

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

SOL IP, LLC,

Plaintiff,

v.

VERIZON COMMUNICATIONS INC. and
CELLCO PARTNERSHIP d/b/a VERIZON
WIRELESS,

Defendants.

Civil Action No. 2:18-cv-00528

PATENT CASE

JURY TRIAL DEMANDED

COMPLAINT FOR PATENT INFRINGEMENT

This is an action for patent infringement in which plaintiff Sol IP, LLC (“Sol IP”), makes the following allegations against the Verizon defendants:

BACKGROUND

1. This lawsuit asserts causes of action for infringement of Sol IP’s patents referenced in Counts One through Twenty-Five herein (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 were invented by researchers at the Electronics and Telecommunications Research Institute (“ETRI”). Sol IP holds an exclusive license to the Asserted Patents from ETRI, which transferred to Sol IP all substantial rights in those patents.

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. 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), and—the technologies at issue in this case—4G LTE (long-term evolution) cellular phone communications and WLAN (wireless local area networking, or Wi-Fi). ETRI employs over two thousand research and technical staff, of whom 94% hold post-graduate degrees and 50% have earned technological doctorate degrees. Over the last five years, ETRI has applied for nearly 17,000 patents, has contributed more than 8,300 proposals adopted by international and domestic standards organizations, and has published over 1,200 articles in peer-reviewed technology publications.

5. ETRI actively contributed to the development of advanced telecommunications platforms including 3G CDMA2000, 3G WCDMA, and 4G/LTE. 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 portfolios, which includes more than 21,000 patents and patent applications worldwide.

6. ETRI has a long history of innovative technical contributions, including its patents relating to LTE, LTE-Advanced, and Wi-Fi technology. Some of ETRI's other accomplishments include: in 1986, ETRI introduced the all-digital telephone exchange; in 1995, ETRI introduced the world's first commercial CDMA network; in 1999, ETRI introduced the CDMA2000 network; in 2004, ETRI introduced the world's first 4G WiBro network; and in 2011, ETRI introduced the world's first LTE-Advanced system.

7. Prior to filing this Complaint, Sol IP provided Verizon with notice of the Asserted Patents or, to the extent a patent had not yet issued at the time the notice was prepared, the

application number resulting in such patent or from which such patent later derived, along with details of Verizon's infringement of such patent or application. Sol IP attempted to engage in negotiations with Verizon to try to resolve this dispute.

8. Despite these efforts, Verizon did not license on mutually agreeable terms the Asserted Patents. Sol IP therefore brings this suit against Verizon seeking the Court's protection of its valuable intellectual property rights.

THE PARTIES

9. Plaintiff Sol IP is an intellectual property licensing company. Sol IP is 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.

10. Upon information and belief, defendant Verizon Communications Inc. ("VCI") is a corporation organized and existing under the laws of Delaware, with a principal place of business at 1 Verizon Way, Basking Ridge, New Jersey 07920. VCI is doing business, either directly or through its agents, on an ongoing basis in this judicial district and elsewhere in the United States, and has a regular and established place of business in this judicial district. VCI may be served through its registered The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

11. Cellco Partnership d/b/a Verizon Wireless ("Verizon Wireless"; with VCI, "Verizon") is a general partnership organized and existing under the laws of Delaware, with a principal place of business at 1 Verizon Way, Basking Ridge, New Jersey 07920. Verizon Wireless is doing business, either directly or through its agents, on an ongoing basis in this judicial district and elsewhere in the United States, and has a regular and established place of business in this judicial district. Verizon Wireless may be served through its registered The

Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

JURISDICTION AND VENUE

12. This action arises under the patent laws of the United States, Title 35 of the United States Code, including in particular 35 U.S.C. § 271.

13. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

14. This Court has personal jurisdiction over Verizon because Verizon has minimum contacts with Texas and this district such that this venue is a fair and reasonable one. Verizon conducts substantial business in this forum, including (i) engaging in the infringing conduct alleged herein and (ii) regularly doing or soliciting business, engaging in other persistent courses of conduct, and/or deriving substantial revenue from goods and services provided to individuals in Texas and in this district.

15. Venue in the Eastern District of Texas is proper under 28 U.S.C. §§ 1391(b) and (c) and 1400(b).

16. Upon information and belief, Verizon has committed infringing acts in this judicial district by making, using, offering for sale, selling, or importing products or services that infringe the Asserted Patents (as defined herein), or by inducing others to infringe the Asserted Patents. On information and belief, Verizon maintains a “regular and established” place of business in this district, including by (a) maintaining or controlling retail stores in this district, (b) maintaining and operating infringing base stations in this district, including on cellular towers and other installation sites owned or leased by them, and (c) maintaining and operating other places of business in this district, including those where research, development, or sales are conducted, where customer service is provided, or where repairs are made.

17. Upon information and belief, Verizon has a regular and established physical presence in the district, including but not limited to, ownership of or control over property, inventory, or infrastructure. For example, Verizon's website displays information for Verizon retail stores located at 2035 North Central Expressway, Suite 620, McKinney, Texas; 8988 South Broadway Avenue, Suite 110, Tyler, Texas; and 2330 Preston Road, Suite 500, Frisco, Texas, all of which lie within this federal judicial district.

18. In other recent actions, Verizon has either admitted or not contested that this federal judicial district is a proper venue for patent infringement actions against it. *See, e.g.*, Answer ¶ 15, *Cellular Commc'ns Equip., LLC v. Apple Inc., et al.*, No. 6:17-cv-146 (E.D. Tex. June 29, 2017), ECF No. 44; Answer ¶ 6, *Traxcell Techs., LLC v. Verizon Commc'ns, Inc., et al.*, No. 2:17-cv-721 (E.D. Tex. Jan. 22, 2018), ECF No. 8. Defendant Cellco Partnership has also admitted or failed to contest that it has transacted business in this district. *See Cellular Commc'ns*, Answer ¶¶ 6, 16; Answer ¶ 7, *Plectrum LLC v. Verizon Commc'ns Inc., et al.*, No. 4:17-cv-126 (E.D. Tex. Apr. 19, 2017), ECF No. 21.

19. Verizon derives benefits from its presence in this federal judicial district, including, but not limited to, sales revenue and serving customers using its mobile network in this district. For example, Verizon receives revenue from its corporate stores in this district, by selling network access, phones/products, and services, and by receiving payment for network access, phones/products, and services.

ACCUSED STANDARDS AND INSTRUMENTALITIES

20. The Third Generation Partnership Project ("3GPP") is an organization that 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 Long Term Evolution ("LTE") Standards. Organizational partners of

3GPP include standard-development organizations from around the world, including (among others) the Alliance for Telecommunications Industry Solutions (“ATIS”), which represents North America in 3GPP; the European Telecommunications Standards Institute (“ETSI”), which represents Europe in 3GPP; and the Telecommunications Technology Association (“TTA”), which represents Korea in 3GPP.

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

22. 3GPP uses a system of “releases” to provide developers with a stable platform for the implementation of features. ATIS published the 3GPP technical specifications for LTE Release 8 and Release 10 (among others) to be the LTE Standards for North America. (Accordingly, references to 3GPP technical specifications (“TS”) in this Complaint should be understood include the corresponding ATIS documents.) Release 8 was the basis for the deployment of the standard technology known as LTE. Subsequent enhancements were incorporated into the LTE Standards in later releases. Release 10, which includes the technology of Release 8, was the basis for the deployment of an advanced form of LTE called LTE-Advanced (“LTE-A”).

