to cause the apparatus to monitor the PDCCH on the first component carrier based on the *longDRX-cycle* in response to receiving the long DRX command MAC control element. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7.

275. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive second control information through the PDCCH on the first component carrier." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 15, TS 38.321 Section 5.7 and TS 38.213 Section 10, each Accused 5G Device includes one or more circuitries configured to cause the apparatus to receive second DCI through the PDCCH on the first component carrier. *See, e.g.*, 3GPP TS 38.321 V15.11.0 § 5.7; 3GPP TS 38.213 V15.12.0 § 10.

276. Claim 6 of the '439 patent recites that the circuitry is configured to "cause the apparatus to receive user data through a physical downlink shared channel (PDSCH) on a second component carrier based on the second control information, wherein the second discontinuous reception cycle is longer than the first discontinuous reception cycle, and wherein the second control information comprises a carrier indicator (CI) indicating the second component carrier." As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 15, TS 38.214 Section 5.1 and TS 38.213 Section 10.1, each Accused 5G Device includes one or more circuitries configured to cause the apparatus to receive user data through a PDSCH on a second component carrier based on the second DCI received on the first component carrier. *See, e.g.*, 3GPP TS 38.214 V15.11.0 § 5.1; 3GPP TS 38.213 V15.12.0 § 10.1. As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 15, TS 38.212 Section 7.3.1, the DCI

includes a carrier indicator field. *See, e.g.*, 3GPP TS 38.212 V15.10.0 § 7.3.1. As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 15, TS 38.331 Section 6.3.2, the *longDRX*-Cycle is longer than the *shortDRX-Cycle*. *See, e.g.*, 3GPP TS 38.331 V15.12.0 § 6.3.2. As recited in claim 6 of the '439 patent and in accordance with at least 3GPP Release 15, TS 38.212 Sections 7.3.1, 7.3.1.1.2 and 7.3.1.2.2, the second DCI on the PDCCH comprises a carrier indicator (CI) indicating the second component carrier. *See, e.g.*, 3GPP TS 38.212 V15.10.0 §§ 7.3.1, 7.3.1.1.2, 7.3.1.2.2.

277. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 6 of the '439 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '439 patent.

278. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 6 of the '439 patent.

279. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 6 of the '439 patent.

280. Qualcomm advertises, markets, and sells the Accused LTE Devices and Accused 5G Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices and Accused 5G Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '439 patent.

281. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices and Accused 5G Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[73] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[74]

282. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices and Accused 5G Devices.[75] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon

[73] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[74] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[75] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

865+ 5G Mobile Platform (model number SM8250-AB),[76] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

283. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices in the United States.[77]

284. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '439 patent and how those steps induce infringement of the '439 patent.

285. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 6 of the '439 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices by others in an infringing manner, knowing that its Accused LTE Devices and Accused 5G Devices are especially made or adapted for use in infringement of the '439 patent.

286. The Accused LTE Devices and Accused 5G Devices are configured to implement specific, intended features of 3GPP Release 12 and 3GPP Release 15, respectively. The Accused LTE Devices and Accused 5G Devices implementing such specific, intended features are a material part of the inventions of the '439 patent and are not staple articles of commerce.

287. As shown in paragraphs 257–266, each of the Accused LTE Devices is configured to implement the functionalities for processing an *RRCConnectionSetup* message related to a short discontinuous reception cycle and a long DRX command MAC control element as recited in claim 6 of the '439 patent and is not suitable for substantial non-infringing uses.

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[76] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[77] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

288. As shown in paragraphs 267–276, each of the Accused 5G Devices is configured to implement the functionalities for processing an *RRCSetup* message related to a short discontinuous reception cycle and a long DRX command MAC control element as recited in claim 6 of the ’439 patent and is not suitable for substantial non-infringing uses.

289. Qualcomm has been on notice of the ’439 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving service of the Complaint, have been with Qualcomm’s knowledge of the ’439 patent, knowledge of infringement of the ’439 patent, intent to encourage others to infringe the ’439 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’439 patent by others in the United States.

290. Qualcomm has known of the ’439 patent and/or its application even before it received service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’439 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices or Accused 5G Devices, have been with Qualcomm’s knowledge of the ’439 patent, knowledge of infringement of the ’439 patent, intent to encourage others to infringe the ’439 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’439 patent by others in the United States.

291. Qualcomm’s infringement of the ’439 patent has been and continues to be deliberate and with willful disregard of the ’439 patent.

COUNT SEVEN
INFRINGEMENT OF U.S. PATENT NO. 10,009,896

292. Sol IP realleges and incorporates each of preceding paragraphs 1–291.

293. On June 26, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,009,896 ("the '896 patent"), titled "Methods for Transmitting and Receiving of Control Channel in Wireless Communication Systems." A true and correct copy of the '896 patent is attached as Exhibit 7.

294. Sol IP is the exclusive licensee of the '896 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

295. The '896 patent is valid and enforceable.

296. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '896 patent, including at least claim 9, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '896 patent without authority, either literally and/or under the doctrine of equivalents.

297. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 11, thereby infringing at least claim 9 of the '896 patent.

298. The preamble of claim 9 of the '896 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused LTE Device is a communication apparatus.

299. Claim 9 of the '896 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

300. Claim 9 of the '896 patent recites "a processor operably coupled to the memory." Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 11. *See supra* para. 45.

301. Claim 9 of the '896 patent recites that the processor is configured to "cause the apparatus to receive a first message from an eNode-B." As recited in claim 9 of the '896 patent and in accordance with at least 3GPP Release 11, TS 36.331 Sections 6.2.2 and 6.3.2, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive, from an eNode-B, an *RRCConnectionSetup* message, which includes an information field *RE-MappingQCLConfigToAddModList-r11*. *See, e.g.*, 3GPP TS 36.331 V11.2.0 §§ 6.2.2, 6.3.2.

302. Claim 9 of the '896 patent recites that the processor is configured to "cause the apparatus to receive control information from the eNode-B, the control information being received through a physical downlink control channel (PDCCH) of a subframe." As recited in claim 9 of the '896 patent and in accordance with at least 3GPP Release 11, TS 36.212 Section 5.3.3 and TS 36.213 Section 7.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive from an eNode-B downlink control information (DCI format 2D), through a physical downlink control channel (PDCCH) of a subframe. *See, e.g.*, 3GPP TS 36.212 V11.2.0 § 5.3.3; 3GPP TS 36.213 V11.2.0 § 7.1.

303. Claim 9 of the '896 patent recites that the processor is configured to "determine whether the subframe is allocated for Multicast-Broadcast Single Frequency Network (MBSFN) at least based on the control information." As recited in claim 9 of the '896 patent and in accordance with at least 3GPP Release 11, TS 36.213 Section 7.1 and TS 36.331 Sections 6.3.2 and 6.3.7, each Accused LTE Device includes one or more processors configured to determine

whether the subframe is allocated for multimedia broadcast multicast service single frequency network (MBSFN) at least based on the value of the "PDSCH RE Mapping and Quasi-Co-Location indicator" field. *See, e.g.*, 3GPP TS 36.213 V11.2.0 § 7.1; 3GPP TS 36.331 V11.2.0 §§ 6.3.2, 6.3.7.

304. Claim 9 of the '896 patent recites that the processor is configured to "cause the apparatus to receive data in the subframe from the eNode-B, wherein the first message comprises a plurality of parameter sets, and the control information comprises an indicator indicating one of the plurality of parameter sets, and wherein each of the plurality of parameter sets indicates a starting symbol of a downlink shared channel in a subframe on which data is transmitted and an MBSFN subframe configuration." As recited in claim 9 of the '896 patent and in accordance with at least 3GPP Release 11, TS 36.213 Section 7.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive physical downlink shared channel (PDSCH) in the subframe from the eNode-B. *See, e.g.*, 3GPP TS 36.213 V11.2.0 § 7.1. As recited in claim 9 of the '896 patent and in accordance with at least 3GPP Release 11, TS 36.331 Sections 6.2 and 6.4, the *RRCConnectionSetup* message comprises a *PDSCH-RE-MappingQCL-Config-r11* information element. *See, e.g.*, 3GPP TS 36.331 V11.2.0 §§ 6.2 and 6.4. As recited in claim 9 of the '896 patent and in accordance with at least 3GPP Release 11, TS 36.212 Section 5.3.3.1.5, the DCI format 2D includes a PDSCH RE Mapping and Quasi-Co-Location Indicator indicating one of the plurality of parameter sets. *See, e.g.*, 3GPP TS 36.212 V11.2.0 § 5.3.3.1.5. As recited in claim 9 of the '896 patent and in accordance with at least 3GPP Release 11, TS 36.331 Sections 6.3.2 and 6.3.7, each *PDSCH-RE-MappingQCL-Config-r11* information element includes a "*pdsch-Start-r11*" field indicating a starting symbol of PDSCH in a subframe and an MBSFN subframe configuration. *See, e.g.*, 3GPP TS 36.331 V11.2.0 §§ 6.3.2, 6.3.7.

305. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 9 of the '896 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '896 patent.

306. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 9 of the '896 patent.

307. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 9 of the '896 patent.

308. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '896 patent.

309. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which

they can be used and specifications for its products.[78] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[79]

310. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[80] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[81] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

311. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[82]

312. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '896 patent and how those steps induce infringement of the '896 patent.

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[78] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[79] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[80] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[81] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[82] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

313. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 9 of the '896 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '896 patent.

314. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 11. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '896 patent and are not staple articles of commerce.

315. As shown in paragraphs 297–304, each of the Accused LTE Devices is configured to implement the functionalities for processing an *RRCConnectionSetup* message comprising a *PDSCH-RE-MappingQCL-Config-r11* information element as recited in claim 9 of the '896 patent and is not suitable for substantial non-infringing uses.

316. Qualcomm has been on notice of the patent application number resulting in the '896 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the '896 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm's knowledge of the '896 patent, knowledge of infringement of the '896 patent, intent to encourage others to infringe the '896 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '896 patent by others in the United States.

317. Qualcomm has known of the ’896 patent and/or its application issued even before it received the 2017 LTE Notice Letter, 2020 Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’896 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’896 patent, knowledge of infringement of the ’896 patent, intent to encourage others to infringe the ’896 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’896 patent by others in the United States.

318. Qualcomm’s infringement of the ’896 patent has been and continues to be deliberate and with willful disregard of the ’896 patent.

COUNT EIGHT
INFRINGEMENT OF U.S. PATENT NO. 10,893,525

319. Sol IP realleges and incorporates each of preceding paragraphs 1–318.

320. On January 12, 2021, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,893,525 (“the ’525 patent”), titled “Method for Transmitting and Receiving Control Channel in Wireless Communication Systems.” A true and correct copy of the ’525 patent is attached as Exhibit 8.

321. Sol IP is the exclusive licensee of the ’525 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

322. The ’525 patent is valid and enforceable.

323. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’525 patent, including at least claim 13, by using, selling,

offering for sale, and/or importing into the United States the Accused LTE Devices and Accused 5G Devices that practice the subject matter claimed in the '525 patent without authority, either literally and/or under the doctrine of equivalents.

324. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 11, thereby infringing at least claim 13 of the '525 patent.

325. The preamble of claim 13 of the '525 patent recites "[a] communication device for a terminal." To the extent the preamble limits the claim, each Accused LTE Device is a communication device for a terminal.

326. Claim 13 of the '525 patent recites "a circuitry." Each Accused LTE Device includes one or more circuitries that are configured to implement at least the features of 3GPP Release 11. *See supra* para. 46.

327. Claim 13 of the '525 patent recites that the circuitry is configured to "cause the terminal to receive a first message, the first message comprising a first set of parameters and a second set of parameters, wherein the first set of parameters comprises first location information and the second set of parameters comprises a second location information." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 11, TS 36.331 Section 6.2.2, each Accused LTE Device includes one or more circuitries configured to cause the terminal to receive an *RRCConnectionSetup* message. *See, e.g.*, 3GPP TS 36.331 V11.2.0 § 6.2.2. As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 11, TS 36.331 Sections 6.2.2, 6.3.2, and 6.4, the *RRCConnectionSetup* message includes a first *PDSCH-RE-MappingQCL-Config-r11* and a second *PDSCH-RE-MappingQCL-Config-r11*. *See, e.g.*, 3GPP TS 36.331 V11.2.0 §§ 6.2.2, 6.3.2, 6.4. As recited in claim 13 of the '525 patent and in accordance with at

least 3GPP Release 11, TS 36.331 Sections 6.2.2 and 6.3.2, the first *PDSCH-RE-MappingQCL-Config-r11* includes a first *pdsch-Start* and the second *PDSCH-RE-MappingQCL-Config-r11* includes a second *pdsch-Start*. *See, e.g.*, 3GPP TS 36.331 V11.2.0 §§ 6.2.2, 6.3.2.

328. Claim 13 of the '525 patent recites that the circuitry is configured to "cause the terminal to receive control information through a Physical Downlink Control Channel (PDCCH) in a first subframe, the control information comprising an identifier to identify the first set of parameters." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 11, TS 36.212 Section 5.3.3 and TS 36.213 Section 7.1, each Accused Device includes one or more circuitries configured to cause the terminal to receive downlink control information (DCI format 2D) through a physical downlink control channel (PDCCH) of a subframe. *See, e.g.*, 3GPP TS 36.212 V11.2.0 § 5.3.3; 3GPP TS 36.213 V11.2.0 § 7.1. As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 11, TS 36.212 Section 5.3.3 and TS 36.213 Section 7.1.9, the DCI format 2D includes a *PDSCH RE Mapping and Quasi-Co-Location Indicator* to identify the first *PDSCH-RE-MappingQCL-Config-r11*. *See, e.g.*, 3GPP TS 36.212 V11.2.0 § 5.3.3; 3GPP TS 36.213 V11.2.0 § 7.1.9.

329. Claim 13 of the '525 patent recites that the circuitry is configured to "determine a starting Orthogonal Frequency Division Multiplexing (OFDM) symbol of a Physical Downlink Shared Channel (PDSCH) in the first subframe based on the first location information." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 11, TS 36.213 Sections 7.1.6.4 and 7.1.9, each Accused LTE Device includes one or more circuitries configured to determine a starting OFDM symbol for a physical downlink shared channel (PDSCH) in the subframe based on the value of the *pdsch-Start* field in the first *PDSCH-RE-MappingQCL-Config-r11*. *See, e.g.*, 3GPP TS 36.213 V11.2.0 §§ 7.1.6.4, 7.1.9.

330. Claim 13 of the '525 patent recites that the circuitry is configured to "cause the terminal to receive data on the PDSCH in the first subframe." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 11, TS 36.213 Sections 7.1 and 7.1.9, each Accused LTE Device includes one or more circuitries configured to cause the terminal to receive data on the PDSCH in the subframe. *See, e.g.*, 3GPP TS 36.213 V11.2.0 §§ 7.1, 7.1.9.

331. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused 5G Devices, which are configured to implement at least the features of 3GPP Release 15, thereby infringing at least claim 13 of the '525 patent.

332. The preamble of claim 13 of the '525 patent recites "[a] communication device for a terminal." To the extent the preamble limits the claim, each Accused 5G Device is a communication device for a terminal.

333. Claim 13 of the '525 patent recites "a circuitry." Each Accused 5G Device includes one or more circuitries that are configured to implement at least the features of 3GPP Release 15. *See supra* para. 46.

334. Claim 13 of the '525 patent recites that the circuitry is configured to "cause the terminal to receive a first message, the first message comprising a first set of parameters and a second set of parameters, wherein the first set of parameters comprises first location information and the second set of parameters comprises a second location information." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 15, TS 38.331 Section 6.2.2, each Accused 5G Device includes one or more circuitries configured to cause the terminal to receive an *RRCSetup* message. *See, e.g.*, 3GPP TS 38.331 V15.12.0 § 6.2.2. As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 15, TS 38.331 Sections 6.2.2, 6.3.2, and 6.4, the *RRCSetup* message includes a first *PDSCH-TimeDomainResourceAllocation* and a second

PDSCH-TimeDomainResourceAllocation. *See, e.g.*, 3GPP TS 38.331 V15.12.0 §§ 6.2.2, 6.3.2, 6.4. As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 15, TS 38.331 Section 6.3.2, the first *PDSCH-TimeDomainResourceAllocation* includes a first *startSymbolAndLength* and the second *PDSCH-TimeDomainResourceAllocation* includes a second *startSymbolAndLength*. *See, e.g.*, 3GPP TS 38.331 V15.12.0 § 6.3.2.

335. Claim 13 of the '525 patent recites that the circuitry is configured to "cause the terminal to receive control information through a Physical Downlink Control Channel (PDCCH) in a first subframe, the control information comprising an identifier to identify the first set of parameters." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 15, TS 38.213 Section 10 and TS 38.212 Section 7.3.1.2, each Accused 5G Device includes one or more circuitries configured to cause the terminal to receive downlink control information (DCI formats 1_0 and 1_1) through a PDCCH of a subframe. *See, e.g.*, 3GPP TS 38.213 V15.12.0 § 10; 3GPP TS 38.212 V15.10.0 § 7.3.1.2. As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 15, TS 38.212 Section 7.3.1.2 and TS 38.214 Section 5.1.2, the DCI includes a *Time domain resource assignment* field to identify the first *PDSCH-TimeDomainResourceAllocation*. *See, e.g.*, 3GPP TS 38.212 V15.10.0 § 7.3.1.2; 3GPP TS 38.214 V15.11.0 § 5.1.2.

336. Claim 13 of the '525 patent recites that the circuitry is configured to "determine a starting Orthogonal Frequency Division Multiplexing (OFDM) symbol of a Physical Downlink Shared Channel (PDSCH) in the first subframe based on the first location information." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 15, TS 38.331 Section 6.3.2 and TS 38.214 Section 5.1.2, each Accused 5G Device includes one or more circuitries configured to determine a starting OFDM symbol for the PDSCH in the subframe based on the

value of the *startSymbolAndLength* field in the first *PDSCH-TimeDomainResourceAllocation. See, e.g.*, 3GPP TS 38.331 V15.12.0 § 6.3.2; TS 38.214 V15.11.0 § 5.1.2.

337. Claim 13 of the '525 patent recites that the circuitry is configured to "cause the terminal to receive data on the PDSCH in the first subframe." As recited in claim 13 of the '525 patent and in accordance with at least 3GPP Release 15, TS 38.214 Section 5.1, each Accused 5G Device includes one or more circuitries configured to cause the terminal to receive data on the PDSCH in the subframe. *See, e.g.*, 3GPP TS 38.214 V15.11.0 § 5.1.

338. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 13 of the '525 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '525 patent.

339. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 13 of the '525 patent.

340. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices and Accused 5G Devices in accordance with at least claim 13 of the '525 patent.

341. Qualcomm advertises, markets, and sells the Accused LTE Devices and Accused 5G Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices and Accused 5G Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '525 patent.

342. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices and Accused 5G Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[83] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[84]

343. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices and Accused 5G Devices.[85] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon

[83] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[84] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[85] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

865+ 5G Mobile Platform (model number SM8250-AB),[86] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

344. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices in the United States.[87]

345. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '525 patent and how those steps induce infringement of the '525 patent.

346. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 13 of the '525 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices and Accused 5G Devices by others in an infringing manner, knowing that its Accused LTE Devices and Accused 5G Devices are especially made or adapted for use in infringement of the '525 patent.

347. The Accused LTE Devices and Accused 5G Devices are configured to implement specific, intended features of 3GPP Release 11 and 3GPP Release 15, respectively. The Accused LTE Devices and Accused 5G Devices implementing such specific, intended features are a material part of the inventions of the '525 patent and are not staple articles of commerce.

348. As shown in paragraphs 324–330, each of the Accused LTE Devices is configured to implement the functionalities for processing an *RRCConnectionSetup* message comprising a first *PDSCH-RE-MappingQCL-Config-r11* and a second *PDSCH-RE-MappingQCL-Config-r11* as recited in claim 13 of the '525 patent and is not suitable for substantial non-infringing uses.

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[86] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[87] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

349. As shown in paragraphs 331–337, each of the Accused 5G Devices is configured to implement the functionalities for processing an *RRCSetup* message comprising a first *PDSCH-TimeDomainResourceAllocation* and a second *PDSCH-TimeDomainResourceAllocation* as recited in claim 13 of the '525 patent and is not suitable for substantial non-infringing uses.

350. Qualcomm has been on notice of the patent application number resulting in the '525 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter, and/or when it received subsequent correspondence identifying the patent. Additionally, Qualcomm has been on notice of the '525 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '525 patent, knowledge of infringement of the '525 patent, intent to encourage others to infringe the '525 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '525 patent by others in the United States.

351. Qualcomm has also been on notice since at least as early as August 13, 2020, when it received the 2020 5G Notice Letter, "that all 5G-compliant products made, used, offered for sale, sold, or imported by [Qualcomm] . . . infringe at least one or more of claims of the exemplary ETRI 5G Patents," including the patent application number resulting in the '525 patent. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused 5G Devices after receiving the 2020 5G Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '525 patent, knowledge of infringement of the '525 patent, intent to encourage others to infringe the '525 patent through use

of the Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '525 patent by others in the United States.

352. Qualcomm has known of the '525 patent and/or its application even before it received the 2020 Notice Letter, 2020 5G Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '525 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices or Accused 5G Devices, have been with Qualcomm's knowledge of the '525 patent, knowledge of infringement of the '525 patent, intent to encourage others to infringe the '525 patent through use of the Accused LTE Devices or Accused 5G Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '525 patent by others in the United States.

353. Qualcomm's infringement of the '525 patent has been and continues to be deliberate and with willful disregard of the '525 patent.

COUNT NINE
INFRINGEMENT OF U.S. PATENT NO. 9,496,976

354. Sol IP realleges and incorporates each of preceding paragraphs 1–353.

355. On November 15, 2016, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,496,976 ("the '976 patent"), titled "Cell Search Method, Forward Link Frame Transmission Method, Apparatus Using the Same and Forward Link Frame Structure." A true and correct copy of the '976 patent is attached as Exhibit 9.