23. 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 standards for wireless local area networks branded as Wi-Fi. The Wi-Fi standards are known as IEEE 802.11. The IEEE has issued numerous releases of the IEEE 802.11 standard,

including the original IEEE 802.11 in 1997 and amendments IEEE 802.11a and 802.11b in 1999, IEEE 802.11g in 2003, IEEE 802.11n in 2009, and IEEE 802.11ac in 2013.

24. Verizon operates and sells access to a mobile network that provides telecommunication, Internet service, and other services to customers in this district and throughout the United States. Verizon's mobile network communicates with customer's mobile devices (also referred to as "terminals" or "user equipment"), such as mobile phones, smartphones, tablets, and mobile hotspots, in accordance with LTE Standards including LTE Release 8 (and later) and LTE Release 10 (and later).¹ Verizon also sells mobile devices, through channels including its website and retail stores, that communicate in accordance with those LTE Standards for use on its network and in accordance with Wi-Fi standards including IEEE 802.11n (and later) and IEEE 802.11ac (and later).

25. Verizon's website states that it operates an LTE mobile network, meaning the network communicates in accordance with, at a minimum, LTE Release 8. According to Verizon's website, "If you're with Verizon, you're with the nation's largest, most reliable 4G LTE network." The website then states: "Only Verizon's 4G LTE is 100% LTE. Verizon's 4G LTE network covers over 98% of Americans. That means you're able to share your moments, stream what matters to you and make connection when you need them most."²

26. Verizon's website provides a coverage map that identifies where it provides 4G LTE coverage.³ That area includes cities in this district such as Marshall, Beaumont, Lufkin, Sherman-Denison, Tyler, and Texarkana.

¹ LTE Release 10 is also referred to as LTE-A Release 10.

² <https://www.verizonwireless.com/landingpages/4g-lte-ret/>

³ <https://www.verizonwireless.com/featured/better-matters/>

27. Verizon's website states that it has deployed LTE-Advanced technology in its mobile network, meaning those portions of its network communicate in accordance with, at a minimum LTE-A Release 10. Verizon's website states that, in 2016, it was the "First U.S. provider to deploy LTE Advanced in cities nationwide."⁴ An associated map shows numerous cities in Texas as having LTE-Advanced coverage.

28. Verizon's website offers mobile devices identified as supporting LTE and LTE-Advanced, meaning they communicate in accordance with, at a minimum, LTE Release 8 and LTE-A Release 10.⁵ Such devices include, among others, "Google Pixel 2 XL,"⁶ "Motorola moto g,"⁷ and "ASUS ZenFone V Live."⁸ Verizon's website states: "These phones will connect automatically with the 4G LTE network where available."⁹

29. Verizon's website states: "LTE stands for Long Term Evolution. It's a term used for the particular type of 4G that delivers the fastest mobile Internet experience. You'll usually see it called 4G LTE. Using a 4G smartphone on Verizon's 4G LTE network means you can download files from the Internet up to 10 times faster than with 3G. With 4G LTE, using the web from your phone is just like using it from your home computer. For 4G LTE to work, all you need is a smartphone that's configured to work with it."¹⁰

30. Verizon's website offers numerous mobile devices further identified as supporting Wi-Fi connectivity and communicating in accordance with specified IEEE 802.11 standards,

⁴ <https://www.verizonwireless.com/featured/better-matters/>

⁵ <https://www.verizonwireless.com/smartphones/>

⁶ <https://www.verizonwireless.com/smartphones/google-pixel-2-xl/#sku=sku2690601>

⁷ <https://www.verizonwireless.com/smartphones/moto-g6/#sku=sku3050009>

⁸ <https://www.verizonwireless.com/smartphones/asus-zenfone-v-live/#sku=sku2730051>

⁹ <https://www.verizonwireless.com/articles/network-speeds-101-comparing-3g-and-4g-lte/>

¹⁰ <https://www.verizonwireless.com/articles/network-speeds-101-comparing-3g-and-4g-lte/>

including, among others, “Google Pixel 2 XL”¹¹ (“Wi-Fi 2.4G + 5 GHz 802.11a/b/g/n/ac 2x2 MIMO”¹²), Motorola moto g6”¹³ (“802.11 a/b/g/n 2.4 GHz + 5 GHz”¹⁴), and “ASUS ZenFone V Live”¹⁵ (“802.11b/g/n”¹⁶).

31. Verizon’s wireless plans impose constraints on the use of wireless data. Verizon’s wireless support website states: “Any data that’s used while your device is connected to the Verizon Wireless network (with the exception of FreeBee sponsored data) will use your monthly data allowance.” To address such constraints, Verizon’s website instructs users to “Connect to Wi-Fi to use less data,” and explains: “When you’re connected to Wi-Fi you won’t be charged for any data you use because you aren’t using the Verizon Wireless network. We recommend you connect to Wi-Fi networks you know and trust whenever they’re available. This is a great way to manage how much data you use and avoid extra charges. Visit the Wi-Fi FAQs to learn more about Wi-Fi.”¹⁷

32. Even Verizon’s wireless plans branded as “Unlimited” impose constraints on the use of wireless data. For example, Verizon’s website states that the “Beyond Unlimited” plan includes “Premium Unlimited 4G LTE Data (22 GB)” and notes: “After 22 GB/line, in times of congestion, your data may be temporarily slower than other traffic.”¹⁸

33. Verizon instructs users on using their mobile device as a mobile Wi-Fi hotspot. For example, Verizon’s website provides such instructions on a webpage titled: “How to use your smartphone as a mobile hotspot.” The webpage has the tagline: “Bye-bye public Wi-Fi:

¹¹ <https://www.verizonwireless.com/smartphones/google-pixel-2-xl/#sku=sku2690601>

¹² https://store.google.com/sg/product/pixel_2_xl_specs

¹³ <https://www.verizonwireless.com/smartphones/moto-g6/#sku=sku3050009>

¹⁴ <https://www.motorola.com/us/products/moto-g-gen-6#specs>

¹⁵ <https://www.verizonwireless.com/smartphones/asus-zenfone-v-live/#sku=sku2730051>

¹⁶ <https://www.asus.com/us/Phone/ASUS-ZenFone-V-Live-V500KL/specifications/>

¹⁷ <https://www.verizonwireless.com/support/data-usage-faqs/>

¹⁸ <https://www.verizonwireless.com/plans/unlimited/>

Leaving the house with a smartphone means you've got the Internet in your pocket.” The webpage also states: “Today, most smartphones from Verizon Wireless have a built-in mobile hotspot function—allowing you to work on the go and browse the Internet anytime.”¹⁹

34. “Accused Usage Devices” refers to mobile devices used on Verizon’s mobile network, excluding any devices subject to a license, covenant not to sue, or standstill for the applicable patent.

35. “Accused Sale Devices” refers to mobile devices sold by Verizon, excluding any devices subject to a license, covenant not to sue, or standstill for the applicable patent.

NOTICE OF THE ASSERTED PATENTS

36. Verizon 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.

37. On May 1, 2015, Sol IP sent a letter to Verizon (the “2015 LTE Notice Letter”). The 2015 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.”

38. The 2015 LTE Notice Letter included an attachment that the letter describes as a “list of some of the ETRI LTE Patents” as well as “pending patent applications.” The attachment lists, among others, the patents referenced in Counts One through Eighteen herein (“Asserted LTE Patents”) by patent number or, to the extent a patent had not yet issued when the list was

¹⁹ <https://www.verizonwireless.com/articles/how-to-use-your-smartphone-as-a-mobile-hotspot/>

prepared, the application number resulting in such patent or from which such patent later derived.

39. The 2015 LTE Notice Letter further stated: “We 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.”

40. On June 8, 2015, Sol IP sent a letter to Verizon (the “2015 Wi-Fi Notice Letter”). The 2015 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.”

41. The 2015 Wi-Fi Notice Letter included an attachment that the letter describes as a “list of exemplary ETRI Wi-Fi Patents and pending patent applications.” The attachment lists, among others, the patents referenced in Counts Nineteen through Twenty-Five herein (“Asserted Wi-Fi Patents”) 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 later derived.

42. The 2015 Wi-Fi Notice Letter further stated: “We hereby 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.”

43. Sol IP engaged in subsequent communications with Verizon, including follow-up correspondence updating the list of patents and a letter on July 10, 2018 (the “2018 Letter”). The 2018 Letter sought to advance the discussion of “entering into a license agreement on FRAND terms.” “FRAND” is an acronym for fair, reasonable, and non-discriminatory. Verizon has not agreed to license the Asserted Patents on such terms.

44. As a member of TTA, ETRI declared the intellectual property rights reflected in the Asserted LTE Patents to be essential to the LTE Standards.

45. Verizon is a 3GPP member organization or is affiliated with a 3GPP member organization. 3GPP solicits identification of standard-essential patents and, through 3GPP, Verizon received notice of the standard-essential patents at issue here when they were disclosed to 3GPP via its organizational partners.

46. 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. 9,603,174

47. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

48. On March 21, 2017, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,603,174 B2 (“the ’174 Patent”), entitled “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 that patent is attached as Exhibit 1.

49. Sol IP is the exclusive licensee of the ’174 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

50. Claims of the ’174 Patent, such as claims 25 and 9, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.213 (including section 7.1 of that document) and 3GPP TS 36.212 (including section 5.3.3 of that document), which include inventions covered by the ’174 Patent. Such inventions are reflected in the claimed methods for a base station’s transmitting, or a

terminal's receiving, a subframe based on an identifier associated with the terminal, such as in claims 25 and 9.

51. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the '174 Patent literally or under the doctrine of equivalents (hereafter "'174 Accused Instrumentalities"). At a minimum, such '174 Accused Instrumentalities include (1) Verizon's mobile network, including all base station equipment configured to transmit a subframe from a transmitter in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to receive a subframe from a transmitter transmitted in accordance with those standards.

52. Verizon has directly infringed and continues to directly infringe the '174 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '174 Accused Instrumentalities.

53. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 25 of the '174 Patent.

54. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '174 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '174 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such

products with knowledge and the specific intent that its efforts will result in the direct infringement of the '174 Patent.

55. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 9 of the '174 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

56. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 9 of the '174 Patent.

57. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '174 Patent and how those steps induce infringement of that patent.

58. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '174 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

59. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '174 Patent, including claim 9.

60. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '174 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

61. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '174 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

62. Verizon has had knowledge and notice of the '174 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

63. Upon information and belief, Verizon's infringement of the '174 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '174 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWO
Infringement of U.S. Patent No. 8,761,814

64. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

65. On June 24, 2014, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,761,814 B2 (“the ’814 Patent”), entitled “Method for paging information in cellular system.” A true and correct copy of that patent is attached as Exhibit 2.

66. Sol IP is the exclusive licensee of the ’814 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

67. Claims of the ’814 Patent, such as claims 10 and 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.331 (including section 5.3.2 of that document), 3GPP TS 36.321 (including section 5.5 of that document), and 3GPP TS 36.304 (including section 7 of that document), which include inventions covered by the ’814 Patent. Such inventions are reflected in the claimed methods for a base station’s transmitting, or a terminal’s receiving, of paging information, such as in claims 10 and 1.

68. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claimed methods of the ’814 Patent literally or under the doctrine of equivalents (hereafter “’814 Accused Instrumentalities”). At a minimum, such ’814 Accused Instrumentalities include (1) Verizon’s mobile network, including all base station equipment configured to generate paging information in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to decode paging information in accordance with those standards.

69. Verizon has directly infringed and continues to directly infringe the '814 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '814 Accused Instrumentalities.

70. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 10 of the '814 Patent.

71. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '814 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '814 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '814 Patent.

72. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '814 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

73. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use

on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '814 Patent.

74. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '814 Patent and how those steps induce infringement of that patent.

75. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '814 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

76. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '814 Patent, including claim 1.

77. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '814 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

78. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights

under the '814 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

79. Verizon has had knowledge and notice of the '814 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

80. Upon information and belief, Verizon's infringement of the '814 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '814 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT THREE
Infringement of U.S. Patent No. 9,155,066

81. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

82. On October 6, 2015, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,155,066 B2 ("the '066 Patent"), entitled "Method for paging information in cellular system." A true and correct copy of that patent is attached as Exhibit 3.

83. Sol IP is the exclusive licensee of the '066 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

84. Claims of the '066 Patent, such as claims 10 and 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.331 (including section 5.3.2 of that document), 3GPP TS 36.321

(including section 5.5 of that document), and 3GPP TS 36.304 (including section 7 of that document), which include inventions covered by the '066 Patent. Such inventions are reflected in the claimed methods for a base station's transmitting, or a terminal's receiving, of paging information, such as in claims 10 and 1.

85. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the '066 Patent literally or under the doctrine of equivalents (hereafter "'066 Accused Instrumentalities"). At a minimum, such '066 Accused Instrumentalities include (1) Verizon's mobile network, including all base station equipment configured to generate paging information in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to decode paging information in accordance with those standards.

86. Verizon has directly infringed and continues to directly infringe the '066 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '066 Accused Instrumentalities.

87. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 10 of the '066 Patent.

88. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '066 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '066 Accused

Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '066 Patent.

89. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '066 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

90. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '066 Patent.

91. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '066 Patent and how those steps induce infringement of that patent.

92. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '066 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

93. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '066 Patent, including claim 1.

94. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '066 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

95. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '066 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

96. Verizon has had knowledge and notice of the '066 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

97. Upon information and belief, Verizon's infringement of the '066 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '066 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT FOUR
Infringement of U.S. Patent No. 8,270,354

98. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

99. On September 18, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,270,354 B2 (“the ’354 Patent”), entitled “Method for transmitting up link control signal in mobile communication system.” A true and correct copy of that patent is attached as Exhibit 4.

100. Sol IP is the exclusive licensee of the ’354 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

101. Claims of the ’354 Patent, such as claims 1 and 10, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.300 (including section 10.1.5 of that document) and 3GPP TS 36.321 (including section 5.1 of that document), which include inventions covered by the ’354 Patent. Such inventions are reflected in the claimed methods for a base station’s transmitting, or a terminal’s receiving, of responses for random access, such as in claims 1 and 10.

102. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the ’354 Patent literally or under the doctrine of equivalents (hereafter “’354 Accused Instrumentalities”). At a minimum, such ’354 Accused Instrumentalities include (1) Verizon’s mobile network, including all base station equipment configured to transmit responses for random access in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to receive responses for random access in accordance with those standards.

103. Verizon has directly infringed and continues to directly infringe the '354 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '354 Accused Instrumentalities.

104. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 1 of the '354 Patent.

105. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '354 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '354 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '354 Patent.

106. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 10 of the '354 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

107. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use

on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 10 of the '354 Patent.

108. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '354 Patent and how those steps induce infringement of that patent.

109. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '354 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

110. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '354 Patent, including claim 10.

111. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '354 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

112. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights

under the '354 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

113. Verizon has had knowledge and notice of the '354 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

114. Upon information and belief, Verizon's infringement of the '354 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '354 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT FIVE
Infringement of U.S. Patent No. 8,311,031

115. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

116. On November 13, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,311,031 B2 ("the '031 Patent"), entitled "Cell search method, forward link frame transmission method, apparatus using the same and forward link frame structure." A true and correct copy of that patent is attached as Exhibit 5.

117. 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.

118. Claims of the '031 Patent, such as claims 1 and 8, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not

limited to 3GPP TS 36.211 (including section 6.11 of that document) and 3GPP 36.213 (including section 4.1 of that document), which include inventions covered by the '031 Patent. Such inventions are reflected in the claimed methods and apparatuses for a mobile station performing cell searches, such as in claims 1 and 8.

119. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others of equipment and services that practice one or more claims of the '031 Patent literally or under the doctrine of equivalents (hereafter "'031 Accused Instrumentalities"). At a minimum, such '031 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to perform cell searches in accordance with LTE Release 8 (or later).

120. Verizon has directly infringed and continues to directly infringe the '031 Patent in violation of 35 U.S.C. § 271(a) by making, selling, offering for sale, importing, or using, without authorization, the '031 Accused Instrumentalities.

121. For example, Verizon makes, sells, or offers to sell in the United States, or imports into the United States, the Accused Sale Devices that are configured to communicate in accordance with LTE Release 8 (or later), thereby infringing at least claim 8 of the '031 Patent.

122. Verizon has indirectly infringed and continues to indirectly infringe the '031 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '031 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with

knowledge and the specific intent that its efforts will result in the direct infringement of the '031 Patent.

123. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '031 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

124. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '031 Patent.

125. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '031 Patent and how those steps induce infringement of that patent.

126. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '031 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

127. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '031 Patent, including claim 1.

128. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '031 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

129. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '031 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

130. Verizon has had knowledge and notice of the '031 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

131. Upon information and belief, Verizon's infringement of the '031 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '031 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT SIX
Infringement of U.S. Patent No. 9,496,976

132. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

133. On November 15, 2016, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,496,976 B2 (“the ’976 Patent”), entitled “Cell search method, forward link frame transmission method, apparatus using the same and forward link frame structure.” A true and correct copy of that patent is attached as Exhibit 6.

134. 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.

135. Claims of the ’976 Patent, such as claims 9 and 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 6.11 of that document) and 3GPP 36.213 (including section 4.1 of that document), which include inventions covered by the ’976 Patent. Such inventions are reflected in the claimed methods for a base station’s transmitting, or a terminal’s receiving, of downlink transmission, such as in claims 9 and 1.

136. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the ’976 Patent literally or under the doctrine of equivalents (hereafter “’976 Accused Instrumentalities”). At a minimum, such ’976 Accused Instrumentalities include (1) Verizon’s mobile network, including all base station equipment configured to generate and transmit downlink transmissions in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to receive a downlink transmission from a transmitter transmitted in accordance with those standards.

137. Verizon has directly infringed and continues to directly infringe the '976 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '976 Accused Instrumentalities.

138. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 9 of the '976 Patent.

139. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '976 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '976 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '976 Patent.

140. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '976 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

141. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use

on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '976 Patent.

142. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '976 Patent and how those steps induce infringement of that patent.

143. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '976 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

144. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '976 Patent, including claim 1.

145. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '976 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

146. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights

under the '976 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

147. Verizon has had knowledge and notice of the '976 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

148. Upon information and belief, Verizon's infringement of the '976 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '976 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT SEVEN
Infringement of U.S. Patent No. 10,080,204

149. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

150. On September 18, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,080,204 B2 ("the '204 Patent"), entitled "Cell search method, forward link frame transmission method, apparatus using the same and forward link frame structure." A true and correct copy of that patent is attached as Exhibit 7.

151. 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.

152. Claims of the '204 Patent, such as claims 1, 7, and 13, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not

limited to 3GPP TS 36.211 (including section 6.11 of that document), which include inventions covered by the '204 Patent. Such inventions are reflected in the claimed methods and apparatuses for a base station's transmitting, or a terminal's receiving, of a frame, such as in claims 1, 7, and 13.

153. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others of equipment and services that practice one or more claims of the '204 Patent literally or under the doctrine of equivalents (hereafter "'204 Accused Instrumentalities"). At a minimum, such '204 Accused Instrumentalities include (1) Verizon's mobile network, including all base station equipment configured to generate and transmit frames in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to receive a frame in accordance with those standards.

154. Verizon has directly infringed and continues to directly infringe the '204 Patent in violation of 35 U.S.C. § 271(a) by making, selling, offering for sale, importing, or using, without authorization, the '204 Accused Instrumentalities.

155. For example, Verizon makes, sells, or offers to sell in the United States, or imports into the United States, the Accused Sale Devices that are configured to communicate in accordance with LTE Release 8 (or later), thereby infringing at least claim 7 of the '204 Patent.

156. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 13 of the '204 Patent.

157. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '204 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and

facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '204 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '204 Patent.

158. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '204 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

159. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '204 Patent.

160. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '204 Patent and how those steps induce infringement of that patent.

161. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '204 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they

are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

162. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '204 Patent, including claim 1.

163. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '204 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

164. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '204 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

165. Verizon has had knowledge and notice of the '204 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

166. Upon information and belief, Verizon's infringement of the '204 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '204 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT EIGHT
Infringement of U.S. Patent No. 8,320,565

167. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

168. On November 27, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,320,565 B2 ("the '565 Patent"), entitled "Method for generating downlink frame, and method for searching cell." A true and correct copy of that patent is attached as Exhibit 8.

169. Sol IP is the exclusive licensee of the '565 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

170. Claims of the '565 Patent, such as claim 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 6.11 of that document) and 3GPP 36.213 (including section 4.1 of that document), which include inventions covered by the '565 Patent. Such inventions are reflected in the claimed methods for a mobile station's searching a cell, such as in claim 1.

171. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the '565 Patent literally or under the doctrine of equivalents (hereafter "'565 Accused Instrumentalities"). At a minimum, such '565 Accused Instrumentalities include

all Accused Usage Devices and Accused Sale Devices that are configured to search a cell in accordance with LTE Release 8 (or later).

172. Verizon has indirectly infringed and continues to indirectly infringe the '565 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '565 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '565 Patent.

173. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '565 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (or later) will cause the user to use their mobile device in a manner that infringes the patent.

174. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '565 Patent.

175. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '565 Patent and how those steps induce infringement of that patent.

176. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '565 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

177. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '565 Patent, including claim 1.

178. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '565 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

179. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '565 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

180. Verizon has had knowledge and notice of the '565 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it

received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

181. Upon information and belief, Verizon's infringement of the '565 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '565 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT NINE
Infringement of U.S. Patent No. 8,320,571

182. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

183. On November 27, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,320,571 B2 ("the '571 Patent"), entitled "Method for generating downlink frame, and method for searching cell." A true and correct copy of that patent is attached as Exhibit 9.

184. Sol IP is the exclusive licensee of the '571 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

185. Claims of the '571 Patent, such as claims 1 and 5, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 6.11 of that document) and 3GPP 36.213 (including section 4.1 of that document), which include inventions covered by the '571 Patent. Such inventions are reflected in the claimed methods and apparatuses for a mobile station's searching a cell, such as in claims 1 and 5.

186. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others of equipment and services that practice one or more claims of the '571 Patent literally or under the doctrine of equivalents (hereafter "571 Accused Instrumentalities"). At a minimum, such '571 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to search a cell in accordance with LTE Release 8 (or later).

187. Verizon has directly infringed and continues to directly infringe the '571 Patent in violation of 35 U.S.C. § 271(a) by making, selling, offering for sale, importing, or using, without authorization, the '571 Accused Instrumentalities.

188. For example, Verizon makes, sells, or offers to sell in the United States, or imports into the United States, the Accused Sale Devices that are configured to communicate in accordance with LTE Release 8 (or later), thereby infringing at least claim 5 of the '571 Patent.

189. Verizon has indirectly infringed and continues to indirectly infringe the '571 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '571 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '571 Patent.

190. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of

at least claim 1 of the '571 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

191. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '571 Patent.

192. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '571 Patent and how those steps induce infringement of that patent.

193. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '571 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

194. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '571 Patent, including claim 1.

195. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '571 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that

they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

196. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '571 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

197. Verizon has had knowledge and notice of the '571 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

198. Upon information and belief, Verizon's infringement of the '571 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '571 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TEN
Infringement of U.S. Patent No. 9,144,064

199. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

200. On September 22, 2015, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,144,064 B2 ("the '064 Patent"), entitled "Generating downlink frame and searching for cell." A true and correct copy of that patent is attached as Exhibit 10.

201. Sol IP is the exclusive licensee of the '064 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

202. Claims of the '064 Patent, such as claim 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 6.11 of that document) and 3GPP 36.213 (including section 4.1 of that document), which include inventions covered by the '064 Patent. Such inventions are reflected in the claimed methods for a mobile station's searching a cell, such as in claim 1.

203. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the '064 Patent literally or under the doctrine of equivalents (hereafter "'064 Accused Instrumentalities"). At a minimum, such '064 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to search a cell in accordance with LTE Release 8 (or later).

204. Verizon has indirectly infringed and continues to indirectly infringe the '064 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '064 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '064 Patent.

205. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '064 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

206. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '064 Patent.

207. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '064 Patent and how those steps induce infringement of that patent.

208. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '064 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

209. For example, Verizon knew that the functionality included in the '064 Accused Instrumentalities enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '064 Patent, including claim 1.

210. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '064 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

211. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '064 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

212. Verizon has had knowledge and notice of the '064 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

213. Upon information and belief, Verizon's infringement of the '064 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '064 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT ELEVEN
Infringement of U.S. Patent No. 9,204,438

214. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

215. On December 1, 2015, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,204,438 B2 (“the ’438 Patent”), entitled “Generating downlink frame and searching for cell.” A true and correct copy of that patent is attached as Exhibit 11.

216. Sol IP is the exclusive licensee of the ’438 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

217. Claims of the ’438 Patent, such as claim 15, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 6.11 of that document) and 3GPP 36.213 (including section 4.1 of that document), which include inventions covered by the ’438 Patent. Such inventions are reflected in the claimed methods for a base station’s generating a downlink frame to facilitate cell search, such as in claim 15.

218. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the ’438 Patent literally or under the doctrine of equivalents (hereafter “’438 Accused Instrumentalities”). At a minimum, such ’438 Accused Instrumentalities include Verizon’s mobile network, including all base station equipment configured to generate downlink frames to facilitate cell search in accordance with LTE Release 8 (or later).

219. Verizon has directly infringed and continues to directly infringe the ’438 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the ’438 Accused Instrumentalities.

220. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 15 of the ’438 Patent.

221. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '438 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

222. Verizon has had knowledge and notice of the '438 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

223. Upon information and belief, Verizon's infringement of the '438 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '438 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWELVE
Infringement of U.S. Patent No. 9,888,435

224. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

225. On February 6, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,888,435 B2 ("the '435 Patent"), entitled "Generating downlink frame and searching for cell." A true and correct copy of that patent is attached as Exhibit 12.

226. 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.

227. Claims of the '435 Patent, such as claim 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 6.11 of that document) and 3GPP 36.213 (including section 4.1 of that document), which include inventions covered by the '435 Patent. Such inventions are reflected in the claimed methods for a base station's generating a downlink frame to facilitate cell search, such as in claim 1.

228. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the '435 Patent literally or under the doctrine of equivalents (hereafter "435 Accused Instrumentalities"). At a minimum, such '435 Accused Instrumentalities include Verizon's mobile network, including all base station equipment configured to generate downlink frames to facilitate cell search in accordance with LTE Release 8 (and later).

229. Verizon has directly infringed and continues to directly infringe the '435 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '435 Accused Instrumentalities.

230. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 1 of the '435 Patent.

231. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '435 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

232. Verizon has had knowledge and notice of the '435 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

233. Upon information and belief, Verizon's infringement of the '435 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '435 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT THIRTEEN
Infringement of U.S. Patent No. 8,320,337

234. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

235. On November 27, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,320,337 B2 ("the '337 Patent"), entitled "Method and apparatus for transmitting ACK/NACK." A true and correct copy of that patent is attached as Exhibit 13.

236. 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.

237. Claims of the '337 Patent, such as claims 5 and 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 6.9 of that document) and 3GPP 36.213 (including section 9.1.2 of that document), which include inventions covered by the '337 Patent. Such inventions are reflected in the claimed methods for a base station's transmitting, or a terminal's

receiving, of acknowledgement (“ACK”) and negative acknowledgement (“NACK”) information about data transmitted to the base station by the terminal, such as in claims 5 and 1.

238. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the ’337 Patent literally or under the doctrine of equivalents (hereafter “’337 Accused Instrumentalities”). At a minimum, such ’337 Accused Instrumentalities include (1) Verizon’s mobile network, including all base station equipment configured to transmit ACK or NACK information in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to receive ACK or NACK information transmitted in accordance with those standards.

239. Verizon has directly infringed and continues to directly infringe the ’337 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the ’337 Accused Instrumentalities.

240. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 5 of the ’337 Patent.

241. In addition, Verizon has indirectly infringed and continues to indirectly infringe the ’337 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the ’337 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such

products with knowledge and the specific intent that its efforts will result in the direct infringement of the '337 Patent.

242. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '337 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

243. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '337 Patent.

244. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '337 Patent and how those steps induce infringement of that patent.

245. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '337 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

246. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '337 Patent, including claim 1.

247. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '337 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

248. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '337 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

249. Verizon has had knowledge and notice of the '337 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

250. Upon information and belief, Verizon's infringement of the '337 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '337 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT FOURTEEN
Infringement of U.S. Patent No. 8,971,168

251. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

252. On March 3, 2015, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,971,168 B2 (“the ’168 Patent”), entitled “Carrier aggregation in wireless communications systems.” A true and correct copy of that patent is attached as Exhibit 14.