356. Sol IP is the exclusive licensee of the '976 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

357. The ’976 patent is valid and enforceable.

358. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’976 patent, including at least claim 1, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the ’976 patent without authority, either literally and/or under the doctrine of equivalents.

359. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 1 of the ’976 patent.

360. The preamble of claim 1 of the ’976 patent recites “[a] method of performing cell search by a mobile station in a wireless communication system.” To the extent the preamble limits the claim, each Accused LTE Device performs a method of performing cell search in a wireless communication system.

361. Claim 1 of the ’976 patent recites “receiving a downlink transmission from a base station.” As recited in claim 1 of the ’976 patent and in accordance with at least 3GPP Release 8, Section 4.1, each Accused LTE Device receives a downlink radio frame from an LTE-compliant eNodeB. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 4.1.

362. Claim 1 of the ’976 patent recites “detecting a first primary synchronization sequence contained in the downlink transmission, wherein the downlink transmission comprises a plurality of subframes sequentially arranged in time domain, each of the plurality of subframes containing a plurality of symbols sequentially arranged in time domain, wherein a first subframe in the downlink transmission includes a first symbol representing the first primary synchronization sequence.” As recited in claim 1 of the ’976 patent and in accordance with at least 3GPP Release

8, TS 36.213 Section 4.1 and TS 36.211 Section 6.11.1, each Accused LTE Device detects a sequence $d(n)$ used for the primary synchronization signal contained in the downlink radio frame. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1; 3GPP TS 36.211 V8.9.0 § 6.1.2, 6.11.1. As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 4, 4.1, 6.2.1, 6.2.3, the downlink radio frame comprises a plurality of subframes sequentially arranged in time domain, each of the subframes containing a plurality of OFDM symbols sequentially arranged in time domain. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 4, 4.1, 6.2.1, 6.2.3. As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 4.1 and 6.11.1.2, subframe 0 in the downlink radio frame includes slot 0, wherein the last OFDM symbol in slot 0 represents the sequence $d(n)$ used for the primary synchronization signal. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 4.1, 6.11.1.2.

363. Claim 1 of the '976 patent recites "detecting a first secondary synchronization sequence contained in the downlink transmission, wherein a second subframe in the downlink transmission includes a second symbol representing the first secondary synchronization sequence." As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 4.1 and TS 36.211 Section 6.11.2.1, each Accused LTE Device detects a sequence $d(0),...,d(61)$ used for the second synchronization signal contained in the downlink radio frame. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1; 3GPP TS 36.211 V8.9.0 § 6.11.2.1. As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 6.11.2.1 and 6.11.2.2, subframe 5 in the downlink radio frame includes slot 10, wherein a second-to-last OFDM symbol in slot 10 represents the sequence $d(0),...,d(61)$ used for the second synchronization signal. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.11.2.1, 6.11.2.2.

364. Claim 1 of the '976 patent recites "determining a first indicator based on the first primary synchronization sequence." As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.1, each Accused LTE Device determines a first indicator ($N_{\mathrm{ID}}^{(2)}$) based on the sequence $d(n)$ used for the primary synchronization signal. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1; 3GPP TS 36.211 V8.9.0 §§ 6.11, 6.11.1.

365. Claim 1 of the '976 patent recites "determining a second indicator based on the first secondary synchronization sequence." As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2, each Accused LTE Device determines a second indicator ($N_{\mathrm{ID}}^{(1)}$) based on the sequence $d(0),\ldots,d(61)$ used for the second synchronization signal. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1; 3GPP TS 36.211 V8.9.0 §§ 6.11, 6.11.2.

366. Claim 1 of the '976 patent recites "determining a cell identifier based on the first indicator and the second indicator." As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11, each Accused LTE Device determines a cell identifier ($N_{\mathrm{ID}}^{\mathrm{cell}}$) based on the first indicator ($N_{\mathrm{ID}}^{(2)}$) and the second indicator ($N_{\mathrm{ID}}^{(1)}$). *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1; 3GPP TS 36.211 V8.9.0 §§ 3.1, 6.11, 6.11.1, 6.11.2.

367. Claim 1 of the '976 patent recites "communicating with the base station, wherein the cell identifier identifies a cell of the base station, wherein the first subframe includes a third symbol representing a second secondary synchronization sequence, the third symbol being directly adjacent to the first symbol, and wherein the second subframe includes a fourth symbol representing a second primary synchronization sequence, the fourth symbol being directly adjacent to the second symbol." As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 4.1, each Accused LTE Device, after cell search by which the time and frequency synchronization with a cell are acquired and the physical layer cell ID of that

cell is determined, communicates with the eNodeB. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1. As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TR 21.905 Section 3, TS 36.213 Section 4.1, and TS 36.211 Section 3.1, identifier ($N_{\mathrm{ID}}^{\mathrm{cell}}$) identifies a cell of the eNodeB. *See, e.g.*, 3GPP TR 21.905 V8.0.0 § 3; 3GPP TS 36.213 V8.8.0 § 4.1; 3GPP TS 36.211 V8.9.0 § 3.1. As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS TS 36.211 Sections 6.11.1, 6.11.1.2, 6.11.2.1, and 6.11.2.2, subframe 0 includes slot 0, wherein the second-to-last OFDM symbol in slot 0 represents a sequence $d(0),\ldots,d(61)$ used for the secondary synchronization signal; the second-to-last OFDM symbol in slot 0 is directly adjacent to the last OFDM symbol in slot 0. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.11.1, 6.11.1.2, 6.11.2.1, 6.11.2.2. As recited in claim 1 of the '976 patent and in accordance with at least 3GPP Release 8, TS TS 36.211 Sections 6.11.1, 6.11.1.2, 6.11.2.1, and 6.11.2.2, subframe 5 includes slot 10, wherein the last OFDM symbol in slot 10 represents sequence $d(n)$ used for the primary synchronization signal; the last OFDM symbol in slot 10 is directly adjacent to the second-to-last OFDM symbol in slot 10. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.11.1, 6.11.1.2, 6.11.2.1, 6.11.2.2.

368. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 1 of the '976 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '976 patent.

369. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD

Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 1 of the '976 patent.

370. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 1 of the '976 patent.

371. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '976 patent.

372. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[88] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[89]

373. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific

[88] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[89] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

technical assistance related to the Accused LTE Devices.[90] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[91] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

374. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[92]

375. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '976 patent and how those steps induce infringement of the '976 patent.

376. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 1 of the '976 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '976 patent.

377. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 8. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '976 patent and are not staple articles of commerce.

378. As shown in paragraphs 359–367, each of the Accused LTE Devices is configured to implement the functionalities for processing a primary synchronization signal and a secondary

[90] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).
[91] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).
[92] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

synchronization signal as recited in claim 1 of the '976 patent and is not suitable for substantial non-infringing uses.

379. Qualcomm has been on notice of the '976 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter. Additionally, Qualcomm has been on notice of the '976 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '976 patent, knowledge of infringement of the '976 patent, intent to encourage others to infringe the '976 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '976 patent by others in the United States.

380. Qualcomm has known of the '976 patent and/or its application even before it received the 2017 LTE Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '976 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm's knowledge of the '976 patent, knowledge of infringement of the '976 patent, intent to encourage others to infringe the '976 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '976 patent by others in the United States.

381. Qualcomm's infringement of the '976 patent has been and continues to be deliberate and with willful disregard of the '976 patent.

COUNT TEN
INFRINGEMENT OF U.S. PATENT NO. 10,080,204

382. Sol IP realleges and incorporates each of preceding paragraphs 1–381.

383. On September 18, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,080,204 ("the '204 patent"), titled "Cell Search Method, Forward Link Frame Transmission Method, Apparatus Using the Same and Forward Link Frame Structure." A true and correct copy of the '204 patent is attached as Exhibit 10.

384. Sol IP is the exclusive licensee of the '204 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

385. The '204 patent is valid and enforceable.

386. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '204 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '204 patent without authority, either literally and/or under the doctrine of equivalents.

387. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 7 of the '204 patent.

388. The preamble of claim 7 of the '204 patent recites "[a]n apparatus for a terminal." To the extent the preamble limits the claim, each Accused LTE Device is an apparatus for a terminal.

389. Claim 7 of the '204 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

390. Claim 7 of the ’204 patent recites “at least one processor coupled to the memory.” Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 8. *See supra* para. 45.

391. Claim 7 of the ’204 patent recites that the at least one processor is configured to cause the terminal to “receive at least a part of a frame, wherein the frame consists of twenty units including a first unit and a second unit, wherein the first unit comprises a first set of Orthogonal Frequency Division Multiplexing (OFDM) symbols including a first OFDM symbol and a second OFDM symbol, the second unit comprises a second set of OFDM symbols including a third OFDM symbol and a fourth OFDM symbol, the first OFDM symbol comprises a first primary synchronization signal, the second OFDM symbol comprises a first secondary synchronization signal, the third OFDM symbol comprises the first primary synchronization signal and the fourth OFDM symbol comprises a second secondary synchronization signal.” As recited in claim 7 of the ’204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 4 and 4.1, each Accused LTE Device includes one or more processors configured to cause the terminal to receive at least a part of a downlink radio frame, wherein the frame consists of twenty slots including slot 0 and slot 10. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 4, 4.1. As recited in claim 7 of the ’204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 4.1 and TS 36.211 Sections 6.2.1 and 6.2.3, slot 0 comprises a first set of OFDM symbols that make up slot 0 including the last OFDM symbol of slot 0 and the second-to-last OFDM symbol of slot 0. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 4.1; 3GPP TS 36.211 V8.9.0 §§ 6.2.1, 6.2.3. As recited in claim 7 of the ’204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 4.1 and TS 36.211 Sections 6.2.1 and 6.2.3, slot 10 comprises a second set of OFDM symbols that make up

slot 10 including the last OFDM symbol of slot 10 and the second-to-last OFDM symbol of slot 10. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 4.1; 3GPP TS 36.211 V8.9.0 §§ 6.2.1, 6.2.3. As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 6.11.1.1, 6.11.1.2, 6.11.2.1, and 6.11.2.2, the last OFDM symbol of slot 0 comprises a first primary synchronization signal, the second-to-last OFDM symbols of slot 0 comprises a first secondary synchronization signal, the last OFDM symbol of slot 10 comprises the first primary synchronization signal, and the second-to-last OFDM symbol of slot 10 comprises a second secondary synchronization signal. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.11.1.1, 6.11.1.2, 6.11.2.1, 6.11.2.2.

392. Claim 7 of the '204 patent recites that the at least one processor is configured to cause the terminal to "determine a first identifier based on the first primary synchronization signal." As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 4.1 and TS 36.211 Section 6.11 and 6.11.1.1, each Accused LTE Device includes one or more processors configured to cause the terminal to determine a first identifier ($N_{\mathrm{ID}}^{(2)}$) based on the first primary synchronization signal. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1, 3GPP TS 36.211 V8.9.0 §§ 6.11, 6.11.1.1.

393. Claim 7 of the '204 patent recites that the at least one processor is configured to cause the terminal to "determine a second identifier based on one of the first secondary synchronization signal and the second secondary synchronization signal." As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 4.1 and TS 36.211 Sections 6.11 and 6.11.2.1, each Accused LTE Device includes one or more processors configured to cause the terminal to determine a second identifier ($N_{\mathrm{ID}}^{(1)}$) based on one of the first

secondary synchronization signal in slots 0 and the second secondary synchronization signal is slot 10. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1, 3GPP TS 36.211 V8.9.0 §§ 6.11, 6.11.2.1.

394. Claim 7 of the '204 patent recites that the at least one processor is configured to cause the terminal to "determine a cell identifier based on the first identifier and the second identifier, wherein: the first secondary synchronization signal and the second secondary synchronization signal are different, the first OFDM symbol and the second OFDM symbol are contiguous, the third OFDM symbol and the fourth OFDM symbol are contiguous, the first OFDM symbol and the second OFDM symbol are last two OFDM symbols of the first unit, the third OFDM symbol and the fourth OFDM symbol are last two OFDM symbols of the second unit, and the second identifier indicates one group of cells among a plurality of groups of cells, and the first identifier indicates a cell within the one group of cells." As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 4.1 and TS 36.211 Sections 3.1 and 6.11, each Accused LTE Device includes one or more processors configured to cause the terminal to determines a cell identifier ($N_{\mathrm{ID}}^{\mathrm{cell}}$) based on the first identifier ($N_{\mathrm{ID}}^{(2)}$) and the second identifier ($N_{\mathrm{ID}}^{(1)}$). *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1; 3GPP TS 36.211 V8.9.0 §§ 3.1, 6.11. As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2.1, first secondary synchronization signal in slot 0 and the second secondary synchronization signal in slot 10 are different. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.2.1. As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 4.1, 6.11.1.2, and 6.11.2.2, in slot 0 the last OFDM symbol and the second-to-last OFDM symbols are contiguous and are the last two OFDM symbols of slot 0. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 4.1, 6.11.1.2, 6.11.2.2. As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 4.1, 6.11.1.2, and 6.11.2.2, in slot 10 the last OFDM

symbol and the second-to-last OFDM symbols are contiguous and are the last two OFDM symbols of slot 10. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 4.1, 6.11.1.2, 6.11.2.2. As recited in claim 7 of the '204 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11, the second identifier ($N_{\mathrm{ID}}^{(1)}$) indicates one group of cells among a plurality of groups of cells (one of 168 groups of cells), and the first identifier ($N_{\mathrm{ID}}^{(2)}$) indicates a cell within the one group of cells (one of three cells with the group of cells). *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.

395. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the '204 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '204 patent.

396. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '204 patent.

397. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '204 patent.

398. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical

information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '204 patent.

399. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[93] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[94]

400. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[95] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[96] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

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[93] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[94] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[95] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[96] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

401. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[97]

402. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '204 patent and how those steps induce infringement of the '204 patent.

403. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '204 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '204 patent.

404. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 8. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '204 patent and are not staple articles of commerce.

405. As shown in paragraphs 387–394, each of the Accused LTE Devices is configured to implement the functionalities for processing a primary synchronization signal and a secondary synchronization signal as recited in claim 7 of the '204 patent and is not suitable for substantial non-infringing uses.

406. Qualcomm has been on notice of the patent application number resulting in the '204 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the '204 patent since at least as early as the

[97] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm's knowledge of the '204 patent, knowledge of infringement of the '204 patent, intent to encourage others to infringe the '204 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '204 patent by others in the United States.

407. Qualcomm has known of the '204 patent and/or its application even before it received the 2017 LTE Notice Letter, 2020 Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '204 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm's knowledge of the '204 patent, knowledge of infringement of the '204 patent, intent to encourage others to infringe the '204 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '204 patent by others in the United States.

408. Qualcomm's infringement of the '204 patent has been and continues to be deliberate and with willful disregard of the '204 patent.

COUNT ELEVEN
INFRINGEMENT OF U.S. PATENT NO. 8,311,031

409. Sol IP realleges and incorporates each of preceding paragraphs 1–408.

410. On November 13, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,311,031 ("the '031 patent"), titled "Cell Search Method, Forward

Link Frame Transmission Method, Apparatus Using the Same and Forward Link Frame Structure." A true and correct copy of the '031 patent is attached as Exhibit 11.

411. Sol IP is the exclusive licensee of the '031 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

412. The '031 patent is valid and enforceable.

413. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '031 patent, including at least claim 8, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '031 patent without authority, either literally and/or under the doctrine of equivalents.

414. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 8 of the '031 patent.

415. The preamble of claim 8 of the '031 patent recites "[an] apparatus for performing cell search in a wireless communication system." To the extent the preamble limits the claim, each Accused LTE Device is an apparatus for performing cell search in a wireless communication system.

416. Claim 8 of the '031 patent recites "a controller configured to identify a cell ID using a primary synchronization sequence (PSS) carrying partial information of a cell identification and at least one secondary synchronization sequence (SSS) carrying remaining information of the cell identification." As recited in claim 8 of the '031 patent and in accordance with at least 3GPP Release 8, Section 4.1, each Accused LTE Device includes a controller configured to identify a cell ID ($N_{\mathrm{ID}}^{\mathrm{cell}}$) using a sequence $d(n)$ used for the primary synchronization signal and at least one

sequence $d(0),\ldots,d(61)$ used for the secondary synchronization signal. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1. As recited in claim 8 of the '031 patent and in accordance with at least 3GPP Release 8, Sections 6.11, 6.11.1, and 6.11.2, the sequence $d(n)$ used for the primary synchronization signal carries partial information ($N_{\mathrm{ID}}^{(2)}$) for identifying a cell and the sequence $d(0),\ldots,d(61)$ used for the secondary synchronization signal carries the remaining information ($N_{\mathrm{ID}}^{(1)}$) for identifying a cell. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.11, 6.11.1.

417. Claim 8 of the '031 patent recites that "the PSS is one of a plurality of different PSSs that the wireless communication system employs, and the PSS is repeatedly disposed in at least two symbols in a frame, and different SSSs are disposed in at least two symbols in the frame." As recited in claim 8 of the '031 patent and in accordance with at least 3GPP Release 8, Section 6.11.1.2, the sequence $d(n)$ used for the primary synchronization signal is one of a plurality of different sequences that the wireless communication system employs and the sequence $d(n)$ used for the primary synchronization signal is repeatedly disposed in at least two OFDM symbols in a frame. *See e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.1. As recited in claim 8 of the '031 patent and in accordance with at least 3GPP Release 8, Section 6.11.2.2, different sequences $d(0),\ldots,d(61)$ used for the secondary synchronization signal are disposed in at least two OFDM symbols in the frame. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.2.

418. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 8 of the '031 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '031 patent.

419. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 8 of the '031 patent.

420. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 8 of the '031 patent.

421. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '031 patent.

422. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[98] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[99]

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[98] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[99] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

423. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[100] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[101] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

424. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[102]

425. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '031 patent and how those steps induce infringement of the '031 patent.

426. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 8 of the '031 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '031 patent.

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[100] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).
[101] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).
[102] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

427. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 8. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the ’031 patent and are not staple articles of commerce.

428. As shown in paragraphs 414–417, each of the Accused LTE Devices is configured to implement the functionalities for processing a primary synchronization signal and a secondary synchronization signal as recited in claim 8 of the ’031 patent and is not suitable for substantial non-infringing uses.

429. Qualcomm has been on notice of the ’031 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter. Additionally, Qualcomm has been on notice of the ’031 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’031 patent, knowledge of infringement of the ’031 patent, intent to encourage others to infringe the ’031 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’031 patent by others in the United States.

430. Qualcomm has known of the ’031 patent and/or its application even before it received the 2017 LTE Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’031 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’031 patent, knowledge of infringement of the ’031

patent, intent to encourage others to infringe the '031 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '031 patent by others in the United States.

431. Qualcomm's infringement of the '031 patent has been and continues to be deliberate and with willful disregard of the '031 patent.

COUNT TWELVE
INFRINGEMENT OF U.S. PATENT NO. 9,888,435

432. Sol IP realleges and incorporates each of preceding paragraphs 1–431.

433. On February 6, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,888,435 ("the '435 patent"), titled "Generating Downlink Frame and Searching for Cell." A true and correct copy of the '435 patent is attached as Exhibit 12.

434. Sol IP is the exclusive licensee of the '435 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

435. The '435 patent is valid and enforceable.

436. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '435 patent, including at least claim 1, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '435 patent without authority, either literally and/or under the doctrine of equivalents.

437. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 1 of the '435 patent.

438. The preamble of claim 1 of the ’435 patent recites “[a] method of generating a downlink frame.” To the extent the preamble limits the claim, each Accused LTE Device performs a method of generating a downlink radio frame.

439. Claim 1 of the ’435 patent recites “generating a first primary synchronization signal.” As recited in claim 1 of the ’435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 6.1.2 and 6.11.1.1, each Accused LTE Device generates a first primary synchronization signal. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.1.2, 6.11.1.1.

440. Claim 1 of the ’435 patent recites “generating a first secondary synchronization signal.” As recited in claim 1 of the ’435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 6.1.2 and 6.11.2.1, each Accused LTE Device generates a first secondary synchronization signal. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 6.1.2, 6.11.2.1.

441. Claim 1 of the ’435 patent recites “generating a downlink frame comprising the first primary synchronization signal and the first secondary synchronization signal.” As recited in claim 1 of the ’435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 4, 4.1, and 6.1.2, each Accused LTE Device generates a downlink radio frame comprising the first primary synchronization signal and the first secondary synchronization signal. *See, e.g.*, TS 36.211 V8.9.0 §§ 4, 4.1, 6.1.2.

442. Claim 1 of the ’435 patent recites “transmitting the downlink frame, wherein the first secondary synchronization signal comprises a first sequence and a second sequence, the first sequence being a third sequence scrambled with a first scrambling sequence, and the second sequence being a fourth sequence scrambled with a second scrambling sequence and a third scrambling sequence, the third sequence and the fourth sequence are generated based on a cell identity group, and the first primary synchronization signal is generated based on a cell identity

within the cell identity group." As recited in claim 1 of the '435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 6.1.2 and 6.3, each Accused LTE Device transmits a downlink radio frame. *See, e.g.*, TS 36.211 V8.9.0 §§ 6.1.2, 6.3. As recited in claim 1 of the '435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2.1, the first secondary synchronization signal comprises a length-62 sequence $d(0),...,d(61)$ comprising two shorter length-31 sequences $d(2n)$ and $d(2n+1)$ where $0 \le n \le 30$. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.2.1. As recited in claim 1 of the '435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2.1, the first sequence ($d(2n)$) comprises a third sequence $s_1^{(m_1)}(n)$ scrambled with a first scrambling sequence $c_0(n)$, and the second sequence ($d(2n+1)$) comprises a fourth sequence $s_0^{(m_0)}(n)$ scrambled with a second scrambling sequence $c_1(n)$ and a third scrambling sequence $z_1^{(m_1)}(n)$. *See, e.g.*, TS 36.211 V8.9.0 § 6.11.2.1. As recited in claim 1 of the '435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2.1, the third sequence ($s_1^{(m_1)}(n)$) and the fourth sequence ($s_0^{(m_0)}(n)$) are determined based on the indices m_0 and m_1, which are derived from a physical-layer cell-identity group $N_{\mathrm{ID}}^{(1)}$. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.2.1. As recited in claim 1 of the '435 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.1.1, the first primary synchronization signal is generated based on a cell identity ($N_{\mathrm{ID}}^{(2)}$) within the cell identity group ($N_{\mathrm{ID}}^{(1)}$). *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.1.1.

443. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 1 of the '435 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers,

resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '435 patent.

444. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 1 of the '435 patent.

445. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 1 of the '435 patent.

446. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '435 patent.

447. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[103] For example, Qualcomm's website provides

[103] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[104]

448. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[105] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[106] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

449. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[107]

450. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '435 patent and how those steps induce infringement of the '435 patent.

451. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 1 of the '435 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner,

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[104] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[105] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[106] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[107] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the ’435 patent.

452. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 8. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the ’435 patent and are not staple articles of commerce.

453. As shown in paragraphs 437–442, each of the Accused LTE Devices is configured to implement the functionalities for generating a primary synchronization signal and a secondary synchronization signal as recited in claim 1 of the ’435 patent and is not suitable for substantial non-infringing uses.

454. Qualcomm has been on notice of the ’435 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the ’435 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’435 patent, knowledge of infringement of the ’435 patent, intent to encourage others to infringe the ’435 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’435 patent by others in the United States.

455. Qualcomm has known of the ’435 patent and/or its application even before it received the 2017 LTE Letter, 2020 Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’435 patent or its application or patent family to a 3GPP

organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm's knowledge of the '435 patent, knowledge of infringement of the '435 patent, intent to encourage others to infringe the '435 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '435 patent by others in the United States.

456. Qualcomm's infringement of the '435 patent has been and continues to be deliberate and with willful disregard of the '435 patent.

COUNT THIRTEEN
INFRINGEMENT OF U.S. PATENT NO. 10,383,041

457. Sol IP realleges and incorporates each of preceding paragraphs 1–456.

458. On August 13, 2019, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,383,041 ("the '041 patent"), titled "Generating Downlink Frame and Searching for Cell." A true and correct copy of the '041 patent is attached as Exhibit 13.

459. Sol IP is the exclusive licensee of the '041 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

460. The '041 patent is valid and enforceable.

461. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '041 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '041 patent without authority, either literally and/or under the doctrine of equivalents.

462. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 7 of the '041 patent.

463. The preamble of claim 7 of the '041 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused LTE Device is a communication apparatus.

464. Claim 7 of the '041 patent recites "a processor." Each Accused LTE Device includes one or more processors, wherein the one or more processors are configured to implement at least the features of 3GPP Release 8. *See supra* para. 45.

465. Claim 7 of the '041 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

466. Claim 7 of the '041 patent recites that the processor is configured to "cause the communication apparatus to receive a first primary synchronization signal." As recited in claim 7 of the '041 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 4.1, each Accused LTE Device includes one or more processors configured to cause the communication apparatus to receive a primary synchronization signal for conducting cell search. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1.

467. Claim 7 of the '041 patent recites that the processor is configured to "cause the communication apparatus to receive a first secondary synchronization signal, wherein the first secondary synchronization signal comprises a first sequence scrambled with a first scrambling sequence and a second sequence scrambled with a second scrambling sequence and a third scrambling sequence." As recited in claim 7 of the '041 patent and in accordance with at least 3GPP Release 8, TS 36.213 Section 4.1, each Accused LTE Device includes one or more

processors configured to cause the communication apparatus to receive a secondary synchronization signal. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 4.1. As recited in claim 7 of the '041 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2.1, the secondary synchronization signal comprises a first sequence ($d(2n)$) and a second sequence ($d(2n+1)$), where the first sequence ($d(2n)$) is scrambled with a first scrambling sequence ($c_0(n)$) and the second sequence ($d(2n+1)$) is scrambled with a second scrambling sequence ($c_1(n)$) and a third scrambling sequence ($z_1^{(m_0)}(n)$). *See, e.g.*, TS 36.211 V8.9.0 § 6.11.2.1.

468. Claim 7 of the '041 patent recites that the processor is configured to "cause the communication apparatus to descramble the first sequence scrambled with the first scrambling sequence based on the first primary synchronization signal." As recited in claim 7 of the '041 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2.1, each Accused LTE Device includes one or more processors configured to cause the communication apparatus to descramble the first sequence ($d(2n)$) based on the first primary synchronization signal. *See, e.g.*, TS 36.211 V8.9.0 § 6.11.2.1.

469. Claim 7 of the '041 patent recites that the processor is configured to "cause the communication apparatus to descramble the second sequence scrambled with the second scrambling sequence and the third scrambling sequence based on the first primary synchronization signal and the first sequence." As recited in claim 7 of the '041 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.2.1, each Accused LTE Device includes one or more processors configured to cause the communication apparatus to descramble second sequence ($d(2n+1)$) based on the primary synchronization signal and the first sequence ($d(2n)$). *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.2.1.

470. Claim 7 of the '041 patent recites that the processor is configured to "identify a cell at least based on the first primary synchronization signal, the first sequence and the second sequence." As recited in claim 7 of the '041 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11, each Accused LTE Device includes one or more processors configured to cause the communication apparatus to identify a cell using $N_{\mathrm{ID}}^{(1)}$, which represents the physical-layer cell-identity group, and $N_{\mathrm{ID}}^{(2)}$, which represents the cell identity within the physical-layer cell-identity group. *See, e.g.*, TS 36.211 V8.9.0 § 6.11. As recited in claim 7 of the '041 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.11.1.1 and TS 36.211 Section 6.11.2.1, $N_{\mathrm{ID}}^{(1)}$ and $N_{\mathrm{ID}}^{(2)}$ are obtained based on the primary synchronization signal, the first sequence ($d(2n)$), and the second sequence ($d(2n+1)$). *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.11.1.1; 3GPP TS 36.211 V8.9.0 § 6.11.2.1.

471. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the '041 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '041 patent.

472. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '041 patent.

473. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '041 patent.

474. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '041 patent.

475. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[108] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[109]

476. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[110] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile

[108] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).
[109] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).
[110] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

Platform (model number SM8250-AB),[111] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

477. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[112]

478. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '041 patent and how those steps induce infringement of the '041 patent.

479. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '041 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '041 patent.

480. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 8. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '041 patent and are not staple articles of commerce.

481. As shown in paragraphs 462–470, each of the Accused LTE Devices is configured to implement the functionalities for processing a primary synchronization signal and a secondary synchronization signal as recited in claim 7 of the '041 patent and is not suitable for substantial non-infringing uses.

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[111] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[112] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

482. Qualcomm has been on notice of the ’041 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the ’041 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’041 patent, knowledge of infringement of the ’041 patent, intent to encourage others to infringe the ’041 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’041 patent by others in the United States.

483. Qualcomm has known of the ’041 patent and/or its application even before it received the 2020 Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’041 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’041 patent, knowledge of infringement of the ’041 patent, intent to encourage others to infringe the ’041 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’041 patent by others in the United States.

484. Qualcomm’s infringement of the ’041 patent has been and continues to be deliberate and with willful disregard of the ’041 patent.

COUNT FOURTEEN
INFRINGEMENT OF U.S. PATENT NO. 10,148,477

485. Sol IP realleges and incorporates each of preceding paragraphs 1–484.

486. On December 4, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,148,477 ("the '477 patent"), titled "Method and Apparatus for Transmitting ACK/NACK." A true and correct copy of the '477 patent is attached as Exhibit 14.

487. Sol IP is the exclusive licensee of the '477 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

488. The '477 patent is valid and enforceable.

489. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '477 patent, including at least claim 25, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '477 patent without authority, either literally and/or under the doctrine of equivalents.

490. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 25 of the '477 patent.

491. The preamble of claim 25 of the '477 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused LTE Device is a communication apparatus.

492. Claim 25 of the '477 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

493. Claim 25 of the '477 patent recites "a processor coupled to the memory." Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 8. *See supra* para. 45.

494. Claim 25 of the ’477 patent recites that the processor is configured to “cause the apparatus to receive cyclic shift information for reference signal.” As recited in claim 25 of the ’477 patent and in accordance with at least 3GPP Release 8, TS 36.212 Section 5.3.3.1.1, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive cyclic shift information for demodulation reference signal (DMRS) field in a downlink control information (DCI) format 0. *See, e.g.*, 3GPP TS 36.212 V8.8.0 § 5.3.3.1.1.

495. Claim 25 of the ’477 patent recites that the processor is configured to “determine a dynamic cyclic shift value based on the cyclic shift information for reference signal.” As recited in claim 25 of the ’477 patent and in accordance with at least 3GPP Release 8, TS 36.212 Section 5.3.3.1.1, each Accused LTE Device includes one or more processors configured to determine a dynamic cyclic shift value $n_{\mathrm{DMRS}}^{(2)}$ based on the cyclic shift for DMRS field in DCI format 0. *See, e.g.*, 3GPP TS 36.212 V8.8.0 § 5.3.3.1.1; 3GPP TS 36.211 V8.9.0 § 5.5.2.1.1.

496. Claim 25 of the ’477 patent recites that the processor is configured to “generate a reference signal by cyclically shifting a sequence at least based on the dynamic cyclic shift value.” As recited in claim 25 of the ’477 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 5.5, 5.5.1 and 5.5.2.1.1, each Accused LTE Device includes one or more processors configured to generate a demodulation reference signal sequence $r^{\mathrm{PUSCH}}(\cdot)$ for physical uplink shared channel (PUSCH) by cyclically shifting a base sequence $\bar{r}_{u,v}(n)$ at least based on the dynamic cyclic shift value $n_{\mathrm{DMRS}}^{(2)}$. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 5.5, 5.5.1, 5.5.2.1.1.

497. Claim 25 of the ’477 patent recites that the processor is configured to “cause the apparatus to transmit data and the reference signal using one or more uplink radio resources.” As recited in claim 25 of the ’477 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 5.1.1, 5.1.2, 5.3, and 5.5.2-5.5.2.1.1, each Accused LTE Device includes one or more

processors configured to cause the apparatus to transmit data and the reference signal using one or more uplink radio resources, such as PUSCH. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 5.1.1, 5.1.2, 5.3, 5.5.2-5.5.2.1.1.

498. Claim 25 of the '477 patent recites that the processor is configured to "cause the apparatus to receive ACK/NACK (Acknowledgement/Negative Acknowledgement) for the transmitted data using a Physical Hybrid ARQ Indicator Channel (PHICH) resource, wherein the dynamic cyclic shift value is determined based on the cyclic shift information for reference signal according to Table 9 and the PHICH resource is determined at least based on the cyclic shift information for reference signal

TABLE 9

cyclic shift information for reference signal	dynamic cyclic shift value
000	0
001	6
010	3
011	4
100	2
101	8
110	10
111	9.

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As recited in claim 25 of the '477 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.1.1 and TS 36.213 Section 9.1.2, each Accused LTE Device includes one or more processors configured to cause the apparatus to receive hybrid automatic repeat request (ARQ) acknowledgement/negative acknowledgement (ACK/NACK) using a physical hybrid ARQ indicator channel (PHICH) resource. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.1.1; 3GPP TS 36.213 V8.8.0 § 9.1.2. As recited in claim 25 of the '477 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 5.5.2.1.1, the dynamic cyclic shift value $n_{\mathrm{DMRS}}^{(2)}$ is determined based on the cyclic shift for DMRS field in DCI format 0 as given in Table 5.5.2.1.1-1:

Table 5.5.2.1.1-1: Mapping of Cyclic Shift Field in DCI format 0 to $n_{\mathrm{DMRS}}^{(2)}$ Values.

Cyclic Shift Field in DCI format 0 [3]	$n_{\mathrm{DMRS}}^{(2)}$
000	0
001	6
010	3
011	4
100	2
101	8
110	10
111	9

See, e.g., 3GPP TS 36.211 V8.9.0 § 5.5.2.1.1. As recited in claim 25 of the '477 patent and in accordance with at least 3GPP Release 8, TS 36.213 V8.8.0 Section 9.1.2, the PHICH resource is determined based on the cyclic shift for DMRS field in DCI format 0. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 9.1.2.

499. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 25 of the '477 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '477 patent.

500. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and

Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 25 of the '477 patent.

501. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 25 of the '477 patent.

502. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '477 patent.

503. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[113] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[114]

504. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[115] For example, Qualcomm's website

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[113] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[114] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[115] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[116] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

505. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[117]

506. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '477 patent and how those steps induce infringement of the '477 patent.

507. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 25 of the '477 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '477 patent.

508. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 8. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '477 patent and are not staple articles of commerce.

509. As shown in paragraphs 490–498, each of the Accused LTE Devices is configured to implement the functionalities for processing a PHICH resource based on the cyclic shift for DMRS field in DCI format 0 as recited in claim 25 of the '477 patent and is not suitable for substantial non-infringing uses.

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[116] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[117] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

510. Qualcomm has been on notice of the ’477 patent since at least as early as November 17, 2017, when it received the 2017 LTE Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the ’477 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’477 patent, knowledge of infringement of the ’477 patent, intent to encourage others to infringe the ’477 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’477 patent by others in the United States.

511. Qualcomm has known of the ’477 patent and/or its application even before it received the 2017 LTE Letter, 2020 Notice Letter, and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’477 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’477 patent, knowledge of infringement of the ’477 patent, intent to encourage others to infringe the ’477 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’477 patent by others in the United States.

512. Qualcomm’s infringement of the ’477 patent has been and continues to be deliberate and with willful disregard of the ’477 patent.

COUNT FIFTEEN
INFRINGEMENT OF U.S. PATENT NO. 10,749,722

513. Sol IP realleges and incorporates each of preceding paragraphs 1–512.

514. On August 18, 2020, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,749,722 ("the '722 patent"), titled "Method and Apparatus for Transmitting ACK/NACK." A true and correct copy of the '722 patent is attached as Exhibit 15.

515. Sol IP is the exclusive licensee of the '722 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

516. The '722 patent is valid and enforceable.

517. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '722 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '722 patent without authority, either literally and/or under the doctrine of equivalents.

518. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 8, thereby infringing at least claim 7 of the '722 patent.

519. The preamble of claim 7 of the '722 patent recites "[a] communication device for a user equipment (UE)." To the extent the preamble limits the claim, each Accused LTE Device is a communication device for a user equipment.

520. Claim 7 of the '722 patent recites "a circuitry." Each Accused LTE Device includes one or more circuitries configured to implement at least the features of 3GPP Release 8. *See supra* para. 46.

521. Claim 7 of the '722 patent recites that the circuitry is configured to "cause the UE to receive cyclic shift information for reference signal." As recited in claim 7 of the '722 patent and in accordance with at least 3GPP Release 8, TS 36.212 Section 5.3.3.1.1, each Accused LTE Device includes one or more circuitries configured to cause the UE to receive a cyclic shift for demodulation reference signal (DMRS) field in downlink control information (DCI) format 0. *See, e.g.*, 3GPP TS 36.212 V8.8.0 § 5.3.3.1.1.

522. Claim 7 of the '722 patent recites that the circuitry is configured to "determine a dynamic cyclic shift value based on the cyclic shift information for reference signal." As recited in claim 7 of the '722 patent and in accordance with at least 3GPP Release 8, TS 36.212 Section 5.3.3.1.1, each Accused LTE Device includes one or more circuitries configured to determine a dynamic cyclic shift value $n_{\mathrm{DMRS}}^{(2)}$ based on the cyclic shift for DMRS field in DCI format 0. *See, e.g.*, 3GPP TS 36.212 V8.8.0 § 5.3.3.1.1; 3GPP TS 36.211 V8.9.0 § 5.5.2.1.1.

523. Claim 7 of the '722 patent recites that the circuitry is configured to "generate a reference signal by cyclically shifting a sequence at least based on the dynamic cyclic shift value." As recited in claim 7 of the '722 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 5.5, 5.5.1 and 5.5.2.1.1, each Accused LTE Device includes one or more circuitries configured to generate a demodulation reference signal sequence $r^{\mathrm{PUSCH}}(\cdot)$ for physical uplink shared channel (PUSCH) by cyclically shifting a base sequence $\bar{r}_{u,v}(n)$ at least based on the dynamic cyclic shift value $n_{\mathrm{DMRS}}^{(2)}$. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 5.5, 5.5.1, 5.5.2.1.1.

524. Claim 7 of the '722 patent recites that the circuitry is configured to "cause the UE to transmit data and the reference signal using one or more uplink radio resources." As recited in claim 7 of the '722 patent and in accordance with at least 3GPP Release 8, TS 36.211 Sections 5.1.1, 5.1.2, 5.3, and 5.5.2-5.5.2.1.1, each Accused LTE Device includes one or more circuitries

configured to cause the UE to transmit data and the reference signal using one or more uplink radio resources, such as PUSCH. *See, e.g.*, 3GPP TS 36.211 V8.9.0 §§ 5.1.1, 5.1.2, 5.3, 5.5.2-5.5.2.1.1.

525. Claim 7 of the '722 patent recites that the circuitry is configured to "cause the UE to receive an acknowledgement for the transmitted data using a Physical Hybrid ARQ Indicator Channel (PHICH) resource, wherein the dynamic cyclic shift value is determined based on the cyclic shift information for reference signal according to Table 3 and the PHICH resource is determined at least based on the cyclic shift information for reference signal

TABLE 3

cyclic shift information for reference signal	dynamic cyclic shift value
000	0
001	6
010	3
011	4
100	2
101	8
110	10
111	9.

."

As recited in claim 7 of the '722 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 6.1.1 and TS 36.213 Section 9.1.2, each Accused LTE Device includes one or more circuitries configured to cause the UE to receive hybrid automatic repeat request (ARQ) acknowledgement/negative acknowledgement (ACK/NACK) using a physical hybrid ARQ indicator channel (PHICH) resource. *See, e.g.*, 3GPP TS 36.211 V8.9.0 § 6.1.1; 3GPP TS 36.213 V8.8.0 § 9.1.2. As recited in claim 7 of the '722 patent and in accordance with at least 3GPP Release 8, TS 36.211 Section 5.5.2.1.1, the dynamic cyclic shift value $n_{\mathrm{DMRS}}^{(2)}$ is determined based on the cyclic shift for DMRS field in DCI format 0 as given in Table 5.5.2.1.1-1:

Table 5.5.2.1.1-1: Mapping of Cyclic Shift Field in DCI format 0 to $n_{\mathrm{DMRS}}^{(2)}$ Values.

Cyclic Shift Field in DCI format 0 [3]	$n_{\mathrm{DMRS}}^{(2)}$
000	0
001	6
010	3
011	4
100	2
101	8
110	10
111	9

See, e.g., 3GPP TS 36.211 V8.9.0 § 5.5.2.1.1. As recited in claim 7 of the '722 patent and in accordance with at least 3GPP Release 8, TS 36.213 V8.8.0 Section 9.1.2, the PHICH resource is determined based on a the cyclic shift information cyclic shift for DMRS field in DCI format 0. *See, e.g.*, 3GPP TS 36.213 V8.8.0 § 9.1.2.

526. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the '722 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '722 patent.

527. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and

Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '722 patent.

528. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '722 patent.

529. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '722 patent.

530. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[118] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[119]

531. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[120] For example, Qualcomm's website

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[118] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[119] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[120] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[121] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

532. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[122]

533. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '722 patent and how those steps induce infringement of the '722 patent.

534. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '722 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '722 patent.

535. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 8. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '722 patent and are not staple articles of commerce.

536. As shown in paragraphs 518–525, each of the Accused LTE Devices is configured to implement the functionalities for processing a PHICH resource based on the cyclic shift for DMRS field in DCI format 0 as recited in claim 7 of the '722 patent and is not suitable for substantial non-infringing uses.

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[121] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[122] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

537. Qualcomm has been on notice of the patent application number resulting in the '722 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the '722 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '722 patent, knowledge of infringement of the '722 patent, intent to encourage others to infringe the '722 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '722 patent by others in the United States.

538. Qualcomm has known of the '722 patent and/or its application even before it received the 2020 Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the '722 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm's knowledge of the '722 patent, knowledge of infringement of the '722 patent, intent to encourage others to infringe the '722 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '722 patent by others in the United States.

539. Qualcomm's infringement of the '722 patent has been and continues to be deliberate and with willful disregard of the '722 patent.

COUNT SIXTEEN
INFRINGEMENT OF U.S. PATENT NO. 10,271,349

540. Sol IP realleges and incorporates each of preceding paragraphs 1–539.

541. On April 23, 2019, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,271,349 ("the '349 patent"), titled "Scheduling Apparatus and Method for Multicast Broadcast Service." A true and correct copy of the '349 patent is attached as Exhibit 16.

542. Sol IP is the exclusive licensee of the '349 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

543. The '349 patent is valid and enforceable.

544. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '349 patent, including at least claim 21, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '349 patent without authority, either literally and/or under the doctrine of equivalents.

545. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 10, thereby infringing at least claim 21 of the '349 patent.

546. The preamble of claim 21 of the '349 patent recites "[a] communication device for a user equipment (UE)." To the extent the preamble limits the claim, each Accused LTE Device is a communication device for a user equipment.

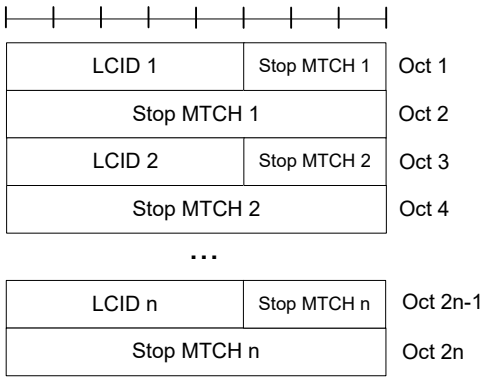
547. Claim 21 of the '349 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

548. Claim 21 of the '349 patent recites "a processor operably coupled to the memory." Each Accused LTE Device includes one or more processors operably coupled to the one or more

memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 10. *See supra* para. 45.