253. Sol IP is the exclusive licensee of the ’168 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

254. Claims of the ’168 Patent, such as claims 18 and 1, are essential to certain LTE Standards, including LTE-A Release 10 (and later) and its technical specifications including but not limited to 3GPP TS 36.211 (including section 5.4.2A of that document), which include inventions covered by the ’168 Patent. Such inventions are reflected in the claimed methods for a base station’s transmitting, or a terminal’s receiving, of data according to a carrier aggregation scheme, such as in claims 18 and 1.

255. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the ’168 Patent literally or under the doctrine of equivalents (hereafter “’168 Accused Instrumentalities”). At a minimum, such ’168 Accused Instrumentalities include (1) Verizon’s mobile network, including all base station equipment configured to receive DFT-S-OFDM symbols in accordance with LTE-A Release 10 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to transmit DFT-S-OFDM symbols in accordance with those standards.

256. Verizon has directly infringed and continues to directly infringe the '168 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '168 Accused Instrumentalities.

257. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE-A Release 10 (or later), thereby infringing at least claim 18 of the '168 Patent.

258. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '168 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '168 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '168 Patent.

259. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '168 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE-A Release 10 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

260. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use

on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '168 Patent.

261. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '168 Patent and how those steps induce infringement of that patent.

262. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '168 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

263. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE-A Release 10 (and later), and that such functionality infringes the '168 Patent, including claim 1.

264. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '168 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE-A Release 10 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

265. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights

under the '168 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

266. Verizon has had knowledge and notice of the '168 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

267. Upon information and belief, Verizon's infringement of the '168 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '168 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT FIFTEEN
Infringement of U.S. Patent No. 8,593,936

268. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

269. On November 26, 2013, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,593,936 B2 ("the '936 Patent"), entitled "Carrier aggregation in wireless communication systems." A true and correct copy of that patent is attached as Exhibit 15.

270. 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.

271. Claims of the '936 Patent, such as claims 12 and 1, are essential to certain LTE Standards, including LTE-A Release 10 (and later) and its technical specifications including but

not limited to 3GPP TS 36.211 (including section 5.4.2A of that document), which include inventions covered by the '936 Patent. Such inventions are reflected in the claimed methods for a base station's transmitting, or a terminal's receiving, of data according to a carrier aggregation scheme, such as in claims 12 and 1.

272. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice one or more claims of the '936 Patent literally or under the doctrine of equivalents (hereafter "'936 Accused Instrumentalities"). At a minimum, such '936 Accused Instrumentalities include (1) Verizon's mobile network, including all base station equipment configured to receive subframes including a plurality of slots in accordance with LTE-A Release 10 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to transmit subframes including a plurality of slots in accordance with those standards.

273. Verizon has directly infringed and continues to directly infringe the '936 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '936 Accused Instrumentalities.

274. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE-A Release 10 (or later), thereby infringing at least claim 12 of the '936 Patent.

275. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '936 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '936 Accused

Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '936 Patent.

276. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '936 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE-A Release 10 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

277. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '936 Patent.

278. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '936 Patent and how those steps induce infringement of that patent.

279. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '936 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

280. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE-A Release 10 (and later), and that such functionality infringes the '936 Patent, including claim 1.

281. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '936 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE-A Release 10 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

282. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '936 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

283. Verizon has had knowledge and notice of the '936 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

284. Upon information and belief, Verizon's infringement of the '936 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '936 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT SIXTEEN
Infringement of U.S. Patent No. 10,075,946

285. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

286. On September 11, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,075,946 B2 (“the ’946 Patent”), entitled “Method and apparatus for transmission and reception in multi-carrier wireless communication systems.” A true and correct copy of that patent is attached as Exhibit 16.

287. Sol IP is the exclusive licensee of the ’946 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

288. Claims of the ’946 Patent, such as claims 14 and 18, are essential to certain LTE Standards, including LTE-A Release 10 (and later) and its technical specifications including but not limited to 3GPP TS 36.213 (including section 9.1.1 of that document), which include inventions covered by the ’946 Patent. Such inventions are reflected in the claimed methods and apparatuses for a terminal’s receiving of Physical Downlink Control Channels (“PDCCHs”), such as in claims 14 and 18.

289. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others of equipment and services that practice one or more claims of the ’946 Patent literally or under the doctrine of equivalents (hereafter “’946 Accused Instrumentalities”). At a minimum, such ’946 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to transmit PDCCHs in accordance with LTE Release 10 (or later).

290. Verizon has directly infringed and continues to directly infringe the '946 Patent in violation of 35 U.S.C. § 271(a) by making, selling, offering for sale, or importing, without authorization, the '946 Accused Instrumentalities.

291. For example, Verizon makes, sells, or offers to sell in the United States, or imports into the United States, the Accused Sale Devices that are configured to communicate in accordance with LTE Release 10 (or later), thereby infringing at least claim 18 of the '946 Patent.

292. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '946 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '946 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '946 Patent.

293. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 14 of the '946 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE-A Release 10 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

294. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 14 of the '946 Patent.

295. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '946 Patent and how those steps induce infringement of that patent.

296. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '946 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

297. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE-A Release 10 (and later), and that such functionality infringes the '946 Patent, including claim 14.

298. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '946 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE-A Release 10 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

299. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those

wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '946 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

300. Verizon has had knowledge and notice of the '946 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

301. Upon information and belief, Verizon's infringement of the '946 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '946 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT SEVENTEEN
Infringement of U.S. Patent No. 10,009,884

302. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

303. On June 26, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,009,884 B2 ("the '884 Patent"), entitled "Method of error recovery in transmitting and receiving voice service in packet based mobile communication systems." A true and correct copy of that patent is attached as Exhibit 17.

304. Sol IP is the exclusive licensee of the '884 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

305. Claims of the '884 Patent, such as claims 13, 19, and 25, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.213 (including section 9.2 of that document) and 3GPP TS 36.321 (including section 5.3.1 of that document), which include inventions covered by the '884 Patent. Such inventions are reflected in the claimed methods and apparatuses for a base station's or a terminal's performance of semi-persistent scheduling, such as in claims 13, 19, and 25.

306. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others of equipment and services that practice one or more claims of the '884 Patent literally or under the doctrine of equivalents (hereafter "'884 Accused Instrumentalities"). At a minimum, such '884 Accused Instrumentalities include (1) Verizon's mobile network, including all base station equipment configured to perform semi-persistent scheduling in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to perform semi-persistent scheduling in accordance with those standards.

307. Verizon has directly infringed and continues to directly infringe the '884 Patent in violation of 35 U.S.C. § 271(a) by making, selling, offering for sale, importing, or using, without authorization, the '884 Accused Instrumentalities.

308. For example, Verizon makes, sells, or offers to sell in the United States, or imports into the United States, the Accused Sale Devices that are configured to communicate in accordance with LTE Release 8 (or later), thereby infringing at least claim 13 of the '884 Patent.

309. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 19 of the '884 Patent.

310. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '884 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '884 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '884 Patent.

311. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 25 of the '884 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

312. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 25 of the '884 Patent.

313. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '884 Patent and how those steps induce infringement of that patent.

314. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '884 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

315. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '884 Patent, including claim 25.

316. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '884 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

317. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '884 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

318. Verizon has had knowledge and notice of the '884 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about

ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

319. Upon information and belief, Verizon's infringement of the '884 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '884 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT EIGHTEEN
Infringement of U.S. Patent No. 9,265,063

320. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

321. On February 16, 2016, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,265,063 B2 ("the '063 Patent"), entitled "Method to transmit downlink signaling message on cellular systems for packet transmission and method for receiving the message." A true and correct copy of that patent is attached as Exhibit 18.

322. Sol IP is the exclusive licensee of the '063 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

323. Claims of the '063 Patent, such as claims 3 and 1, are essential to certain LTE Standards, including LTE Release 8 (and later) and its technical specifications including but not limited to 3GPP TS 36.300 (including section 10.1.5 of that document) and 3GPP TS 36.321 (including section 5.1 of that document), which include inventions covered by the '063 Patent. Such inventions are reflected in the claimed methods for a base station's supporting, or a terminal's performing, of random access, such as in claims 3 and 1.

324. Verizon has and continues, without authorization, to operate and use, and/or to induce and contribute to the operation and use by others of equipment and services that practice

one or more claims of the '063 Patent literally or under the doctrine of equivalents (hereafter "'063 Accused Instrumentalities"). At a minimum, such '063 Accused Instrumentalities include (1) Verizon's mobile network, including all base station equipment configured to facilitate the non-contention based random access procedure in accordance with LTE Release 8 (or later), and (2) all Accused Usage Devices and Accused Sale Devices that are configured to perform the non-contention based random access procedure in accordance with those standards.

325. Verizon has directly infringed and continues to directly infringe the '063 Patent in violation of 35 U.S.C. § 271(a) by using, without authorization, the '063 Accused Instrumentalities.

326. For example, Verizon operates and sells access to its LTE mobile network that includes base stations that communicate with user mobile devices in accordance with LTE Release 8 (or later), thereby infringing at least claim 3 of the '063 Patent.

327. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '063 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination of the '063 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '063 Patent.

328. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of

at least claim 1 of the '063 Patent, including by selling access to its LTE mobile network and encouraging users to operate Accused Usage Devices on that network despite knowing of the patent and the fact that such usage of its network in accordance with LTE Release 8 (and later) will cause the user to use their mobile device in a manner that infringes the patent.

329. Such active steps include, for example, advertising and marketing Verizon's LTE mobile network, marketing and selling of Accused Sale Devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that directly infringe at least claim 1 of the '063 Patent.

330. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '063 Patent and how those steps induce infringement of that patent.

331. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '063 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

332. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with LTE Release 8 (and later), and that such functionality infringes the '063 Patent, including claim 1.

333. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '063 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with LTE Release 8 (and later) specifically so that

they can operate on Verizon's mobile network. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

334. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial. Verizon's infringement of Sol IP's rights under the '063 Patent will continue to damage Sol IP, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

335. Verizon has had knowledge and notice of the '063 Patent and its infringement since (i) at least May 2015, when it received the 2015 LTE Notice Letter, and/or when it received subsequent correspondence identifying the patent, (ii) at least, and through, the filing and service of the Complaint, and (iii) at least upon receiving notice about ETRI's identification of the patent or its application or family as standard-essential. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

336. Upon information and belief, Verizon's infringement of the '063 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '063 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT NINETEEN
Infringement of U.S. Patent No. 10,057,095

337. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

338. On August 21, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,057,095 B2 ("the '095 Patent"), entitled "Packet mode auto-detection in multi-mode wireless communication system, signal field transmission for the packet

mode auto-detection, and gain control based on the packet mode.” A true and correct copy of that patent is attached as Exhibit 19.

339. Sol IP is the exclusive licensee of the '095 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

340. Claims of the '095 Patent, such as claims 1, 8, 15, and 21, are essential to certain Wi-Fi Standards, including IEEE 802.11ac (and later), which include inventions covered by the '095 Patent. Such inventions are reflected in the claimed apparatuses and methods for transmitting or receiving frames, such as in claims 1, 8, 15, and 21.

341. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others, products and services that practice one or more claims of the '095 Patent literally or under the doctrine of equivalents (hereafter “'095 Accused Instrumentalities”). At a minimum, such '095 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (or later).

342. Verizon has directly infringed and continues to directly infringe the '095 Patent in violation of 35 U.S.C. § 271(a) by making, using, offering for sale, selling, or importing, without authorization, the '095 Accused Instrumentalities.

343. For example, Verizon sells the Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (and later), thereby infringing at least claims 8 and 21 of the '095 Patent.

344. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '095 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidaries, affiliates, partners,

service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, with knowledge and the specific intent that its efforts will result in the direct infringement of the '095 Patent.

345. For example, Verizon took active steps to encourage customers and end users to utilize Wi-Fi networks in the United States in a manner it knows will directly infringe each element of at least claims 1 and 15 of the '095 Patent, including by encouraging users to operate Accused Usage Devices and Accused Sale Devices on Wi-Fi networks, and encouraging users to operate Accused Usage Devices and Accused Sale Devices as Wi-Fi access points, despite knowing of the patent and the fact that such usage of Wi-Fi networks in accordance with IEEE 802.11ac (and later) will cause the user to use their mobile device in a manner that infringes the patent.

346. Such active steps include, for example, the dissemination of the '095 Accused Instrumentalities; the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products; and the imposition of data limits, bandwidth throttling, charges for data or excess data usage, or other constraints on the use of cellular data and encouraging the use of Wi-Fi data by customers and end users, with knowledge and the specific intent that its efforts will result in the direct infringement of the '095 Patent.

347. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '095 Patent and how those steps induce infringement of that patent.

348. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '095 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they

are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

349. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with IEEE 802.11ac (and later), and that such functionality infringes the '095 Patent, including claims 1 and 15.

350. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '095 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with IEEE 802.11ac (and later) specifically so that they can operate on compatible Wi-Fi networks. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

351. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial.

352. Verizon has had knowledge and notice of the '095 Patent and its infringement since (i) at least June 2015, when it received the 2015 Wi-Fi Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, and (ii) at least, and through, the filing and service of the Complaint. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

353. Upon information and belief, Verizon's infringement of the '095 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '095 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWENTY
Infringement of U.S. Patent No. 9,432,940

354. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

355. On August 30, 2016, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,432,940 B2 (“the ’940 Patent”), entitled “Power saving method in wireless communication system.” A true and correct copy of that patent is attached as Exhibit 20.

356. Sol IP is the exclusive licensee of the ’940 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

357. Claims of the ’940 Patent, such as claims 1, 5, 9, and 13, are essential to certain Wi-Fi Standards, including IEEE 802.11ac (and later), which include inventions covered by the ’940 Patent. Such inventions are reflected in the claimed apparatuses and methods for accessing a channel in a wireless local area network, such as in claims 1, 5, 9, and 13.

358. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others, products and services that practice one or more claims of the ’940 Patent literally or under the doctrine of equivalents (hereafter “’940 Accused Instrumentalities”). At a minimum, such ’940 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to access a channel in a wireless local area network in accordance with IEEE 802.11ac (or later).

359. Verizon has directly infringed and continues to directly infringe the ’940 Patent in violation of 35 U.S.C. § 271(a) by making, using, offering for sale, selling, or importing, without authorization, the ’940 Accused Instrumentalities.