549. Claim 21 of the '349 patent recites that the processor is configured to "cause the UE to receive a plurality of subframes including a first subframe during a first period." As recited in claim 21 of the '349 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.12 and TS 36.300 Section 15.3.3, each Accused LTE Device includes one or more processors configured to cause the UE to receive a plurality of subframes including a first subframe allocated to a multicast channel (MCH) within a MCH scheduling period. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 5.12; 3GPP TS 36.300 V10.4.0 § 15.3.3.

550. Claim 21 of the '349 patent recites that the processor is configured to "cause the UE to obtain a first message from the first subframe, wherein the first message comprises a first identifier, a first value, a second identifier and a second value." As recited in claim 21 of the '349 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.12., each Accused LTE Device includes one or more processors configured to cause the UE to obtain an MCH scheduling information medium access control (MAC) control element from the first subframe. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 5.12. As recited in claim 21 of the '349 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 6.1.3.7, the MCH scheduling information MAC control element comprises a first logical channel ID (LCID) in LCID 1 field, a first value in Stop Multicast Traffic Channel (MTCH) 1 field, a second logical channel ID in LCID 2 field, and a second value in Stop MTCH 2 field:



See, e.g., 3GPP TS 36.321 V10.4.0 § 6.1.3.7.

551. Claim 21 of the '349 patent recites that the processor is configured to "cause the UE to obtain a first multimedia service during the first period based on the first identifier and the first value." As recited in claim 21 of the '349 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.12, each Accused LTE Device includes one or more processors configured to cause the UE to obtain a first scheduled MTCH based on the first LCID and the first value. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 5.12.

552. Claim 21 of the '349 patent recites that the processor is configured to "determine that a second multimedia service is not provided during the first period based on the second identifier and the second value, wherein: the first subframe comprises the first message, the first subframe is received before other subframes of the plurality of subframes are received, and the second value is equal to a predetermined value indicating that the second service is not provided during the first period." As recited in claim 21 of the '349 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 6.1.3.7, each Accused LTE Device includes one or more processors configured to determine that an MTCH is not scheduled based on the logical channel ID and Stop MTCH value. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 6.1.3.7. As recited in claim 21 of the '349 patent and in accordance with at least 3GPP Release 10, TS 36.300 Section 15.3.3 and TS 36.321 Section 5.12, the MCH Scheduling Information MAC control element is included in

the first subframe allocated to the MCH within the MCH scheduling period and is provided at the beginning of the MCH scheduling period before other subframes of the plurality of subframes are received. *See, e.g.*, 3GPP TS 36.300 V10.4.0 § 15.3.3; 3GPP TS 36.321 V10.4.0 § 5.12. As recited in claim 21 of the '349 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 6.1.3.7, the Stop MTCH value being equal to a predetermined special Stop MTCH value 2047 indicates that the corresponding MTCH is not scheduled. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 6.1.3.7.

553. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 21 of the '349 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '349 patent.

554. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 21 of the '349 patent.

555. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 21 of the '349 patent.

556. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and

marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '349 patent.

557. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[123] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[124]

558. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[125] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[126] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

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[123] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[124] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[125] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[126] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

559. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[127]

560. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[128]

561. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '349 patent and how those steps induce infringement of the '349 patent.

562. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 21 of the '349 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '349 patent.

563. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 10. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '349 patent and are not staple articles of commerce.

564. As shown in paragraphs 545–552, each of the Accused LTE Devices is configured to implement the functionalities for processing an MCH scheduling information MAC control element as recited in claim 21 of the '349 patent and is not suitable for substantial non-infringing uses.

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[127] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

[128] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 14, 2021).

565. Qualcomm has been on notice of the ’349 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the ’349 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’349 patent, knowledge of infringement of the ’349 patent, intent to encourage others to infringe the ’349 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’349 patent by others in the United States.

566. Qualcomm has known of the ’349 patent and/or its application even before it received the 2020 Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’349 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’349 patent, knowledge of infringement of the ’349 patent, intent to encourage others to infringe the ’349 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’349 patent by others in the United States.

567. Qualcomm’s infringement of the ’349 patent has been and continues to be deliberate and with willful disregard of the ’349 patent.

COUNT SEVENTEEN
INFRINGEMENT OF U.S. PATENT NO. 10,687,351

568. Sol IP realleges and incorporates each of preceding paragraphs 1–567.

569. On June 16, 2020, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,687,351 ("the '351 patent"), titled "Scheduling Apparatus and Method for Multicast Broadcast Service." A true and correct copy of the '351 patent is attached as Exhibit 17.

570. Sol IP is the exclusive licensee of the '351 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

571. The '351 patent is valid and enforceable.

572. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '351 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '351 patent without authority, either literally and/or under the doctrine of equivalents.

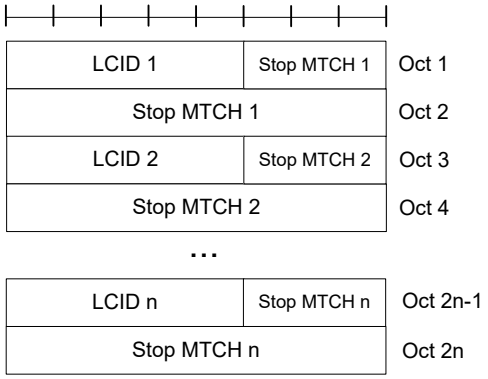
573. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 10, thereby infringing at least claim 7 of the '351 patent.

574. The preamble of claim 7 of the '351 patent recites "[a] method for receiving a service." To the extent the preamble limits the claim, each Accused LTE Device performs a method for receiving a service.

575. Claim 7 of the '351 patent recites "receiving a first subframe during a first period, wherein the first subframe comprises a first message." As recited in claim 7 of the '351 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.12 and TS 36.300 Section 15.3.3, each Accused LTE Device receives a first subframe allocated to a multicast channel (MCH) within a MCH scheduling period. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 5.12; 3GPP TS 36.300

V10.4.0 § 15.3.3. As recited in claim 7 of the '351 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.12, the first subframe includes an MCH scheduling information medium access control (MAC) control element. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 5.12.

576. Claim 7 of the '351 patent recites "obtaining a first information unit and a second information unit from the first message, wherein the first information unit comprises a first field comprising a first identifier and a second field comprising a first value, the second information unit comprises a third field comprising a second identifier and a fourth field comprising a second value, wherein the first identifier indicates a first service and the second identifier indicates a second service, and wherein the first value indicates an end point where the first service ends in the first period and the second value is a predetermined value which indicates that the second service is not provided during the first period." As recited in claim 7 of the '351 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 6.1.3.7, each Accused LTE Device obtains a first information unit (Oct 1 and Oct 2) and a second information unit (Oct 3 and Oct 4) from the MCH Scheduling Information MAC control element:



See, e.g., 3GPP TS 36.321 V10.4.0 § 6.1.3.7. As recited in claim 7 of the '351 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 6.1.3.7, the first information unit comprises a first field (logical channel ID (LCID) 1) comprising a first identifier and a second field (Stop Multicast Traffic Channel (MTCH) 1) comprising a first value, the second information unit

comprises a third field (LCID 2) comprising a second identifier and a fourth field (Stop MTCH 2) comprising a second value, wherein the first identifier indicates a first service (first MTCH), and the second identifier indicates a second service (second MTCH), and wherein the first value indicates an end point where the corresponding MTCH stops in the first period and the second value is a predetermined special Stop MTCH value 2047 that indicates that the second service is not scheduled during the first period. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 6.1.3.7.

577. Claim 7 of the ’351 patent recites “determining that the second service is not to be provided during the first period based on the second value.” As recited in claim 7 of the ’351 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 6.1.3.7 and TS 36.300 Section 15.3.3, each Accused LTE Device determines that the second service is not to be provided during the first period based on the special Stop MTCH value when multiple services are multiplexed onto the MCH. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 6.1.3.7; 3GPP TS 36.300 V10.4.0 § 15.3.3.

578. Claim 7 of the ’351 patent recites “receiving the first service based on the first value.” As recited in claim 7 of the ’351 patent and in accordance with at least 3GPP Release 10, TS 36.321 Section 5.12 and TS 36.321 Section 6.1.3.7, each Accused LTE Device receives the first scheduled MTCH based on the first Stop MTCH value. *See, e.g.*, 3GPP TS 36.321 V10.4.0 § 5.12; 3GPP TS 36.321 V10.4.0 § 6.1.3.7.

579. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the ’351 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the ’351 patent.

580. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '351 patent.

581. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 7 of the '351 patent.

582. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '351 patent.

583. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[129] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[130]

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[129] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[130] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

584. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[131] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[132] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

585. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[133]

586. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '351 patent and how those steps induce infringement of the '351 patent.

587. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '351 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '351 patent.

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[131] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).
[132] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).
[133] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

588. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 10. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the ’351 patent and are not staple articles of commerce.

589. As shown in paragraphs 573–578, each of the Accused LTE Devices is configured to implement the functionalities for processing an MCH scheduling information MAC control element as recited in claim 7 of the ’351 patent and is not suitable for substantial non-infringing uses.

590. Qualcomm has been on notice of the patent application resulting in the ’351 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the ’351 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’351 patent, knowledge of infringement of the ’351 patent, intent to encourage others to infringe the ’351 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’351 patent by others in the United States.

591. Qualcomm has known of the ’351 patent and/or its application even before it received the 2020 Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’351 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’351 patent, knowledge of infringement of the ’351

patent, intent to encourage others to infringe the ’351 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’351 patent by others in the United States.

592. Qualcomm’s infringement of the ’351 patent has been and continues to be deliberate and with willful disregard of the ’351 patent.

COUNT EIGHTEEN
INFRINGEMENT OF U.S. PATENT NO. 8,593,936

593. Sol IP realleges and incorporates each of preceding paragraphs 1–592.

594. On November 26, 2013, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,593,936 (“the ’936 patent”), titled “Carrier Aggregation in Wireless Communication Systems.” A true and correct copy of the ’936 patent is attached as Exhibit 18.

595. Sol IP is the exclusive licensee of the ’936 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

596. The ’936 patent is valid and enforceable.

597. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’936 patent, including at least claim 1, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the ’936 patent without authority, either literally and/or under the doctrine of equivalents.

598. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 10, thereby infringing at least claim 1 of the ’936 patent.

599. The preamble of claim 1 of the '936 patent recites "[a] method of transmitting data at a first terminal in a wireless communication system." To the extent the preamble limits the claim and in accordance with at least 3GPP Release 10, TS 36.211 §§ 4-4.1, each Accused LTE Device is configured to transmit uplink control information in physical uplink control channel (PUCCH) format 3 in one radio subframe that comprises two time slots.

600. Claim 1 of the '936 patent recites "multiplying a plurality of data symbols, included in a first slot, with a first orthogonal sequence." As recited in claim 1 of the '936 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, each Accused LTE Device multiplies a plurality of data symbols ($d(i)$)with a first orthogonal sequence ($w^{(\tilde{p})}_{n_{oc},0}(\overline{n})$). *See, e.g.*, 3GPP TS 36.211 V10.1.0 § 5.4.2A. As recited in claim 1 of the '936 patent and in accordance with at least 3GPP Release 10, TS 36.211 Sections 4-4.1 and TS 36.211 Section 5.4.2A, the plurality of data symbols ($d(i)$) multiplied with a first orthogonal sequence ($w^{(\tilde{p})}_{n_{oc},0}(\overline{n})$) are sent in the first slot (when $n < N^{\text{PUCCH}}_{\text{SF},0}$). *See, e.g.*, 3GPP Release 10, TS 36.211 §§ 4-4.1; 3GPP TS 36.211 V10.1.0 § 5.4.2A.

601. Claim 1 of the '936 patent recites "multiplying a plurality of data symbols, included in a second slot, with a second orthogonal sequence." As recited in claim 1 of the '936 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, each Accused LTE Device multiplies a plurality of data symbols ($d(N^{\text{RB}}_{\text{sc}}+i)$) with a second orthogonal sequence ($w^{(\tilde{p})}_{n_{oc},1}(\overline{n})$). *See, e.g.*, 3GPP TS 36.211 V10.1.0 § 5.4.2A. As recited in claim 1 of the '936 patent and in accordance with at least 3GPP Release 10, TS 36.211 Sections 4-4.1 and TS 36.211 Section 5.4.2A, the plurality of data symbols ($d(N^{\text{RB}}_{\text{sc}}+i)$) multiplied with a second orthogonal sequence

($w_{n_{oc},1}^{(\tilde{p})}(\bar{n})$) are sent in the second slot (when $n \geq N_{SF,0}^{PUCCH}$). *See, e.g.*, 3GPP Release 10, TS 36.211 §§ 4-4.1; 3GPP TS 36.211 V10.1.0 § 5.4.2A.

602. Claim 1 of the '936 patent recites "transmitting, to a base station, the data symbols included in the first slot and the data symbols included in the second slot, wherein the first orthogonal sequence and the second orthogonal sequence are selected from orthogonal sequences of Table 1,

TABLE 1

Sequence index	orthogonal sequence
0	[1 1 1 1 1]
1	[1 $e^{j2\pi/5}$ $e^{j4\pi/5}$ $e^{j6\pi/5}$ $e^{j8\pi/5}$]
2	[1 $e^{j4\pi/5}$ $e^{j8\pi/5}$ $e^{j12\pi/5}$ $e^{j16\pi/5}$]
3	[1 $e^{j6\pi/5}$ $e^{j12\pi/5}$ $e^{j18\pi/5}$ $e^{j24\pi/5}$]
4	[1 $e^{j8\pi/5}$ $e^{j16\pi/5}$ $e^{j24\pi/5}$ $e^{j32\pi/5}$]

and the index of the second orthogonal sequence is determined based on the index of the first orthogonal sequence according to Table 2

TABLE 2

Index of first orthogonal sequence	Index of second orthogonal sequence
0	0
1	3
2	1
3	4
4	2

."

As recited in claim 1 of the '936 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, each Accused LTE Device transmits the data symbols in the normal PUCCH format 3. *See, e.g.*, 3GPP TS 36.211 V10.1.0 § 5.4.2A. As recited in claim 1 of the '936 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, for the normal PUCCH format 3, $N_{SF,0}^{PUCCH} = N_{SF,1}^{PUCCH} = 5$ for both slots in a subframe and, as such, the first and

second orthogonal sequences, $w^{(\tilde{p})}_{n_{oc},0}(\overline{n})$ and $w^{(\tilde{p})}_{n_{oc},1}(\overline{n})$ respectively, are selected from the orthogonal sequences of the $N^{PUCCH}_{SF}=5$ column of Table 5.4.2A-1 of 3GPP TS 36.211:

Table 5.4.2A-1: The orthogonal sequence $w_{n_{oc}}(i)$.

Sequence index n_{oc}	Orthogonal sequence $\left[w_{n_{oc}}(0) \quad \cdots \quad w_{n_{oc}}(N^{PUCCH}_{SF}-1)\right]$	
	$N^{PUCCH}_{SF}=5$	$N^{PUCCH}_{SF}=4$
0	$[1 \quad 1 \quad 1 \quad 1 \quad 1]$	$[+1 \quad +1 \quad +1 \quad +1]$
1	$[1 \quad e^{j2\pi/5} \quad e^{j4\pi/5} \quad e^{j6\pi/5} \quad e^{j8\pi/5}]$	$[+1 \quad -1 \quad +1 \quad -1]$
2	$[1 \quad e^{j4\pi/5} \quad e^{j8\pi/5} \quad e^{j2\pi/5} \quad e^{j6\pi/5}]$	$[+1 \quad +1 \quad -1 \quad -1]$
3	$[1 \quad e^{j6\pi/5} \quad e^{j2\pi/5} \quad e^{j8\pi/5} \quad e^{j4\pi/5}]$	$[+1 \quad -1 \quad -1 \quad +1]$
4	$[1 \quad e^{j8\pi/5} \quad e^{j6\pi/5} \quad e^{j4\pi/5} \quad e^{j2\pi/5}]$	-

See, e.g., 3GPP TS 36.211 V10.1.0 § 5.4.2A. As recited in claim 1 of the '936 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, in the normal PUCCH format 3 (where $N^{PUCCH}_{SF,0}=N^{PUCCH}_{SF,1}=5$ for both slots in a subframe), the sequence index of the first orthogonal sequence ($n^{(\tilde{p})}_{oc,0}$) is given by the equation $n^{(\tilde{p})}_{oc,0}=n^{(3,\tilde{p})}_{PUCCH} \bmod 5$ and, as such, the index of the first orthogonal sequence can take the values 0, 1, 2, 3, and 4, and the index of the second orthogonal sequence ($n^{(\tilde{p})}_{oc,1}$) is related to the index of the first orthogonal sequence ($n^{(\tilde{p})}_{oc,0}$) by the equation $n^{(\tilde{p})}_{oc,1}=(3n^{(\tilde{p})}_{oc,0}) \bmod 5$ and, as such, the index of the second orthogonal sequence corresponds to the index of the first orthogonal sequence according to the following:

$n^{(\tilde{p})}_{oc,0}$	$n^{(\tilde{p})}_{oc,1}=(3n^{(\tilde{p})}_{oc,0}) \bmod 5$
0	0
1	3
2	1
3	4
4	2

See, e.g., 3GPP TS 36.211 V10.1.0 § 5.4.2A.

603. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 1 of the ’936 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the ’936 patent.

604. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 1 of the ’936 patent.

605. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 1 of the ’936 patent.

606. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the ’936 patent.

607. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which

they can be used and specifications for its products.[134] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[135]

608. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[136] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[137] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

609. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[138]

610. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '936 patent and how those steps induce infringement of the '936 patent.

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[134] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[135] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[136] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[137] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[138] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

611. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 1 of the ’936 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the ’936 patent.

612. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 10. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the ’936 patent and are not staple articles of commerce.

613. As shown in paragraphs 598–602, each of the Accused LTE Devices is configured to implement the functionalities for transmitting uplink control information in PUCCH format 3 as recited in claim 1 of the ’936 patent and is not suitable for substantial non-infringing uses.

614. Qualcomm has been on notice of the ’936 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter. Additionally, Qualcomm has been on notice of the ’936 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’936 patent, knowledge of infringement of the ’936 patent, intent to encourage others to infringe the ’936 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’936 patent by others in the United States.

615. Qualcomm has known of the ’936 patent and/or its application even before it received the 2017 LTE Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that

ETRI identified the ’936 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’936 patent, knowledge of infringement of the ’936 patent, intent to encourage others to infringe the ’936 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’936 patent by others in the United States.

616. Qualcomm’s infringement of the ’936 patent has been and continues to be deliberate and with willful disregard of the ’936 patent.

COUNT NINETEEN
INFRINGEMENT OF U.S. PATENT NO. 10,938,534

617. Sol IP realleges and incorporates each of preceding paragraphs 1–616.

618. On March 2, 2021, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,938,534 (“the ’534 patent”), titled “Carrier Aggregation in Wireless Communication Systems.” A true and correct copy of the ’534 patent is attached as Exhibit 19.

619. Sol IP is the exclusive licensee of the ’534 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

620. The ’534 patent is valid and enforceable.

621. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’534 patent, including at least claim 17, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the ’534 patent without authority, either literally and/or under the doctrine of equivalents.

622. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 10, thereby infringing at least claim 17 of the '534 patent.

623. The preamble of claim 17 of the '534 patent recites "[a] device for a terminal." To the extent the preamble limits the claim, each Accused LTE Device is a device for a terminal.

624. Claim 17 of the '534 patent recites "a circuitry." Each Accused LTE Device includes one or more circuitries, wherein the one or more circuitries are configured to implement at least the features of 3GPP Release 10. *See supra* para. 46.

625. Claim 17 of the '534 patent recites that the circuitry is configured to "cause the terminal to generate a first set of bits based on first data." As recited in claim 17 of the '534 patent and in accordance with at least 3GPP Release 10, TS 36.212 Section 5.2.3, each Accused LTE Device includes one or more circuitries configured to cause the terminal to generate a first set of bits $b(0),...,b(M_{\text{bit}}-1)$ based on first data for transmitting uplink control information on physical uplink control channel (PUCCH). *See, e.g.*, 3GPP TS 36.212 V10.0.0 § 5.2.3.

626. Claim 17 of the '534 patent recites that the circuitry is configured to "cause the terminal to generate a first set of complex-valued symbols based on the first set of bits." As recited in claim 17 of the '534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, each Accused LTE Device includes one or more circuitries configured to cause the terminal to generate a first block of complex-valued modulation symbols $d(0),...,d(M_{\text{symb}}-1)$ based on the first set of bits $b(0),...,b(M_{\text{bit}}-1)$. *See, e.g.*, 3GPP TS 36.211 V10.1.0 § 5.4.2A.

627. Claim 17 of the '534 patent recites that the circuitry is configured to "determine a first sequence index." As recited in claim 17 of the '534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, each Accused LTE Device includes one or more

circuitries configured to determine a first sequence index $n_{\mathrm{oc},0}^{(\tilde{p})}$. *See, e.g.*, 3GPP TS 36.211 V10.1.0 § 5.4.2A.

628. Claim 17 of the '534 patent recites that the circuitry is configured to "cause the terminal to obtain one of a first set of orthogonal sequences based on the first sequence index." As recited in claim 17 of the '534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, each Accused LTE Device includes one or more circuitries configured to cause the terminal to obtain one of a first set of orthogonal sequences $w_{n_{\mathrm{oc},0}}^{(\tilde{p})}(i)$ based on the first sequence index $n_{\mathrm{oc},0}^{(\tilde{p})}$. *See, e.g.*, 3GPP TS 36.211 V10.1.0 (2011-03) § 5.4.2A.

629. Claim 17 of the '534 patent recites that the circuitry is configured to "multiply each of the first set of complex-valued symbols by the one of the first set of orthogonal sequences and a first set of complex numbers to generate a first set of symbols." As recited in claim 17 of the '534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4.2A, each Accused LTE Device includes one or more circuitries configured to multiply each of the first block of complex-valued modulation symbols $d(0),\ldots,d(M_{\mathrm{symb}}-1)$ by one of the first set of orthogonal sequences $w_{n_{\mathrm{oc},0}}^{(\tilde{p})}(i)$ and a first set of complex numbers $e^{j\pi\lfloor n_{cs}^{cell}(n_s,l)/64\rfloor/2}$, to generate a first set of symbols. *See, e.g.*, 3GPP TS 36.211 V10.1.0 (2011-03) § 5.4.2A.

630. Claim 17 of the '534 patent recites that the circuitry is configured to "cause the terminal to generate a subframe comprising the first set of symbols." As recited in claim 17 of the '534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Sections 4, 4.1, and 5.4.3, each Accused LTE Device includes one or more circuitries configured to cause the terminal to map $z^{(\tilde{p})}(i)$ to resource elements for transmission of PUCCH, which uses one resource block in each of the two slots in a subframe. *See, e.g.*, 3GPP TS 36.211 V10.1.0 (2011-03) §§ 4, 4.1, 5.4.3.

631. Claim 17 of the ’534 patent recites that the circuitry is configured to “cause the terminal to transmit the subframe to a base station, wherein: the subframe comprises a first slot; the first slot comprises the first set of symbols; each of the first set of complex numbers has a same amplitude; and each of the first set of complex numbers is generated based on a cell identifier (cell ID).” As recited in claim 17 of the ’534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Sections 5.4.2A, 5.4.3, and 5.4, each Accused LTE Device includes one or more circuitries configured to cause the terminal to transmit the PUCCH format 3 to a base station. *See, e.g.*, 3GPP TS 36.211 V10.1.0 §§ 5.4.2A, 5.4.3, 5.4. As recited in claim 17 of the ’534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Sections 4, 4.1, and 5.4.2A, the subframe comprises a first slot, and the first slot comprises the first set of symbols when $n < N_{\mathrm{SF},0}^{\mathrm{PUCCH}}$). *See, e.g.*, 3GPP TS 36.211 V10.1.0 §§ 4-4.1, 5.4.2A. As recited in claim 17 of the ’534 patent and in accordance with at least 3GPP Release 10, TS 36.211 Section 5.4, each of the first set of complex numbers $e^{j\pi\lfloor n_{cs}^{cell}(n_s,l)/64\rfloor/2}$ has the same amplitude, and each of the first set of complex numbers $e^{j\pi\lfloor n_{cs}^{cell}(n_s,l)/64\rfloor/2}$ uses a cell-specific cyclic shift $n_{\mathrm{cs}}^{\mathrm{cell}}(n_{\mathrm{s}},l)$, which is generated based on a pseudo-random sequence $c(i)$ initialized with a cell identifier (N_{ID}^{cell}). *See, e.g.*, 3GPP TS 36.211 V10.1.0 § 5.4.

632. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 17 of the ’534 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the ’534 patent.

633. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 17 of the '534 patent.

634. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 17 of the '534 patent.

635. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '534 patent.

636. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[139] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[140]

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[139] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[140] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

637. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[141] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[142] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

638. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[143]

639. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '534 patent and how those steps induce infringement of the '534 patent.

640. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 17 of the '534 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '534 patent.

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[141] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).
[142] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).
[143] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

641. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 10. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the ’534 patent and are not staple articles of commerce.

642. As shown in paragraphs 622–631, each of the Accused LTE Devices is configured to implement the functionalities for transmitting uplink control information on PUCCH format 3 as recited in claim 17 of the ’534 patent and is not suitable for substantial non-infringing uses.

643. Qualcomm has been on notice of the patent application number resulting in the ’534 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the ’534 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’534 patent, knowledge of infringement of the ’534 patent, intent to encourage others to infringe the ’534 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’534 patent by others in the United States.

644. Qualcomm has known of the ’534 patent and/or its application even before it received the 2020 Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the ’534 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’534 patent, knowledge of infringement of the ’534 patent, intent to encourage others to infringe the ’534 patent through use of the Accused LTE

Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '534 patent by others in the United States.

645. Qualcomm's infringement of the '534 patent has been and continues to be deliberate and with willful disregard of the '534 patent.

COUNT TWENTY
INFRINGEMENT OF U.S. PATENT NO. RE48,101

646. Sol IP realleges and incorporates each of preceding paragraphs 1–645.

647. On July 14, 2020, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. RE48,101 ("the RE'101 patent"), titled "Method of Transmitting Downlink Channel Rank Information Through Physical Uplink Shared Channel." A true and correct copy of the RE'101 patent is attached as Exhibit 20.

648. Sol IP is the exclusive licensee of the RE'101 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

649. The RE'101 patent is valid and enforceable.

650. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the RE'101 patent, including at least claim 5, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the RE'101 patent without authority, either literally and/or under the doctrine of equivalents.

651. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 10, thereby infringing at least claim 5 of the RE'101 patent.

652. The preamble of claim 5 of the RE'101 patent recites "[a] communication apparatus." To the extent the preamble limits the claim, each Accused LTE Device is a communication apparatus.

653. Claim 5 of the RE'101 patent recites "a processor." Each Accused LTE Device includes one or more processors that are configured to implement at least the features of 3GPP Release 10. *See supra* para. 45.

654. Claim 5 of the RE'101 patent recites that the processor is configured to "map rank indication (RI) to a set of bits, the set of bits comprising N^{RI} bits $\{O_0^{RI} O_1^{RI} \ldots O^{RI}_{N^{RI}-1}\}$, wherein N^{RI} is an integer equal to or larger than 3." As recited in claim 5 of the RE'101 patent and in accordance with at least 3GPP Release 10, TS 36.212 Section 5.2.2.6, each Accused LTE Device includes one or more processors configured to map rank indication (RI) to a set of bits ($[o_0^{RI} o_1^{RI},...,o^{RI}_{O^{RI}-1}]$) where the RI feedback consists of $3 \le O^{RI} \le [11]$ bits of information. *See, e.g.*, 3GPP TS 36.212 V10.0.0 § 5.2.2.6.

655. Claim 5 of the RE'101 patent recites that the processor is configured to "encode the set of bits to generate a set of encoded bits." As recited in claim 5 of the RE'101 patent and in accordance with at least 3GPP Release 10, TS 36.212 Section 5.2.2.6, each Accused LTE Device includes one or more processors configured to obtain a coded bit sequence ($[\tilde{q}_0^{RI} \tilde{q}_1^{RI},...,\tilde{q}_{31}^{RI}]$) by using the bit sequence ($[o_0^{RI} o_1^{RI},...,o^{RI}_{O^{RI}-1}]$) as the input to the channel coding block. *See, e.g.*, 3GPP TS 36.212 V10.0.0 § 5.2.2.6.

656. Claim 5 of the RE'101 patent recites that the processor is configured to "generate symbols based on the set of encoded bits." As recited in claim 5 of the RE'101 patent and in accordance with at least 3GPP Release 10, TS 36.212 Section 5.2.2.8, each Accused LTE Device includes one or more processors configured to generate modulation symbols where the vector

sequence ($q_0^{RI}, q_1^{RI}, q_2^{RI}, \ldots, q_{Q_{RI}-1}^{RI}$) for the rank information is mapped into a $(R_{mux} \times C_{mux})$ matrix for transmission in a physical uplink shared channel (PUSCH) reporting format. *See, e.g.*, 3GPP TS 36.212 V10.0.0 § 5.2.2.8.

657. Claim 5 of the RE'101 patent recites that the processor is configured to "cause the communication apparatus to transmit the symbols, wherein the encoding is performed by the following expression:

$$q_i^{RI} = \sum_{n=0}^{N^{RI}-1} (O_n^{RI} \cdot M_{(imod32),n}) mod 2 \quad (i = 0, 1, \ldots, Q_{RI} - 1)$$

where q_i^{RI} denotes a bit sequence obtained after encoding, Q_{RI} denotes a number of bits after encoding, and $M_{i,n}$ denotes a sequence defined by Table 1:

TABLE 1

i	$M_{i,0}$	$M_{i,1}$	$M_{i,2}$	$M_{i,3}$	$M_{i,4}$	$M_{i,5}$	$M_{i,6}$	$M_{i,7}$	$M_{i,8}$	$M_{i,9}$	$M_{i,10}$
0	1	1	0	0	0	0	0	0	0	0	1
1	1	1	1	0	0	0	0	0	0	1	1
2	1	0	0	1	0	0	1	0	1	1	1
3	1	0	1	1	0	0	0	0	1	0	1
4	1	1	1	1	0	0	0	1	0	0	1
5	1	1	0	0	1	0	1	1	1	0	1
6	1	0	1	0	1	0	1	0	1	1	1
7	1	0	0	1	1	0	0	1	1	0	1
8	1	1	0	1	1	0	0	1	0	1	1
9	1	0	1	1	1	0	1	0	0	1	1
10	1	0	1	0	0	1	1	1	0	1	1
11	1	1	1	0	0	1	1	0	1	0	1
12	1	0	0	1	0	1	0	1	1	1	1
13	1	1	0	1	0	1	0	1	0	1	1
14	1	0	0	0	1	1	0	1	0	0	1
15	1	1	0	0	1	1	1	1	0	1	1
16	1	1	1	0	1	1	1	0	0	1	0
17	1	0	0	1	1	1	0	0	1	0	0
18	1	1	0	1	1	1	1	1	0	0	0
19	1	0	0	0	0	1	1	0	0	0	0
20	1	0	1	0	0	0	1	0	0	0	1
21	1	1	0	1	0	0	0	0	0	1	1
22	1	0	0	0	1	0	0	1	1	0	1
23	1	1	1	0	1	0	0	0	1	1	1
24	1	1	1	1	1	0	1	1	1	1	0
25	1	1	0	0	0	1	1	1	0	0	1
26	1	0	1	1	0	1	0	0	1	1	0
27	1	1	1	1	0	1	0	1	1	1	0
28	1	0	1	0	1	1	1	0	1	0	0
29	1	0	1	1	1	1	1	1	1	0	0
30	1	1	1	1	1	1	1	1	1	1	1
31	1	0	0	0	0	0	0	0	0	0	0.

."

As recited in claim 5 of the RE'101 patent and in accordance with at least 3GPP Release 10, Sections 5.2.2.6.4 and 5.2.2.8, each Accused LTE Device includes one or more processors configured to transmit the symbols in a PUSCH-based reporting format. *See, e.g.*, 3GPP TS 36.212 V10.0.0 §§ 5.2.2.6.4, 5.2.2.8. As also recited in claim 5 of the RE'101 patent and in accordance with at least 3GPP Release 10, TS 36.212 Sections 5.2.2.6 and 5.2.2.6.4, the coded bit sequence $[\tilde{q}_0^{RI}\ \tilde{q}_1^{RI},...,\tilde{q}_{31}^{RI}]$ for rank indication is encoded by the channel coding block (described in section 5.2.2.6.4), which uses a channel coding scheme expressed as $b_i = \sum_{n=0}^{O-1}(o_n \cdot M_{i,n}) \bmod 2$ where $i = 0, 1, 2, \ldots, B-1$, wherein $M_{i,n}$ denotes one of the basis sequences defined in Table 5.2.2.6.4-1 below:

Table 5.2.2.6.4-1: Basis sequences for (32, *O*) code.

i	$M_{i,0}$	$M_{i,1}$	$M_{i,2}$	$M_{i,3}$	$M_{i,4}$	$M_{i,5}$	$M_{i,6}$	$M_{i,7}$	$M_{i,8}$	$M_{i,9}$	$M_{i,10}$
0	1	1	0	0	0	0	0	0	0	0	1
1	1	1	1	0	0	0	0	0	0	1	1
2	1	0	0	1	0	0	1	0	1	1	1
3	1	0	1	1	0	0	0	0	1	0	1
4	1	1	1	1	0	0	0	1	0	0	1
5	1	1	0	0	1	0	1	1	1	0	1
6	1	0	1	0	1	0	1	0	1	1	1
7	1	0	0	1	1	0	0	1	1	0	1
8	1	1	0	1	1	0	0	1	0	1	1
9	1	0	1	1	1	0	1	0	0	1	1
10	1	0	1	0	0	1	1	1	0	1	1
11	1	1	1	0	0	1	1	0	1	0	1
12	1	0	0	1	0	1	0	1	1	1	1
13	1	1	0	1	0	1	0	1	0	1	1
14	1	0	0	0	1	1	0	1	0	0	1
15	1	1	0	0	1	1	1	1	0	1	1
16	1	1	1	0	1	1	1	0	0	1	0
17	1	0	0	1	1	1	0	0	1	0	0
18	1	1	0	1	1	1	1	1	0	0	0
19	1	0	0	0	0	1	1	0	0	0	0
20	1	0	1	0	0	0	1	0	0	0	1
21	1	1	0	1	0	0	0	0	0	1	1
22	1	0	0	0	1	0	0	1	1	0	1
23	1	1	1	0	1	0	0	0	1	1	1
24	1	1	1	1	1	0	1	1	1	1	0
25	1	1	0	0	0	1	1	1	0	0	1
26	1	0	1	1	0	1	0	0	1	1	0
27	1	1	1	1	0	1	0	1	1	1	0
28	1	0	1	0	1	1	1	0	1	0	0
29	1	0	1	1	1	1	1	1	1	0	0
30	1	1	1	1	1	1	1	1	1	1	1
31	1	0	0	0	0	0	0	0	0	0	0

See, e.g., 3GPP TS 36.212 V10.0.0 §§ 5.2.2.6, 5.2.2.6.4.

658. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 5 of the RE'101 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the RE'101 patent.

659. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 5 of the RE'101 patent.

660. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 5 of the RE'101 patent.

661. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the RE'101 patent.

662. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which

they can be used and specifications for its products.[144] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[145]

663. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[146] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[147] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

664. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[148]

665. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the RE'101 patent and how those steps induce infringement of the RE'101 patent.

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[144] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[145] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[146] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[147] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[148] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

666. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 5 of the RE'101 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the RE'101 patent.

667. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 10. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the RE'101 patent and are not staple articles of commerce.

668. As shown in paragraphs 651–657, each of the Accused LTE Devices is configured to implement the functionalities for reporting rank indication in PUSCH reporting format as recited in claim 5 of the RE'101 patent and is not suitable for substantial non-infringing uses.

669. Qualcomm has been on notice of the RE'101 patent since at least as early as November 17, 2017, when it received the 2017 LTE Notice Letter. Additionally, Qualcomm has been on notice of the RE'101 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2017 LTE Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the RE'101 patent, knowledge of infringement of the RE'101 patent, intent to encourage others to infringe the RE'101 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the RE'101 patent by others in the United States.

670. Qualcomm has known of the RE'101 patent even before it received the 2017 LTE Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI identified the

RE'101 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm's knowledge of the RE'101 patent, knowledge of infringement of the RE'101 patent, intent to encourage others to infringe the RE'101 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the RE'101 patent by others in the United States.

671. Qualcomm's infringement of the RE'101 patent has been and continues to be deliberate and with willful disregard of the RE'101 patent.

COUNT TWENTY-ONE
INFRINGEMENT OF U.S. PATENT NO. 10,462,776

672. Sol IP realleges and incorporates each of preceding paragraphs 1–671.

673. On October 29, 2019, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,462,776 ("the '776 patent"), titled "Method for Transmitting and Receiving Control Information of a Mobile Communication System." A true and correct copy of the '776 patent is attached as Exhibit 21.

674. Sol IP is the exclusive licensee of the '776 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

675. The '776 patent is valid and enforceable.

676. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '776 patent, including at least claim 13, by using, selling, offering for sale, and/or importing into the United States the Accused LTE Devices that practice the subject matter claimed in the '776 patent without authority, either literally and/or under the doctrine of equivalents.

677. Qualcomm uses, sells, offers for sale, and/or imports the Accused LTE Devices, which are configured to implement at least the features of 3GPP Release 11, thereby infringing at least claim 13 of the '776 patent.

678. The preamble of claim 13 of the '776 patent recites "[a] communication device for a terminal." To the extent the preamble limits the claim, each Accused LTE Device is a communication device for a terminal.

679. Claim 13 of the '776 patent recites "a memory." Each Accused LTE Device includes one or more memories. *See supra* para. 44.

680. Claim 13 of the '776 patent recites "a processor operably coupled to the memory." Each Accused LTE Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of 3GPP Release 11. *See supra* para. 45.

681. Claim 13 of the '776 patent recites that the processor is configured to "cause the terminal to receive a first message." As recited in claim 13 of the '776 patent and in accordance with at least 3GPP Release 11, TS 36.331 Section 6.3.2, each Accused LTE Device includes one or more processors configured to cause the terminal to receive an EPDCCH-Config for enhanced physical downlink control channel (EPDCCH) monitoring in a first subframe. *See, e.g.*, 3GPP TS 36.331 V11.2.0 § 6.3.2 (EPDCCH-Config).

682. Claim 13 of the '776 patent recites that the processor is configured to "decide, using the first message, to monitor an enhanced physical downlink control channel (ePDCCH) in a first subframe, wherein the first subframe consists of resource elements arranged in frequency and time domain, the first subframe consists of a first region of resource elements and a second region of resource elements, each of the resource elements in the first region precedes each of the resource

elements in the second region in time domain, the first region includes a physical downlink control channel (PDCCH), and the second region includes a physical downlink shared channel for data transmission." As recited in claim 13 of the '776 patent and in accordance with at least 3GPP Release 11, TS 36.331 Section 6.3.2, each Accused LTE Device includes one or more processors configured to decide, using the EPDCCH-Config, for EPDCCH monitoring in a first subframe. *See, e.g.*, 3GPP TS 36.331 V11.2.0 § 6.3.2 (EPDCCH-Config). As recited in claim 13 of the '776 patent and in accordance with at least 3GPP Release 11, TS 36.331 Section 6.3.2, TS 36.211 Section 6.2.2, and TS 36.300 Section 5.1.3, EPDCCH-Config indicates the OFDM starting symbol for an EPDCCH and physical downlink shared channel (PDSCH) scheduled by EPDCCH on the same cell, where a first n OFDM symbols, in a subframe consisting of resource elements arranged in frequency and time domain, include a PDCCH and the remaining region of the subframe includes a PDSCH. *See, e.g.*, 3GPP TS 36.331 V11.2.0 § 6.3.2 (EPDCCH-Config); 3GPP TS 36.211 V8.9.0 § 6.2.2; 3GPP TS 36.300 § 5.1.3.

683. Claim 13 of the '776 patent recites that the processor is configured to "determine a location of a search space for the ePDCCH in the second region at least based on an identifier of the terminal." As recited in claim 13 of the '776 patent and in accordance with at least 3GPP Release 11, TS 36.213 Section 9.1.4, each Accused Device includes one or more processors configured to determine a location of a search space for the EPDCCH in the second region based on an identifier of the terminal (n_{RNTI}). *See, e.g.*, 3GPP TS 36.213 V11.3.0 § 9.1.4.

684. Claim 13 of the '776 patent recites that the processor is configured to "cause the terminal to obtain the ePDCCH at least based on the location of the search space." As recited in claim 13 of the '776 patent and in accordance with at least 3GPP Release 11, TS 36.213 Section 9.1.4, each Accused Device includes one or more processors configured to cause the terminal to

obtain the EPDCCH at least based on the EPDCCH UE-specific search spaces. *See, e.g.*, 3GPP TS 36.213 V11.3.0 § 9.1.4.

685. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 13 of the '776 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '776 patent.

686. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 13 of the '776 patent.

687. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused LTE Devices in accordance with at least claim 13 of the '776 patent.

688. Qualcomm advertises, markets, and sells the Accused LTE Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused LTE Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '776 patent.

689. Qualcomm provides marketing and/or technical support services for the Accused LTE Devices from its facilities in the United States. For example, Qualcomm maintains a website

that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[149] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[150]

690. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused LTE Devices.[151] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[152] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

691. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused LTE Devices in the United States.[153]

692. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '776 patent and how those steps induce infringement of the '776 patent.

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[149] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Qualcomm 5G Modems and RF Modules | Advanced 4G LTE Modems*, QUALCOMM, https://www.qualcomm.com/products/modems (last visited Jan. 28, 2021).

[150] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[151] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021).

[152] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[153] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

693. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 13 of the '776 patent by contributing to use, sale, offer for sale, and/or importation of the Accused LTE Devices by others in an infringing manner, knowing that its Accused LTE Devices are especially made or adapted for use in infringement of the '776 patent.

694. The Accused LTE Devices are configured to implement specific, intended features of 3GPP Release 11. The Accused LTE Devices implementing such specific, intended features are a material part of the inventions of the '776 patent and are not staple articles of commerce.

695. As shown in paragraphs 677–684, each of the Accused LTE Devices is configured to implement the functionalities for processing an EPDCCH-Config for EPDCCH monitoring as recited in claim 13 of the '776 patent and is not suitable for substantial non-infringing uses.

696. Qualcomm has been on notice of the patent application number resulting in the '776 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the '776 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '776 patent, knowledge of infringement of the '776 patent, intent to encourage others to infringe the '776 patent through use of the Accused LTE Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '776 patent by others in the United States.

697. Qualcomm has known of the '776 patent and/or its application even before it received the 2020 Notice Letter and/or service of this Complaint. For example, Qualcomm, as a member of 3GPP or affiliated with one or more 3GPP member organizations, had notice that ETRI

identified the ’776 patent or its application or patent family to a 3GPP organizational partner as standard-essential. From that time onward, Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused LTE Devices, have been with Qualcomm’s knowledge of the ’776 patent, knowledge of infringement of the ’776 patent, intent to encourage others to infringe the ’776 patent through use of the Accused LTE Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’776 patent by others in the United States.

698. Qualcomm’s infringement of the ’776 patent has been and continues to be deliberate and with willful disregard of the ’776 patent.

COUNT TWENTY-TWO
INFRINGEMENT OF U.S. PATENT NO. 10,090,894

699. Sol IP realleges and incorporates each of preceding paragraphs 1–698.

700. On October 2, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,090,894 (“the ’894 patent”), titled “Method and Apparatus for Transceiving Data in a MIMO System.” A true and correct copy of the ’894 patent is attached as Exhibit 22.

701. Sol IP is the exclusive licensee of the ’894 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

702. The ’894 patent is valid and enforceable.

703. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’894 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused AC Devices that practice the subject matter claimed in the ’894 patent without authority, either literally and/or under the doctrine of equivalents.

704. Qualcomm uses, sells, offers for sale, and/or imports the Accused AC Devices, which are configured to implement at least the features of IEEE 802.11ac, thereby infringing at least claim 7 of the '894 patent.

705. The preamble of claim 7 of the '894 patent recites "[a]n apparatus." To the extent the preamble limits the claim, each Accused AC Device is an apparatus.

706. Claim 7 of the '894 patent recites "a memory." Each Accused AC Device includes one or more memories. *See supra* para. 48.

707. Claim 7 of the '894 patent recites "a processor operably coupled to the memory." Each Accused AC Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of IEEE 802.11ac. *See supra* para. 49.

708. Claim 7 of the '894 patent recites that the processor is configured to "cause the apparatus to generate a Very High Throughput-Signal A (VHT-SIG A) field." As recited in claim 7 of the '894 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.4.5, each Accused AC Device includes one or more processors configured to cause the apparatus to generate a very high-throughput signal A (VHT-SIG A) field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.4, Figure 21-4, Table 21-4.

709. Claim 7 of the '894 patent recites that the processor is configured to "cause the apparatus to generate a Very High Throughput-Signal B (VHT-SIG B) field." As recited in claim 7 of the '894 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.4.8, each Accused AC Device includes one or more processors configured to cause the apparatus to generate a very high-throughput signal B (VHT-SIG B) field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.4, Figure 21-4, Table 21-4.

710. Claim 7 of the ’894 patent recites that the processor is configured to “cause the apparatus to generate a service field.” As recited in claim 7 of the ’894 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.10.2, each Accused AC Device includes one or more processors configured to cause the apparatus to generate a service field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.10, Figure 21-4, Tables 21-4, 21-16.

711. Claim 7 of the ’894 patent recites that the processor is configured to “cause the apparatus to generate a data unit.” As recited in claim 7 of the ’894 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.4.9, each Accused AC Device includes one or more processors configured to cause the apparatus to generate a physical layer service data unit (PSDU). *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.4, Figure 21-4, Table 21-4.

712. Claim 7 of the ’894 patent recites that the processor is configured to “cause the apparatus to transmit the VHT-SIG A field.” As recited in claim 7 of the ’894 patent and in accordance with at least IEEE 802.11ac, Section 21.3.19, each Accused AC Device includes one or more processors configured to cause the apparatus to transmit the VHT-SIG A field. *See, e.g.*, IEEE 802.11-2016 § 21.3.19, Figures 21-4, 21-34, Table 21-4.

713. Claim 7 of the ’894 patent recites that the processor is configured to “cause the apparatus to transmit a training field after transmitting the VHT-SIG A field.” As recited in claim 7 of the ’894 patent and in accordance with at least IEEE 802.11ac, Section 21.3.19, each Accused AC Device includes one or more processors configured to cause the apparatus to transmit very high-throughput (VHT) training symbols comprising VHT short training field and VHT long training field after transmitting the VHT-SIG A field. *See, e.g.*, IEEE 802.11-2016 § 21.3.19, Figures 21-4, 21-34, Table 21-4.

714. Claim 7 of the '894 patent recites that the processor is configured to "cause the apparatus to transmit the VHT-SIG B field after transmitting the training field." As recited in claim 7 of the '894 patent and in accordance with at least IEEE 802.11ac, Section 21.3.19, each Accused AC Device includes one or more processors configured to cause the apparatus to transmit the VHT-SIG B field after transmitting the VHT training symbols. *See, e.g.*, IEEE 802.11-2016 § 21.3.19, Figures 21-4, 21-34, Table 21-4.

715. Claim 7 of the '894 patent recites that the processor is configured to "cause the apparatus to transmit the service field after transmitting the VHT-SIG B field." As recited in claim 7 of the '894 patent and in accordance with at least IEEE 802.11ac, Section 21.3.19, each Accused AC Device includes one or more processors configured to cause the apparatus to transmit the service field after transmitting the VHT-SIG B field. *See, e.g.*, IEEE 802.11-2016 § 21.3.19, Figures 21-4, 21-34, Table 21-4.

716. Claim 7 of the '894 patent recites that the processor is configured to "cause the apparatus to transmit the data unit after transmitting the service field, wherein: the VHT-SIG B field includes bits relating to a length of the data unit and tail bits; and the service field comprises bits relating to a scrambler and cyclic redundancy check (CRC) bits." As recited in claim 7 of the '894 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.19, 21.3.8.3.6, and 21.3.10, each Accused AC Device includes one or more processors configured to cause the apparatus to transmit the PSDU after transmitting the VHT-SIG B field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 21.3.10, 21.3.19, Figures 21-4, 21-34, 21-22, 21-23, 9-741, Tables 21-4, 21-14, 21-16. As recited in claim 7 of the '894 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.8.3.6, 21.4.3, and 10.13.6, the VHT-SIG-B field includes a VHT-SIG-B length field with bits relating to the length of the PSDU and a tail field with tail bits. *See, e.g.*, IEEE 802.11-

2016 §§ 21.3.8, 21.4.3, 10.13.6, Figures 21-22, 9-741, 21-34, Table 21-14. As recited in claim 7 of the '894 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.10.2 and 21.3.10.3, the service field comprises a scrambler initialization field with bits relating to a scrambler and a cyclic redundancy check (CRC) field with CRC bits. *See, e.g.*, IEEE 802.11-2016 § 21.3.10, Figure 21-23, Table 21-16.

717. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the '894 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '894 patent.

718. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 7 of the '894 patent.

719. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 7 of the '894 patent.

720. Qualcomm advertises, markets, and sells the Accused AC Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical

information relating to the Accused AC Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '894 patent.

721. Qualcomm provides marketing and/or technical support services for the Accused AC Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[154] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[155]

722. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused AC Devices.[156] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[157] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

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[154] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Wi-Fi*, QUALCOMM, https://www.qualcomm.com/products/wi-fi (last visited Jan. 28, 2021).

[155] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[156] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021); *see also Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Access Point," "Bluetooth/Wi-Fi," "Connectivity," "Wi-Fi," or "Wi-Fi PCIe Radio Chip" hyperlinks on the sidebar) (last visited Jan. 28, 2021).

[157] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

723. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused AC Devices in the United States.[158]

724. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '894 patent and how those steps induce infringement of the '894 patent.

725. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '894 patent by contributing to use, sale, offer for sale, and/or importation of the Accused AC Devices by others in an infringing manner, knowing that its Accused AC Devices are especially made or adapted for use in infringement of the '894 patent.

726. The Accused AC Devices are configured to implement specific, intended features of IEEE 802.11ac. The Accused AC Devices implementing such specific, intended features are a material part of the inventions of the '894 patent and are not staple articles of commerce.

727. As shown in paragraphs 704–716, each of the Accused AC Devices is configured to implement the functionalities for transmitting a VHT physical layer protocol data unit comprising a VHT-SIG A field, VHT short training field, VHT long training field, VHT-SIG B field, service field, and PSDU as recited in claim 7 of the '894 patent and is not suitable for substantial non-infringing uses.

728. Qualcomm has been on notice of the patent application number resulting in the '894 patent since at least as early as November 17, 2017, when it received the 2017 Wi-Fi Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the

[158] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

patent. Additionally, Qualcomm has been on notice of the '894 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused AC Devices after receiving the 2017 Wi-Fi Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm's knowledge of the '894 patent, knowledge of infringement of the '894 patent, intent to encourage others to infringe the '894 patent through use of the Accused AC Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '894 patent by others in the United States.

729. Qualcomm's infringement of the '894 patent has been and continues to be deliberate and with willful disregard of the '894 patent.

COUNT TWENTY-THREE
INFRINGEMENT OF U.S. PATENT NO. 10,601,474

730. Sol IP realleges and incorporates each of preceding paragraphs 1–729.

731. On March 24, 2020, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,601,474 ("the '474 patent"), titled "Method and Apparatus for Transceiving Data." A true and correct copy of the '474 patent is attached as Exhibit 23.

732. Sol IP is the exclusive licensee of the '474 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

733. The '474 patent is valid and enforceable.

734. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '474 patent, including at least claim 5, by using, selling, offering for sale, and/or importing into the United States the Accused AC Devices that practice the subject matter claimed in the '474 patent without authority, either literally and/or under the doctrine of equivalents.

735. Qualcomm uses, sells, offers for sale, and/or imports the Accused AC Devices, which are configured to implement at least the features of IEEE 802.11ac, thereby infringing at least claim 5 of the ’474 patent.

736. The preamble of claim 5 of the ’474 patent recites “[a] communication apparatus.” To the extent the preamble limits the claim, each Accused AC Device is a communication apparatus.

737. Claim 5 of the ’474 patent recites “a memory.” Each Accused AC Device includes one or more memories. *See supra* para. 48.

738. Claim 5 of the ’474 patent recites “at least one processor coupled to the memory.” Each Accused AC Device includes one or more processors operably coupled to the one or more memories, wherein the one or more processors are configured to implement at least the features of IEEE 802.11ac. *See supra* para. 49.

739. Claim 5 of the ’474 patent recites that the processor is configured to “generate a legacy signal (L-SIG) field.” As recited in claim 5 of the ’474 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.4.4, each Accused AC Device includes one or more processors configured to generate a legacy signal (L-SIG) field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.4, Figure 21-4, Table 21-4.

740. Claim 5 of the ’474 patent recites that the processor is configured to “generate a Very High Throughput-Signal A (VHT-SIG A) field.” As recited in claim 5 of the ’474 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.4.5, each Accused AC Device includes one or more processors configured to generate a very high-throughput signal A (VHT-SIG A) field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.4, Figure 21-4, Table 21-4.

741. Claim 5 of the '474 patent recites that the processor is configured to "generate a Very High Throughput-Signal B (VHT-SIG B) field." As recited in claim 5 of the '474 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.4.8, each Accused AC Device includes one or more processors configured to generate a very high-throughput signal B (VHT-SIG B) field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.4, Figure 21-4, Table 21-4.

742. Claim 5 of the '474 patent recites that the processor is configured to "generate data field." As recited in claim 5 of the '474 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.2 and 21.3.10, each Accused AC Device includes one or more processors configured to generate a data field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.2, 21.3.10, Figure 21-4, Tables 21-4, 21-16.

743. Claim 5 of the '474 patent recites that the processor is configured to "scramble the data field to generate a scrambled data field, the scrambled data field comprising a service field and a physical service data unit (PSDU)." As recited in claim 5 of the '474 patent and in accordance with at least IEEE 802.11ac, Section 21.3.10, each Accused AC Device includes one or more processors configured to scramble the data field to generate a scrambled data field that comprises a service field and a physical layer service data unit (PSDU). *See, e.g.*, IEEE 802.11-2016 § 21.3.10.

744. Claim 5 of the '474 patent recites that the processor is configured to "cause the communication apparatus to transmit a physical layer convergence protocol (PLCP) protocol data unit (PPDU), the PPDU comprising the L-SIG field, the VHT-SIG A field, the VHT-SIG B field and the scrambled data field, wherein: the VHT-SIG B field includes a first set of bits and tail bits, the first set of bits comprises bits relating to a length of the PSDU, the service field comprises bits relating to a scrambler and cyclic redundancy check (CRC) bits, the CRC bits calculated based on

the first set of bits of the VHT-SIG B field, and the L-SIG field includes bits relating to a length of the L-SIG field, the VHT-SIG A field, the VHT-SIG B field, and the data field combined." As recited in claim 5 of the '474 patent and in accordance with at least IEEE 802.11ac, Sections 21.1.1, 21.3.2, 21.3.19, 21.3.8.3.6, and 21.3.10, each Accused AC Device includes one or more processors configured to cause the communication apparatus to transmit a physical layer protocol data unit (PPDU) comprising the L-SIG field, the VHT-SIG A field, the VHT-SIG B field, and the scrambled data field. *See, e.g.*, IEEE 802.11-2016 §§ 21.1.1, 21.3.2, 21.3.8, 21.3.10, 21.3.19, Figures 21-4, 21-34, Table 21-4. As recited in claim 5 of the '474 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.8.3.6 and 10.13.6, the VHT-SIG B field includes a first set of bits and a tail field with tail bits. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 10.13.6, Figures 21-22, 9-741, 21-34, Table 21-14. For example, in the VHT multi-user (MU) PPDU allocation, the VHT-SIG-B field includes VHT-SIG-B length field with bits relating to the length of the PSDU and very high-throughput modulation and coding scheme (VHT-MCS) field (i.e., first set of bits) and a tail field with tail bits. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 21.4.3, 10.13.6, Figures 21-22, 9-741, 21-34, Table 21-14. Further, for example, in the VHT single-user (SU) PPDU allocation, the VHT-SIG-B field includes VHT-SIG-B length field with bits relating to the length of the PSDU and reserved field (i.e., first set of bits) and a tail field with tail bits. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 21.4.3, 10.13.6, Figures 21-22, 9-741, 21-34, Table 21-14. As recited in claim 5 of the '474 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.10.2 and 21.3.10.3, the service field comprises a scrambler initialization field with bits relating to a scrambler and a cyclic redundancy check (CRC) field with CRC bits, and the CRC bits are calculated based on the first set of bits of the VHT-SIG B field. *See, e.g.*, IEEE 802.11-2016 § 21.3.10, Figure 21-23, Table 21-16. As recited in claim 5 of the '474 patent and in accordance

with at least IEEE 802.11ac, Sections 21.3.8.2.4, 21.4.3, and 21.3.10.1, the L-SIG includes a length field with bits that relate to the length of the L-SIG field, the VHT-SIG A field, the VHT-SIG B field, and the data field combined. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 21.3.10, 21.4.3, Figures 21-4, 21-22, 21-34, 9-741, 17-5, Tables 21-4, 21-14, 21-1, 21-5.

745. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 5 of the ’474 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the ’474 patent.

746. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 5 of the ’474 patent.

747. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 5 of the ’474 patent.

748. Qualcomm advertises, markets, and sells the Accused AC Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused AC Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the ’474 patent.

749. Qualcomm provides marketing and/or technical support services for the Accused AC Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[159] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[160]

750. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused AC Devices.[161] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[162] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

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[159] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Wi-Fi*, QUALCOMM, https://www.qualcomm.com/products/wi-fi (last visited Jan. 28, 2021).

[160] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[161] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021); *see also Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Access Point," "Bluetooth/Wi-Fi," "Connectivity," "Wi-Fi," or "Wi-Fi PCIe Radio Chip" hyperlinks on the sidebar) (last visited Jan. 28, 2021).

[162] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

751. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused AC Devices in the United States.[163]

752. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '474 patent and how those steps induce infringement of the '474 patent.

753. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 5 of the '474 patent by contributing to use, sale, offer for sale, and/or importation of the Accused AC Devices by others in an infringing manner, knowing that its Accused AC Devices are especially made or adapted for use in infringement of the '474 patent.

754. The Accused AC Devices are configured to implement specific, intended features of IEEE 802.11ac. The Accused AC Devices implementing such specific, intended features are a material part of the inventions of the '474 patent and are not staple articles of commerce.

755. As shown in paragraphs 735–744, each of the Accused AC Devices is configured to implement the functionalities for transmitting a VHT PPDU comprising an L-SIG field, VHT-SIG A field, VHT-SIG B field, and a scrambled data field comprising a service field and a PSDU as recited in claim 5 of the '474 patent and is not suitable for substantial non-infringing uses.

756. Qualcomm has been on notice of the '474 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the '474 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the

[163] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

Accused AC Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '474 patent, knowledge of infringement of the '474 patent, intent to encourage others to infringe the '474 patent through use of the Accused AC Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '474 patent by others in the United States.

757. Qualcomm's infringement of the '474 patent has been and continues to be deliberate and with willful disregard of the '474 patent.

COUNT TWENTY-FOUR
INFRINGEMENT OF U.S. PATENT NO. 9,900,067

758. Sol IP realleges and incorporates each of preceding paragraphs 1–757.

759. On February 20, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,900,067 ("the '067 patent"), titled "Method and Apparatus for Transmitting and Receiving Data in a MIMO System." A true and correct copy of the '067 patent is attached as Exhibit 24.

760. Sol IP is the exclusive licensee of the '067 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

761. The '067 patent is valid and enforceable.

762. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '067 patent, including at least claim 38, by using, selling, offering for sale, and/or importing into the United States the Accused AC Devices that practice the subject matter claimed in the '067 patent without authority, either literally and/or under the doctrine of equivalents.

763. Qualcomm uses, sells, offers for sale, and/or imports the Accused AC Devices, which are configured to implement at least the features of IEEE 802.11ac, thereby infringing at least claim 38 of the '067 patent.

764. The preamble of claim 38 of the '067 patent recites "[a] communication device." To the extent the preamble limits the claim, each Accused AC Device is a communication device.

765. Claim 38 of the '067 patent recites "a processor." Each Accused AC Device includes one or more processors. *See supra* para. 49.

766. Claim 38 of the '067 patent recites "a memory operably coupled with the processor and storing program instructions." Each Accused AC Device includes one or more memories that are operably coupled with the one or more processors and store program instructions that, when executed by the one or more processors, cause the communication device to implement at least the features of IEEE 802.11ac. *See supra* para. 48.

767. Claim 38 of the '067 patent recites that the program instructions, when executed by the processor, cause the communication device to "transmit a first control field over a first frequency band, a bandwidth of the first frequency band being a multiple of 20 MHz." As recited in claim 38 of the '067 patent and in accordance with at least IEEE 802.11ac, Sections 21.1.1 and 21.3.19, each Accused AC Device includes program instructions that, when executed by one or more processors, cause the communication device to transmit a very high-throughput signal A (VHT-SIG A) field over a frequency band of 20 MHz, 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz. *See, e.g.*, IEEE 802.11-2016 §§ 21.1.1, 21.3.19, Figures 21-4, 21-34, Table 21-4.

768. Claim 38 of the '067 patent recites that the program instructions, when executed by the processor, cause the communication device to "transmit a second control field over the first frequency band, wherein the second control field comprises a first indicator indicating a length of

subsequent user data, a reserved bit portion subsequent to the first indicator and a tail bit portion subsequent to the reserved bit portion, and wherein a number of bits comprising the first indicator when the first frequency band is 40 MHz is smaller than a number of bits comprising the first indicator when the first frequency band is larger than 40 MHz." As recited in claim 38 of the '067 patent and in accordance with at least IEEE 802.11ac, Sections 21.1.1, 21.3.19, and 21.3.8.3.6, each Accused AC Device includes program instructions that, when executed by one or more processors, cause the communication device to transmit a very high-throughput signal B (VHT-SIG B) field over the same frequency band that the VHT-SIG-A field was transmitted over. *See, e.g.*, IEEE 802.11-2016 §§ 21.1.1, 21.3.8, 21.3.19, Figures 21-4, 21-34, Table 21-4. As recited in claim 38 of the '067 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.8.3.6 and 21.4.3, the VHT-SIG B field comprises a VHT-SIG B length field, a reserved field after the VHT-SIG B length field, and a tail field after the reserved field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 21.4.3, Figures 21-22, 9-741, Table 21-14. As recited in claim 38 of the '067 patent and in accordance with at least IEEE 802.11ac, Section 21.3.8.3.6, the VHT-SIG B length field has fewer bits when the frequency band is 40 MHz than when the frequency band is larger than 40 Mhz. *See, e.g.*, IEEE 802.11-2016 § 21.3.8, Figures 21-22, 9-741, Table 21-14.

769. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 38 of the '067 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '067 patent.

770. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 38 of the '067 patent.

771. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 38 of the '067 patent.

772. Qualcomm advertises, markets, and sells the Accused AC Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused AC Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '067 patent.

773. Qualcomm provides marketing and/or technical support services for the Accused AC Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[164] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[165]

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[164] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Wi-Fi*, QUALCOMM, https://www.qualcomm.com/products/wi-fi (last visited Jan. 28, 2021).

[165] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

774. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused AC Devices.[166] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[167] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

775. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused AC Devices in the United States.[168]

776. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '067 patent and how those steps induce infringement of the '067 patent.

777. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 38 of the '067 patent by contributing to use, sale, offer for sale, and/or importation of the Accused AC Devices by others in an infringing manner, knowing that its Accused AC Devices are especially made or adapted for use in infringement of the '067 patent.

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[166] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021); *see also Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Access Point," "Bluetooth/Wi-Fi," "Connectivity," "Wi-Fi," or "Wi-Fi PCIe Radio Chip" hyperlinks on the sidebar) (last visited Jan. 28, 2021).

[167] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[168] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

778. The Accused AC Devices are configured to implement specific, intended features of IEEE 802.11ac. The Accused AC Devices implementing such specific, intended features are a material part of the inventions of the ’067 patent and are not staple articles of commerce.

779. As shown in paragraphs 763–768, each of the Accused AC Devices is configured to implement the functionalities for transmitting a VHT-SIG A field over a frequency band of 20 MHz, 40 MHz, 80 MHz, 160 MHz, or 80+80 MHz, and a VHT-SIG B field over the same frequency band that the VHT-SIG-A field was transmitted over as recited in claim 38 of the ’067 patent and is not suitable for substantial non-infringing uses.

780. Qualcomm has been on notice of the patent application number resulting in the ’067 patent since at least as early as November 17, 2017, when it received the 2017 Wi-Fi Notice Letter, and/or when it received the subsequent 2020 Notice Letter on August 1, 2020, identifying the patent. Additionally, Qualcomm has been on notice of the ’067 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused AC Devices after receiving the 2017 Wi-Fi Notice Letter, 2020 Notice Letter, and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’067 patent, knowledge of infringement of the ’067 patent, intent to encourage others to infringe the ’067 patent through use of the Accused AC Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’067 patent by others in the United States.

781. Qualcomm’s infringement of the ’067 patent has been and continues to be deliberate and with willful disregard of the ’067 patent.

COUNT TWENTY-FIVE
INFRINGEMENT OF U.S. PATENT NO. 10,931,337

782. Sol IP realleges and incorporates each of preceding paragraphs 1–781.

783. On February 23, 2021, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,931,337 ("the '337 patent"), titled "Method and Apparatus for Transmitting and Receiving Data in a MIMO System." A true and correct copy of the '337 patent is attached as Exhibit 25.

784. Sol IP is the exclusive licensee of the '337 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

785. The '337 patent is valid and enforceable.

786. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '337 patent, including at least claim 1, by using, selling, offering for sale, and/or importing into the United States the Accused AC Devices that practice the subject matter claimed in the '337 patent without authority, either literally and/or under the doctrine of equivalents.

787. Qualcomm uses, sells, offers for sale, and/or imports the Accused AC Devices, which are configured to implement at least the features of IEEE 802.11ac, thereby infringing at least claim 1 of the '337 patent.

788. The preamble of claim 1 of the '337 patent recites "[a] wireless communication apparatus." To the extent the preamble limits the claim, each Accused AC Device is a wireless communication apparatus.

789. Claim 1 of the '337 patent recites "a circuitry." Each Accused AC Device includes one or more circuitries that are configured to implement at least the features of IEEE 802.11ac. *See supra* para. 50.

790. Claim 1 of the '337 patent recites that the circuitry is configured to "cause the apparatus to receive a first signal field in a frame through a transmission channel." As recited in

claim 1 of the '337 patent and in accordance with at least IEEE 802.11ac, Sections 21.1.1, 21.1.2, 21.3.4.4, and 21.3.20, each Accused AC Device includes one or more circuitries configured to cause the apparatus to receive a legacy signal (L-SIG) field in a frame through a transmission channel. *See, e.g.*, IEEE 802.11-2016 §§ 21.1.1, 21.1.2, 21.3.4, 21.3.20, Figures 21-4, 21-36, Table 21-4.

791. Claim 1 of the '337 patent recites that the circuitry is configured to "cause the apparatus to receive a second signal field in the frame through the transmission channel after receiving the first signal field." As recited in claim 1 of the '337 patent and in accordance with at least IEEE 802.11ac, Sections 21.1.1, 21.3.2, 21.3.4.5, and 21.3.20, each Accused AC Device includes one or more circuitries configured to cause the apparatus to receive a very high-throughput signal A (VHT-SIG A) field in the frame through a transmission channel after receiving the L-SIG field. *See, e.g.*, IEEE 802.11-2016 §§ 21.1.1, 21.3.2, 21.3.4, 21.3.20, Figures 21-4, 21-36, Table 21-4.

792. Claim 1 of the '337 patent recites that the circuitry is configured to "cause the apparatus to receive a third signal field in the frame through the transmission channel after receiving the second signal field, wherein the third signal field comprises a first set of bits indicating a length of data." As recited in claim 1 of the '337 patent and in accordance with at least IEEE 802.11ac, Sections 21.1.1, 21.3.2, 21.3.4.8, and 21.3.20, each Accused AC Device includes one or more circuitries configured to cause the apparatus to receive a very high-throughput signal B (VHT-SIG-B) field in the frame through a transmission channel after receiving the VHT-SIG A field. *See, e.g.*, IEEE 802.11-2016 §§ 21.1.1, 21.3.2, 21.3.4, 21.3.20, Figures 21-4, 21-36, Table 21-4. As recited in claim 1 of the '337 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.8.3.6, 21.4.3, and 10.13.6, the VHT-SIG-B field comprises a VHT-SIG-B length

field that indicates a length of data. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 21.4.3, 10.13.6, Figures 21-4, 21-36, 9-741, Tables 21-4, 21-14.

793. Claim 1 of the '337 patent recites that the circuitry is configured to "determine the length of the data based on the first set of bits." As recited in claim 1 of the '337 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.8.3.6, 21.3.20, and 21.2.2, each Accused AC Device includes one or more circuitries configured to determine the length of data based on the VHT-SIG B length field. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.8, 21.3.20, 21.2.2, Tables 21-14 and 21-1.

794. Claim 1 of the '337 patent recites that the circuitry is configured to "cause the apparatus to receive a data field comprising the data in the frame through the transmission channel after receiving the third signal field, wherein a number of bits of the first set of bits is determined based on a bandwidth of the transmission channel." As recited in claim 1 of the '337 patent and in accordance with at least IEEE 802.11ac, Sections 21.1.1, 21.3.2, 21.3.8.3.6, 21.3.10, and 21.3.20, each Accused AC Device includes one or more circuitries configured to cause the apparatus to receive a data field in the frame through a transmission channel after receiving the VHT-SIG B field. *See, e.g.*, IEEE 802.11-2016 §§ 21.1.1, 21.3.2, 21.3.8, 21.3.10, 21.3.20. As recited in claim 1 of the '337 patent and in accordance with at least IEEE 802.11ac, Section 21.3.8.3.6, the number of bits of the VHT-SIG-B length field is determined based on the bandwidth of the transmission channel. *See, e.g.*, IEEE 802.11-2016 § 21.3.8, Figures 21-4, 21-36, Tables 21-4, 21-14.

795. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 1 of the '337 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers,

resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '337 patent.

796. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 1 of the '337 patent.

797. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 1 of the '337 patent.

798. Qualcomm advertises, markets, and sells the Accused AC Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused AC Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '337 patent.

799. Qualcomm provides marketing and/or technical support services for the Accused AC Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[169] For example, Qualcomm's website provides

[169] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Wi-Fi*, QUALCOMM, https://www.qualcomm.com/products/wi-fi (last visited Jan. 28, 2021).

a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[170]

800. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused AC Devices.[171] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[172] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

801. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused AC Devices in the United States.[173]

802. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '337 patent and how those steps induce infringement of the '337 patent.

803. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 1 of the '337 patent by contributing to use, sale, offer

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[170] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[171] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021); *see also Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Access Point," "Bluetooth/Wi-Fi," "Connectivity," "Wi-Fi," or "Wi-Fi PCIe Radio Chip" hyperlinks on the sidebar) (last visited Jan. 28, 2021).

[172] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[173] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

for sale, and/or importation of the Accused AC Devices by others in an infringing manner, knowing that its Accused AC Devices are especially made or adapted for use in infringement of the ’337 patent.

804. The Accused AC Devices are configured to implement specific, intended features of IEEE 802.11ac. The Accused AC Devices implementing such specific, intended features are a material part of the inventions of the ’337 patent and are not staple articles of commerce.

805. As shown in paragraphs 787–794, each of the Accused AC Devices is configured to implement the functionalities for receiving a VHT physical layer protocol data unit comprising an L-SIG field, VHT-SIG A field, VHT-SIG-B field, and data field as recited in claim 1 of the ’337 patent and is not suitable for substantial non-infringing uses.

806. Qualcomm has been on notice of the patent application number resulting in the ’337 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the ’337 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused AC Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’337 patent, knowledge of infringement of the ’337 patent, intent to encourage others to infringe the ’337 patent through use of the Accused AC Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’337 patent by others in the United States.

807. Qualcomm’s infringement of the ’337 patent has been and continues to be deliberate and with willful disregard of the ’337 patent.

COUNT TWENTY-SIX
INFRINGEMENT OF U.S. PATENT NO. 8,582,686

808. Sol IP realleges and incorporates each of preceding paragraphs 1–807.

809. On November 12, 2013, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,582,686 ("the '686 patent"), titled "Transmitter and Method for Transmitting Data Block in Wireless Communication System." A true and correct copy of the '686 patent is attached as Exhibit 26.

810. Sol IP is the exclusive licensee of the '686 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

811. The '686 patent is valid and enforceable.

812. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '686 patent, including at least claim 8, by using, selling, offering for sale, and/or importing into the United States the Accused AC Devices and Accused AX Devices that practice the subject matter claimed in the '686 patent without authority, either literally and/or under the doctrine of equivalents.

813. Qualcomm uses, sells, offers for sale, and/or imports the Accused AC Devices, which are configured to implement at least the features of IEEE 802.11ac, thereby infringing at least claim 8 of the '686 patent.

814. The preamble of claim 8 of the '686 patent recites "[a] transmitter configured for transmitting a data block in a wireless communication system." To the extent the preamble limits the claim, each Accused AC Device is a transmitter configured to transmit a data block.

815. Claim 8 of the '686 patent recites "a coding unit configured to generate a coded block of N_{CBPSS} bits." As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.3, 21.3.10.5, 21.3.10.6, and 21.3.4.9, each Accused AC Device includes a coding unit comprising an encoder and a stream parser that generate a coded block of N_{CBPSS} bits. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.3, 21.3.4, 21.3.10, Figures 21-8, 21-9, 21-13 to -16.

816. Claim 8 of the '686 patent recites "a parsing unit configured to parse the coded block to generate two subblocks with an index *l*=0, 1." As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ac, Section 21.3.10.7, each Accused AC Device includes a segment parser that parses the coded block to generate two subblocks with an index *l*=0, 1. *See, e.g.*, IEEE 802.11-2016 § 21.3.10, Figures 21-13, 21-14.

817. Claim 8 of the '686 patent recites "a transmission unit configured to transmit the two subblocks to a receiver" As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.3 and 21.3.19, in binary convolutional code (BCC) encoding, each Accused AC Device includes one or more submodules, such as an interleaver and a constellation mapper, as shown in Figure 21-13. *See, e.g.*, IEEE 802.11-2016 § 21.3.3, 21.3.19, Figures 21-8, 21-9, 21-13, 21-15. As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.3 and 21.3.19, in low-density parity-check (LDPC) encoding, each Accused AC Device includes one or more submodules, such as a constellation mapper and an LDPC tone mapper, as shown in Figure 21-14. *See, e.g.*, IEEE 802.11-2016 § 21.3.3, 21.3.19, Figures 21-14, 21-16.

818. Claim 8 of the '686 patent recites a transmitter, "wherein the parsing unit is configured to parse the coded block as shown:

$$y_{k,l} = \begin{cases} x_{2s\cdot N_{ES}\left\lfloor \frac{k}{s\cdot N_{ES}} \right\rfloor + l\cdot s\cdot N_{ES} + k \bmod (s\cdot N_{ES})}, & k = 0, 1, \ldots, \lfloor N_{CBPSS}/(2s\cdot N_{ES})\rfloor s\cdot N_{ES} - 1 \\ x_{2s\cdot N_{ES}\left\lfloor \frac{k}{s\cdot N_{ES}} \right\rfloor + 2s\cdot\left\lfloor \frac{k \bmod (s\cdot N_{ES})}{s} \right\rfloor + k \bmod s}, & k = \lfloor N_{CBPSS}/(2s\cdot N_{ES})\rfloor s\cdot N_{ES}, \ldots, \frac{N_{CBPSS}}{2} - 1 \end{cases}$$

where

$$s = \max\left\{1, \frac{N_{BPSCS}}{2}\right\}, , ,$$

N_{BPSCS} is the number of coded bits per subcarrier per spatial stream, N_{ES} is the number of encoders, $\lfloor z \rfloor$ is the largest integer less than or equal to z, z mod t is the remainder resulting from the division

of integer z by integer t, x_m is an m-th bit of a block of bits, m=0 to N_{CBPSS}-1, and $y_{k,l}$ is bit k of a subblock l." As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ac, Section 21.3.10.7, each Accused AC Device includes a segment parser configured to parse the coded block as shown in Equations (21-74) and (21-73):

$$y_{k,l} = \begin{cases} x_{2s \cdot N_{ES}\left\lfloor \frac{k}{s \cdot N_{ES}} \right\rfloor + l \cdot s \cdot N_{ES} + k \bmod (s \cdot N_{ES})}, & k = 0, 1, \ldots, \lfloor N_{CBPSS}/(2s \cdot N_{ES}) \rfloor \cdot s \cdot N_{ES} - 1 \\ x_{2s \cdot N_{ES}\left\lfloor \frac{k}{s \cdot N_{ES}} \right\rfloor + 2s \cdot \left\lfloor \frac{k \bmod (s \cdot N_{ES})}{s} \right\rfloor + l \cdot s + k \bmod s}, & k = \lfloor N_{CBPSS}/(2s \cdot N_{ES}) \rfloor \cdot s \cdot N_{ES}, \ldots, \frac{N_{CBPSS}}{2} - 1 \end{cases} \quad (21\text{-}74)$$

where

x_m	is the m th bit of a block of N_{CBPSS} bits, m= 0 to N_{CBPSS} – 1
l	is the frequency subblock index, l = 0, 1
$y_{k,l}$	is bit k of the frequency subblock l
s	is defined in Equation (21-68)

See, e.g., IEEE 802.11-2016 § 21.3.10, Figures 21-14, 21-16, Table 21-6, Equations (21-74), (21-73). As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ac, Section 21.3.10.6:

$$s = \max\left\{1, \frac{N_{BPSCS}}{2}\right\} \quad (21\text{-}68)$$

See, e.g., IEEE 802.11-2016 § 21.3.10.6, Equation (21-68). As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ac, Sections 1.5, 21.3.6, and 21.3.10.7, N_{BPSCS} is the "[n]umber of coded bits per subcarrier per spatial stream," N_{ES} is the number of encoders, "[f]loor (x), also written as $\lfloor x \rfloor$, is the largest integer smaller than or equal to x," "x mod y is the remainder when x is divided by y," "x_m is the m th bit of a block of N_{CBPSS} bits, m=0 to N_{CBPSS}-1," and "$y_{k,l}$ is bit k of the frequency subblock l." *See, e.g.*, IEEE 802.11-2016 §§ 1.5, 21.3.10, 21.3.10.6, 21.3.6, Figures 21-14, 21-16, Table 21-6, Equation (21-74).

819. Additionally, Qualcomm uses, sells, offers for sale, and/or imports the Accused AX Devices, which are configured to implement at least the features of IEEE 802.11ax, thereby infringing at least claim 8 of the ’686 patent.

820. The preamble of claim 8 of the ’686 patent recites “[a] transmitter configured for transmitting a data block in a wireless communication system.” To the extent the preamble limits the claim, each Accused AX Device is a transmitter configured to transmit a data block.

821. Claim 8 of the ’686 patent recites “a coding unit configured to generate a coded block of N_{CBPSS} bits.” As recited in claim 8 of the ’686 patent and in accordance with at least IEEE 802.11ax, Sections 27.3.5, 27.3.12.5, and 27.3.12.6, each Accused AX Device includes a coding unit comprising an encoder, a padding component, and a stream parser that generate a coded block of N_{CBPSS} bits. *See, e.g.*, IEEE P802.11AX/D8.0 §§ 27.3.5, 27.3.12, Figures 27-21, 27-22.

822. Claim 8 of the ’686 patent recites “a parsing unit configured to parse the coded block to generate two subblocks with an index l=0, 1.” As recited in claim 8 of the ’686 patent and in accordance with at least IEEE 802.11ax, Section 27.3.12.7, each Accused AX Device includes a segment parser that parses the coded block to generate two subblocks with an index l=0, 1. *See, e.g.*, IEEE P802.11AX/D8.0 § 27.3.12, Figures 27-21, 27-22.

823. Claim 8 of the ’686 patent recites “a transmission unit configured to transmit the two subblocks to a receiver.” As recited in claim 8 of the ’686 patent and in accordance with at least IEEE 802.11ax, Sections 27.3.5 and 27.3.21, each Accused AX Device includes one or more submodules, such as a constellation mapper and an LDPC tone mapper, as shown in Figure 27-21. *See, e.g.*, IEEE P802.11AX/D8.0 §§ 27.3.5, 27.3.21, Figures 27-21, 27-22.

824. Claim 8 of the ’686 patent recites a transmitter, “wherein the parsing unit is configured to parse the coded block as shown:

$$y_{k,l} = \begin{cases} x_{2s\cdot N_{ES}\left\lfloor \frac{k}{s\cdot N_{ES}} \right\rfloor + l\cdot s\cdot N_{ES} + k \bmod (s\cdot N_{ES})}, & k = 0, 1, \ldots, \lfloor N_{CBPSS}/(2s\cdot N_{ES})\rfloor s\cdot N_{ES} - 1 \\ x_{2s\cdot N_{ES}\left\lfloor \frac{k}{s\cdot N_{ES}} \right\rfloor + 2s\cdot\left\lfloor \frac{k \bmod (s\cdot N_{ES})}{s} \right\rfloor + k \bmod s}, & k = \lfloor N_{CBPSS}/(2s\cdot N_{ES})\rfloor s\cdot N_{ES}, \ldots, \frac{N_{CBPSS}}{2} - 1 \end{cases}$$

where

$$s = \max\left\{1, \frac{N_{BPSCS}}{2}\right\}, , ,$$

N_{BPSCS} is the number of coded bits per subcarrier per spatial stream, N_{ES} is the number of encoders, $\lfloor z \rfloor$ is the largest integer less than or equal to z, z mod t is the remainder resulting from the division of integer z by integer t, x_m is an m-th bit of a block of bits, m=0 to N_{CBPSS}-1, and $y_{k,l}$ is bit k of a subblock l." As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ax, Section 27.3.12.7, each Accused AX Device includes a segment parser configured to parse the coded block as shown in Equations (27-93) and (27-94):

$$y_{k,l} = x_m \tag{27-93}$$

$$m = 2s \cdot \left\lfloor \frac{k}{s} \right\rfloor + l \cdot s + (k \bmod s), \quad k = 0, 1, \ldots, \frac{N_{CBPSS}}{2} - 1 \tag{27-94}$$

and

x_m	is bit m of a block of N_{CBPSS} bits and $m = 0, \ldots, N_{CBPSS} - 1$
l	is the frequency subblock index and $l = 0, 1$
$y_{k,l}$	is bit k of the frequency subblock l
s	is defined in Equation (27-91)

.

See, e.g., IEEE P802.11AX/D8.0 § 27.3.12, Figures 27-21, 27-22, Equations (27-93), (27-94). As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ax, Section 27.3.12.6:

$$s = max(1, \frac{N_{BPSCS}}{2}) \tag{27-91}$$

.

See, e.g., IEEE P802.11AX/D8.0 § 27.3.12, Equation (27-91). As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ax, Section 27.3.9, N_{BPSCS} is defined as the

"[n]umber of coded bits per subcarrier per spatial stream." *See, e.g.*, IEEE P802.11AX/D8.0 § 27.3.9, Table 27-15. As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ax, Section 27.3.5, the number of encoders is equal to 1 and N_{ES} is equal to 1. *See, e.g.*, IEEE P802.11AX/D8.0 §§ 27.3.5, 27.3.12.5.1, 27.3.12.5.2, Figures 27-21, 27-22. As recited in claim 8 of the '686 patent and in accordance with at least IEEE 802.11ax, which incorporates IEEE 802.11ac, Section 1.5,"[f]loor (x), also written as $\lfloor x \rfloor$, is the largest integer smaller than or equal to x," and "x mod y is the remainder when x is divided by y." *See, e.g.*, IEEE P802.11AX/D8.0, § 1.5; IEEE 802.11-2016 §§ 1.5, 21.3.6.

825. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 8 of the '686 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '686 patent.

826. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused AC Devices and Accused AX Devices in accordance with at least claim 8 of the '686 patent.

827. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused AC Devices and Accused AX Devices in accordance with at least claim 8 of the '686 patent.

828. Qualcomm advertises, markets, and sells the Accused AC Devices and Accused AX Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused AC Devices and Accused AX Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '686 patent.

829. Qualcomm provides marketing and/or technical support services for the Accused AC Devices and Accused AX Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[174] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[175]

830. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused AC Devices and Accused AX Devices.[176] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon

[174] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Wi-Fi*, QUALCOMM, https://www.qualcomm.com/products/wi-fi (last visited Jan. 28, 2021).

[175] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[176] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021); *see also Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Access Point," "Bluetooth/Wi-Fi," "Connectivity," "Wi-Fi," or "Wi-Fi PCIe Radio Chip" hyperlinks on the sidebar) (last visited Jan. 28, 2021).

865+ 5G Mobile Platform (model number SM8250-AB),[177] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

831. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused AC Devices and Accused AX Devices in the United States.[178]

832. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '686 patent and how those steps induce infringement of the '686 patent.

833. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 8 of the '686 patent by contributing to use, sale, offer for sale, and/or importation of the Accused AC Devices and Accused AX Devices by others in an infringing manner, knowing that its Accused AC Devices and Accused AX Devices are especially made or adapted for use in infringement of the '686 patent.

834. The Accused AC Devices and Accused AX Devices are configured to implement specific, intended features of IEEE 802.11ac and IEEE 802.11ax, respectively. The Accused AC Devices and Accused AX Devices implementing such specific, intended features are a material part of the inventions of the '686 patent and are not staple articles of commerce.

835. As shown in paragraphs 813–818, each of the Accused AC Devices is configured to implement the functionalities for processing a data field for VHT transmission as recited in claim 8 of the '686 patent and is not suitable for substantial non-infringing uses.

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[177] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[178] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

836. As shown in paragraphs 819–824, each of the Accused AX Devices is configured to implement the functionalities for processing a data field for VHT transmission as recited in claim 8 of the ’686 patent and is not suitable for substantial non-infringing uses.

837. Qualcomm has been on notice of the ’686 patent since at least as early as November 17, 2017, when it received the 2017 Wi-Fi Notice Letter. Additionally, Qualcomm has been on notice of the ’686 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused AC Devices after receiving the 2017 Wi-Fi Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’686 patent, knowledge of infringement of the ’686 patent, intent to encourage others to infringe the ’686 patent through use of the Accused AC Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’686 patent by others in the United States.

838. Qualcomm has also been on notice since at least as early as August 1, 2020, when it received the 2020 Notice Letter, identifying the ’686 patent as “relating to technological requirements stated in the IEEE 802.11 standards,” including IEEE 802.11ax. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused AX Devices after receiving the 2020 Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’686 patent, knowledge of infringement of the ’686 patent, intent to encourage others to infringe the ’686 patent through use of the Accused AX Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’686 patent by others in the United States.

839. Qualcomm’s infringement of the ’686 patent has been and continues to be deliberate and with willful disregard of the ’686 patent.

COUNT TWENTY-SEVEN
INFRINGEMENT OF U.S. PATENT NO. 9,088,395

840. Sol IP realleges and incorporates each of preceding paragraphs 1–839.

841. On July 21, 2015, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,088,395 ("the '395 patent"), titled "Transmitter and Method for Transmitting Data Block in Wireless Communication System." A true and correct copy of the '395 patent is attached as Exhibit 27.

842. Sol IP is the exclusive licensee of the '395 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

843. The '395 patent is valid and enforceable.

844. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the '395 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused AC Devices that practice the subject matter claimed in the '395 patent without authority, either literally and/or under the doctrine of equivalents.

845. Qualcomm uses, sells, offers for sale, and/or imports the Accused AC Devices, which are configured to implement at least the features of IEEE 802.11ac, thereby infringing at least claim 7 of the '395 patent.

846. The preamble of claim 7 of the '395 patent recites "[a] transmitter of transmitting a data block in a wireless communication system." To the extent the preamble limits the claim, each Accused AC Device is a transmitter that transmits a data block in a wireless communication system.

847. Claim 7 of the '395 patent recites "a coding unit configured to determine a number of bits assigned to a single axis of a signal constellation, s, and a number of encoders, N_{ES}, and

generate a coded block." As recited in claim 7 of the '395 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.10.5, 21.3.10.6, 21.3.3, and 21.3.6, each Accused AC Device includes a coding unit, which comprises an encoder and a stream parser, that generates a coded block of N_{CBPSS} bits, including by determining (i) a number of bits assigned to a single axis (real or imaginary) in a constellation point in a spatial stream as shown in Equation 21-68 and (ii) a number of encoders N_{ES}. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.10, 21.3.3, 21.3.6, Figures 21-8, 21-9, 21-13 to -16, Equation (21-68).

848. Claim 7 of the '395 patent recites "a parsing unit configured to: parse the coded block to generate a plurality of frequency subblocks in unit of sN_{ES} bits." As recited in claim 7 of the '395 patent and in accordance with at least IEEE 802.11ac, Section 21.3.10.7, each Accused AC Device includes a segment parser that parses the coded block to generate a plurality of frequency subblocks in units of sN_{ES} bits as shown in Equations (21-73) and (21-74). *See, e.g.*, IEEE 802.11-2016 § 21.3.10, Figures 21-13, 21-14, Equations (21-73), (21-74).

849. Claim 7 of the '395 patent recites that the parsing unit is configured to "if N_{CBPSS} is not divisible by MsN_{ES} and there are residue bits of the coded block after parsing the coded block in unit of sN_{ES} bits, assign the residue bits to the plurality of frequency subblocks in unit of s bits, where M denotes a number of the plurality of frequency subblocks and N_{CBPSS} denotes a number of coded bits per symbol per spatial stream." As recited in claim 7 of the '395 patent and in accordance with at least IEEE 802.11ac, Section 21.3.10.7, each Accused AC Device includes a segment parser that parses the coded block, as explained in paragraph 848, and, if N_{CBPSS} is not divisible by MsN_{ES} and parsing at the segment parser results in residue bits of the coded block, then the segment parser divides the residue bits into subsets of *s* bits, with each subset of *s* bits being assigned to the plurality of frequency subblocks in a round robin fashion, as per Equation

(21-74). *See, e.g.*, IEEE 802.11-2016 § 21.3.10, Equation (21-74). As recited in claim 7 of the '395 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.10.7 and 21.3.6, M denotes a number of the plurality of frequency subblocks (if $l = 0, 1$, then M = 2) and N_{CBPSS} is defined as a number of coded bits per symbol per spatial stream. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.10, 21.3.6.

850. Claim 7 of the '395 patent recites "a transmission unit configured to transmit the plurality of subblocks to a receiver." As recited in claim 7 of the '395 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.3 and 21.3.19, in binary convolutional code (BCC) encoding, each Accused AC Device includes one or more submodules, such as an interleaver and a constellation mapper, as shown in Figure 21-13. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.3, 21.3.19, Figures 21-8, 21-9, 21-13, 21-15. As recited in claim 7 of the '395 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.3 and 21.3.19, in low-density parity-check (LDPC) encoding, each Accused AC Device includes one or more submodules, such as a constellation mapper and an LDPC tone mapper, as shown in Figure 21-14. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.3, 21.3.19, Figures 21-14, 21-16.

851. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the '395 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the '395 patent.

852. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized

Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 7 of the '395 patent.

853. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 7 of the '395 patent.

854. Qualcomm advertises, markets, and sells the Accused AC Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to the Accused AC Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '395 patent.

855. Qualcomm provides marketing and/or technical support services for the Accused AC Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[179] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[180]

856. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation;

[179] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Wi-Fi*, QUALCOMM, https://www.qualcomm.com/products/wi-fi (last visited Jan. 28, 2021).

[180] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused AC Devices.[181] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[182] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

857. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused AC Devices in the United States.[183]

858. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '395 patent and how those steps induce infringement of the '395 patent.

859. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '395 patent by contributing to use, sale, offer for sale, and/or importation of the Accused AC Devices by others in an infringing manner, knowing that its Accused AC Devices are especially made or adapted for use in infringement of the '395 patent.

860. The Accused AC Devices are configured to implement specific, intended features of IEEE 802.11ac. The Accused AC Devices implementing such specific, intended features are a material part of the inventions of the '395 patent and are not staple articles of commerce.

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[181] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021); *see also Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Access Point," "Bluetooth/Wi-Fi," "Connectivity," "Wi-Fi," or "Wi-Fi PCIe Radio Chip" hyperlinks on the sidebar) (last visited Jan. 28, 2021).

[182] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

[183] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

861. As shown in paragraphs 845–850, each of the Accused AC Devices is configured to implement the functionalities for processing a data field for VHT transmission as recited in claim 7 of the ’395 patent and is not suitable for substantial non-infringing uses.

862. Qualcomm has been on notice of the ’395 patent since at least as early as November 17, 2017, when it received the 2017 Wi-Fi Notice Letter. Additionally, Qualcomm has been on notice of the ’395 patent since at least as early as the service of this Complaint. Qualcomm’s continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused AC Devices after receiving the 2017 Wi-Fi Notice Letter and/or service of the Complaint, have been with Qualcomm’s knowledge of the ’395 patent, knowledge of infringement of the ’395 patent, intent to encourage others to infringe the ’395 patent through use of the Accused AC Devices, and knowledge that Qualcomm’s encouraging acts actually result in direct infringement of the ’395 patent by others in the United States.

863. Qualcomm’s infringement of the ’395 patent has been and continues to be deliberate and with willful disregard of the ’395 patent.

COUNT TWENTY-EIGHT
INFRINGEMENT OF U.S. PATENT NO. 10,841,056

864. Sol IP realleges and incorporates each of preceding paragraphs 1–863.

865. On November 17, 2020, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,841,056 (“the ’056 patent”), titled “Transmitter and Method for Transmitting Data Block in Wireless Communication System.” A true and correct copy of the ’056 patent is attached as Exhibit 28.

866. Sol IP is the exclusive licensee of the ’056 patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

867. The ’056 patent is valid and enforceable.

868. Qualcomm, in violation of 35 U.S.C. § 271(a), has infringed and continues to infringe one or more claims of the ’056 patent, including at least claim 7, by using, selling, offering for sale, and/or importing into the United States the Accused AC Devices that practice the subject matter claimed in the ’056 patent without authority, either literally and/or under the doctrine of equivalents.

869. Qualcomm uses, sells, offers for sale, and/or imports the Accused AC Devices, which are configured to implement at least the features of IEEE 802.11ac, thereby infringing at least claim 7 of the ’056 patent.

870. The preamble of claim 7 of the ’056 patent recites “[a] communication apparatus.” To the extent the preamble limits the claim, each Accused AC Device is a communication apparatus.

871. Claim 7 of the ’056 patent recites “a circuitry.” Each Accused AC Device includes one or more circuitries that are configured to implement at least the features of IEEE 802.11ac. *See supra* para. 50.

872. Claim 7 of the ’056 patent recites that the circuitry is configured to “cause the communication apparatus to generate a first sequence and a second sequence based on data, wherein the first sequence comprises a first group of at least two consecutive bits and a second group of at least two consecutive bits, the second sequence comprises a third group of at least two consecutive bits and a fourth group of at least two consecutive bits, the first group of at least two consecutive bits and the second group of at least two consecutive bits are adjacent to each other in the first sequence, and the third group of at least two consecutive bits and the fourth group of at least two consecutive bits are adjacent to each other in the second sequence.” As recited in claim 7 of the ’056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and

21.3.10.6, each Accused AC Device includes one or more circuitries configured to cause forward error correction (FEC) encoders of the communication apparatus to generate data bit streams. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.10, 21.3.4. As recited in claim 7 of the '056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.6, the first FEC encoder outputs a data bit stream, which comprises groups of N_{CBPS} bits including a first group of at least two consecutive bits and a second group of at least two consecutive bits, wherein the first group and second group are adjacent to each other. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.10, 21.3.4. As recited in claim 7 of the '056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.6, the second FEC encoder outputs a data bit stream, which comprises groups of N_{CBPS} bits including a third group of at least two consecutive bits and a fourth group of at least two consecutive bits, wherein the third group and fourth group are adjacent to each other. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.4, 21.3.10, Figure 21-4, 21-13, Table 21-4.

873. Claim 7 of the '056 patent recites that the circuitry is configured to "cause the communication apparatus to generate a third sequence and a fourth sequence by parsing the first sequence and the second sequence, wherein the third sequence comprises the first group of at least two consecutive bits and the third group of at least two consecutive bits, and the fourth sequence comprises the second group of at least two consecutive bits and the fourth group of at least two consecutive bits, the first group of at least two consecutive bits and the third group of at least two consecutive bits are adjacent to each other in the third sequence, and the second group of at least two consecutive bits and the fourth group of at least two consecutive bits are adjacent to each other in the fourth sequence." As recited in claim 7 of the '056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.6, each Accused AC Device includes one or more circuitries configured to cause a stream parser of the communication apparatus to parse the data

bit streams to generate spatial streams. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.4, 21.3.10. As recited in claim 7 of the '056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.6, the consecutive blocks of bits from the data bit streams are assigned to different spatial streams in a round robin fashion where a first spatial stream comprises the first group of at least two consecutive bits and the third group of at least two consecutive bits, and the first group and third group are adjacent to each other in the first spatial stream, and a second spatial stream comprises the second group of at least two consecutive bits and the fourth group of at least two consecutive bits, and the second group and fourth group are adjacent to each other in the second spatial stream. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.4, 21.3.10, Figure 21-13.

874. Claim 7 of the '056 patent recites that the circuitry is configured to "cause the communication apparatus to generate a fifth sequence and a sixth sequence by parsing the third sequence, wherein the fifth sequence comprises the first group of at least two consecutive bits and the third group of at least two consecutive bits and the first group of at least two consecutive bits and the third group of at least two consecutive bits are adjacent to each other in the fifth sequence." As recited in claim 7 of the '056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.7, each Accused AC Device includes one or more circuitries configured to cause a segment parser of the communication apparatus to parse the first spatial stream to generate a first subblock and a second subblock. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.4, 21.3.10. As recited in claim 7 of the '056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.7, the first subblock comprises the first group of at least two consecutive bits and the third group of at least two consecutive bits, and the first group and third group are adjacent to each other in the first subblock. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.4, 21.3.10, Figure 21-13.

875. Claim 7 of the ’056 patent recites that the circuitry is configured to “cause the communication apparatus to generate a seventh sequence and an eighth sequence by parsing the fourth sequence, wherein the seventh sequence comprises the second group of at least two consecutive bits and the fourth group of at least two consecutive bits and the second group of at least two consecutive bits and the fourth group of at least two consecutive bits are adjacent to each other in the seventh sequence.” As recited in claim 7 of the ’056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.7, each Accused AC Device includes one or more circuitries configured to cause a segment parser of the communication apparatus to parse the second spatial stream to generate a third subblock and a fourth subblock. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.4, 21.3.10. As recited in claim 7 of the ’056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.4.9.1 and 21.3.10.7, the third subblock comprises the second group of at least two consecutive bits and the fourth group of at least two consecutive bits and the second group and the fourth group are adjacent to each other in the third subblock. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.4, 21.3.10.

876. Claim 7 of the ’056 patent recites that the circuitry is configured to “cause the communication apparatus to interleave the fifth sequence, the sixth sequence, the seventh sequence and the eighth sequence to generate interleaved data blocks.” As recited in claim 7 of the ’056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.3 and 21.3.10.8, each Accused AC Device includes one or more circuitries configured to cause interleavers of the communication apparatus to interleave the first subblock, the second subblock, the third subblock, and the fourth subblock to generate interleaved data blocks. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.3, 21.3.10, Figure 21-13.

877. Claim 7 of the ’056 patent recites that the circuitry is configured to “cause the communication apparatus to transmit the interleaved data blocks.” As recited in claim 7 of the ’056 patent and in accordance with at least IEEE 802.11ac, Sections 21.3.3, 21.3.4.9.1, and 21.3.19, each Accused AC Device includes one or more circuitries configured to cause the communication apparatus to transmit data blocks processed by an interleaver. *See, e.g.*, IEEE 802.11-2016 §§ 21.3.3, 21.3.4, 21.3.19, Figure 21-13.

878. Qualcomm has indirectly infringed and continues to indirectly infringe at least claim 7 of the ’056 patent under 35 U.S.C. § 271(b), either literally and/or under the doctrine of equivalents, by actively inducing others, including OEMs, agent-subsidiaries, affiliates, partners, software and hardware providers, manufacturers, system integrators, distributors, importers, resellers, customers, end users, and/or other third parties, in this district and elsewhere in the United States, to directly infringe the ’056 patent.

879. Qualcomm actively induces others through its Qualcomm Advantage Network programs—including but not limited to its Authorized Design Center Program, Authorized Distributor Program, Automotive Solutions Ecosystem Program, Extension Program, HMD Accelerator Program, IoT Accelerator Program, Platform Solutions Ecosystem Program, and Smart Cities Accelerator Program—to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 7 of the ’056 patent.

880. Qualcomm works closely with others to use, sell, offer for sale, and/or import the Accused AC Devices in accordance with at least claim 7 of the ’056 patent.

881. Qualcomm advertises, markets, and sells the Accused AC Devices throughout the United States, including in this district, through the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical

information relating to the Accused AC Devices with knowledge and the specific intent that its efforts will result in the direct infringement of the '056 patent.

882. Qualcomm provides marketing and/or technical support services for the Accused AC Devices from its facilities in the United States. For example, Qualcomm maintains a website that advertises its products, including identifying the technology and the applications for which they can be used and specifications for its products.[184] For example, Qualcomm's website provides a product brief that advertises the Qualcomm Snapdragon 865+ 5G Mobile Platform and the applications for which it can be used.[185]

883. Qualcomm's website also contains product kits; development content for specific chip products and applications; catalogs of hardware, software, and tools documentation; knowledgebase articles; software code and tools; release history and notes; and case-specific technical assistance related to the Accused AC Devices.[186] For example, Qualcomm's website provides product kits, including a test device for the Qualcomm Snapdragon 865+ 5G Mobile Platform (model number SM8250-AB),[187] for using and testing the Qualcomm Snapdragon 865+ 5G Mobile Platform.

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[184] *See, e.g.*, *Product Finder*, QUALCOMM, https://www.qualcomm.com/products/catalog (last visited Jan. 28, 2021); *Wi-Fi*, QUALCOMM, https://www.qualcomm.com/products/wi-fi (last visited Jan. 28, 2021).

[185] *Product Brief for Snapdragon 865+ Mobile Platform*, QUALCOMM, https://www.qualcomm.com/media/documents/files/qualcomm-snapdragon-865-5g-mobile-platform-product-brief.pdf (last visited Jan. 28, 2021).

[186] *Product Support*, QUALCOMM, https://www.qualcomm.com/support (last visited Jan. 28, 2021); *see also Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Access Point," "Bluetooth/Wi-Fi," "Connectivity," "Wi-Fi," or "Wi-Fi PCIe Radio Chip" hyperlinks on the sidebar) (last visited Jan. 28, 2021).

[187] *Qualcomm CreatePoint*, QUALCOMM, https://createpoint.qti.qualcomm.com/ (follow "Test Device" hyperlink on the sidebar and "SM8250+SDX55M Android Test Device (Test)") (last visited Jan. 28, 2021).

884. Qualcomm further provides membership to its Qualcomm Advantage Network to encourage the use, sale, offer for sale, and/or importation of the Accused AC Devices in the United States.[188]

885. Qualcomm undertook and continues to undertake the above-noted acts after receiving notice of the '056 patent and how those steps induce infringement of the '056 patent.

886. Qualcomm, in violation of 35 U.S.C. § 271(c), has indirectly infringed and continues to indirectly infringe at least claim 7 of the '056 patent by contributing to use, sale, offer for sale, and/or importation of the Accused AC Devices by others in an infringing manner, knowing that its Accused AC Devices are especially made or adapted for use in infringement of the '056 patent.

887. The Accused AC Devices are configured to implement specific, intended features of IEEE 802.11ac. The Accused AC Devices implementing such specific, intended features are a material part of the inventions of the '056 patent and are not staple articles of commerce.

888. As shown in paragraphs 869–877, each of the Accused AC Devices is configured to implement the functionalities for processing a data field for VHT transmission as recited in claim 7 of the '056 patent and is not suitable for substantial non-infringing uses.

889. Qualcomm has been on notice of the patent application number resulting in the '056 patent since at least as early as August 1, 2020, when it received the 2020 Notice Letter. Additionally, Qualcomm has been on notice of the '056 patent since at least as early as the service of this Complaint. Qualcomm's continued actions of using, selling, offering for sale, and/or importing into the United States any of the Accused AC Devices after receiving the 2020 Notice

[188] *Qualcomm Advantage Network*, QUALCOMM, https://www.qualcomm.com/support/qan (last visited Jan. 28, 2021).

Letter and/or service of the Complaint, have been with Qualcomm's knowledge of the '056 patent, knowledge of infringement of the '056 patent, intent to encourage others to infringe the '056 patent through use of the Accused AC Devices, and knowledge that Qualcomm's encouraging acts actually result in direct infringement of the '056 patent by others in the United States.

890. Qualcomm's infringement of the '056 patent has been and continues to be deliberate and with willful disregard of the '056 patent.

DEMAND FOR TRIAL BY JURY

891. Sol IP respectfully requests a trial by jury on all issues so triable in accordance with Rule 38 of the Federal Rules of Civil Procedure.

PR AYER FOR RELIEF

892. WHEREFORE, Sol IP respectfully requests that the Court enter judgment in its favor on the claims set forth above and respectfully requests the following relief:

a) Entry of judgment that Qualcomm has directly and/or indirectly infringed the '031, '686, '936, '395, '976, '435, '067, '896, '204, '894, '477, '207, '211, '559, '349, '041, '277, '776, '474, '351, '722, '056, '439, '525, '337, '298, '534, and RE'101 patents, and continue to do so;

b) Entry of judgment against Qualcomm, awarding Sol IP damages adequate to compensate Sol IP for Qualcomm's direct and/or indirect infringement of the '031, '686, '936, '395, '976, '435, '067, '896, '204, '894, '477, '207, '211, '559, '349, '041, '277, '776, '474, '351, '722, '056, '439, '525, '337, '298, '534, and RE'101 patents, and for any continuing or future infringement through the date such judgment is entered, including pre-judgment interest and post-judgment interest, costs, and expenses, as well as an accounting and award of damages against Qualcomm for all future infringing acts occurring after the date such judgment is entered;

c) Entry of judgment that Qualcomm's direct and/or indirect infringement of the '031, '686, '936, '395, '976, '435, '067, '896, '204, '894, '477, '207, '211, '559, '349, '041, '277, '776, '474, '351, '722, '056, '439, '525, '337, '298, '534, and RE'101 patents has been willful;

d) Entry of judgment as provided by 35 U.S.C. § 284 for an award of treble damages against Qualcomm for their willful direct and/or indirect infringement of the '031, '686, '936, '395, '976, '435, '067, '896, '204, '894, '477, '207, '211, '559, '349, '041, '277, '776, '474, '351, '722, '056, '439, '525, '337, '298, '534, and RE'101 patents;

e) Entry of judgment as provided by 35 U.S.C. § 285 that this case is exceptional and an award granting Sol IP their reasonable attorneys' fees, expenses, and costs; and

g) Entry of judgment in favor of Sol IP granting any further or additional relief the Court deems just and proper.

Dated: March 17, 2021

/s/ John P. Palmer

J. Michael Jakes (*pro hac vice* to be submitted)
Houtan Khalili Esfahani (*pro hac vice* to be submitted)
Smith R. Brittingham IV (*pro hac vice* to be submitted)
D. Brian Kacedon (*pro hac vice* to be submitted)
Rajeev Gupta (*pro hac vice* to be submitted)
Christopher T. Blackford (*pro hac vice* to be submitted)
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
901 New York Avenue, N.W.
Washington, DC 20001
(202) 408-4000

mike.jakes@finnegan.com
houtan.esfahani@finnegan.com
smith.brittingham@finnegan.com
brian.kacedon@finnegan.com
raj.gupta@finnegan.com
christopher.blackford@finnegan.com

John P. Palmer
State Bar No. 15430600
John A. “Andy” Powell
State Bar No. 24029775
USPTO Reg. No. 71,533
Jacqueline P. Altman
State Bar No. 24087010
NAMAN HOWELL SMITH & LEE, PLLC
400 Austin Ave., Suite 800
Waco, Texas 76701

palmer@namanhowell.com
powell@namanhowell.com
jaltman@namanhowell.com