360. For example, Verizon sells the Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (and later), thereby infringing at least claims 5 and 13 of the '940 Patent.

361. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '940 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, with knowledge and the specific intent that its efforts will result in the direct infringement of the '940 Patent.

362. For example, Verizon took active steps to encourage customers and end users to utilize Wi-Fi networks in the United States in a manner it knows will directly infringe each element of at least claims 1 and 9 of the '940 Patent, including by encouraging users to operate Accused Usage Devices and Accused Sale Devices on Wi-Fi networks, and encouraging users to operate Accused Usage Devices and Accused Sale Devices as Wi-Fi access points, despite knowing of the patent and the fact that such usage of Wi-Fi networks in accordance with IEEE 802.11ac (and later) will cause the user to use their mobile device in a manner that infringes the patent.

363. Such active steps include, for example, the dissemination of the '940 Accused Instrumentalities; the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products; and the imposition of data limits, bandwidth throttling, charges for data or excess data usage, or other constraints on the use of cellular data and encouraging the use of Wi-Fi data by

customers and end users, with knowledge and the specific intent that its efforts will result in the direct infringement of the '940 Patent.

364. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '940 Patent and how those steps induce infringement of that patent.

365. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '940 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

366. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with IEEE 802.11ac (and later), and that such functionality infringes the '940 Patent, including claims 1 and 9.

367. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '940 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with IEEE 802.11ac (and later) specifically so that they can operate on compatible Wi-Fi networks. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

368. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial.

369. Verizon has had knowledge and notice of the '940 Patent and its infringement since (i) at least June 2015, when it received the 2015 Wi-Fi Notice Letter, and/or when it

received subsequent correspondence identifying the patent, and (ii) at least, and through, the filing and service of the Complaint. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

370. Upon information and belief, Verizon's infringement of the '940 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '940 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWENTY-ONE
Infringement of U.S. Patent No. 9,634,746

371. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

372. On April 25, 2017, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,634,746 B2 ("the '746 Patent"), entitled "Method and apparatus for transceiving data in a MIMO system." A true and correct copy of that patent is attached as Exhibit 21.

373. Sol IP is the exclusive licensee of the '746 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

374. Claims of the '746 Patent, such as claims 1 and 12, are essential to certain Wi-Fi Standards, including IEEE 802.11ac (and later), which include inventions covered by the '746 Patent. Such inventions are reflected in the claimed apparatuses and methods for transmitting physical layer protocol data, such as in claims 1 and 12.

375. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others, products and services that practice one or more claims of the '746 Patent literally or under the doctrine of equivalents

(hereafter “’746 Accused Instrumentalities”). At a minimum, such ’746 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to transmit physical layer protocol data in accordance with IEEE 802.11ac (or later).

376. Verizon has directly infringed and continues to directly infringe the ’746 Patent in violation of 35 U.S.C. § 271(a) by making, using, offering for sale, selling, or importing, without authorization, the ’746 Accused Instrumentalities.

377. For example, Verizon sells the Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (and later), thereby infringing at least claim 12 of the ’746 Patent.

378. In addition, Verizon has indirectly infringed and continues to indirectly infringe the ’746 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, with knowledge and the specific intent that its efforts will result in the direct infringement of the ’746 Patent.

379. For example, Verizon took active steps to encourage customers and end users to utilize Wi-Fi networks in the United States in a manner it knows will directly infringe each element of at least claim 1 of the ’746 Patent, including by encouraging users to operate Accused Usage Devices and Accused Sale Devices on Wi-Fi networks, and encouraging users to operate Accused Usage Devices and Accused Sale Devices as Wi-Fi access points, despite knowing of the patent and the fact that such usage of Wi-Fi networks in accordance with IEEE 802.11ac (and later) will cause the user to use their mobile device in a manner that infringes the patent.

380. Such active steps include, for example, the dissemination of the '746 Accused Instrumentalities; the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products; and the imposition of data limits, bandwidth throttling, charges for data or excess data usage, or other constraints on the use of cellular data and encouraging the use of Wi-Fi data by customers and end users, with knowledge and the specific intent that its efforts will result in the direct infringement of the '746 Patent.

381. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '746 Patent and how those steps induce infringement of that patent.

382. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '746 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

383. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with IEEE 802.11ac (and later), and that such functionality infringes the '746 Patent, including claim 1.

384. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '746 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with IEEE 802.11ac (and later) specifically so that they can operate on compatible Wi-Fi networks. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

385. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial.

386. Verizon has had knowledge and notice of the '746 Patent and its infringement since (i) at least June 2015, when it received the 2015 Wi-Fi Notice Letter, and/or when it received subsequent correspondence identifying the patent, and (ii) at least, and through, the filing and service of the Complaint. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

387. Upon information and belief, Verizon's infringement of the '746 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '746 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWENTY-TWO
Infringement of U.S. Patent No. 10,090,894

388. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

389. On October 2, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,090,894 B2 ("the '894 Patent"), entitled "Method and apparatus for transceiving data in a MIMO system." A true and correct copy of that patent is attached as Exhibit 22.

390. 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.

391. Claims of the '894 Patent, such as claims 1, 7, 13, and 19, are essential to certain Wi-Fi Standards, including IEEE 802.11ac (and later), which include inventions covered by the

'894 Patent. Such inventions are reflected in the claimed apparatuses and methods for transmitting or receiving physical layer protocol data, such as in claims 1, 7, 13, and 19.

392. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others, products and services that practice one or more claims of the '894 Patent literally or under the doctrine of equivalents (hereafter "'894 Accused Instrumentalities"). At a minimum, such '894 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to transmit or receive physical layer protocol data in accordance with IEEE 802.11ac (or later).

393. Verizon has directly infringed and continues to directly infringe the '894 Patent in violation of 35 U.S.C. § 271(a) by making, using, offering for sale, selling, or importing, without authorization, the '894 Accused Instrumentalities.

394. For example, Verizon sells the Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (and later), thereby infringing at least claims 1 and 13 of the '894 Patent.

395. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '894 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, with knowledge and the specific intent that its efforts will result in the direct infringement of the '894 Patent.

396. For example, Verizon took active steps to encourage customers and end users to utilize Wi-Fi networks in the United States in a manner it knows will directly infringe each

element of at least claims 1 and 13 of the '894 Patent, including by encouraging users to operate Accused Usage Devices and Accused Sale Devices on Wi-Fi networks, and encouraging users to operate Accused Usage Devices and Accused Sale Devices as Wi-Fi access points, despite knowing of the patent and the fact that such usage of Wi-Fi networks in accordance with IEEE 802.11ac (and later) will cause the user to use their mobile device in a manner that infringes the patent.

397. Such active steps include, for example, the dissemination of the '894 Accused Instrumentalities; the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products; and the imposition of data limits, bandwidth throttling, charges for data or excess data usage, or other constraints on the use of cellular data and encouraging the use of Wi-Fi data by customers and end users, with knowledge and the specific intent that its efforts will result in the direct infringement of the '894 Patent.

398. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '894 Patent and how those steps induce infringement of that patent.

399. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '894 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

400. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with IEEE 802.11ac (and later), and that such functionality infringes the '894 Patent, including claims 1 and 13.

401. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '894 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with IEEE 802.11ac (and later) specifically so that they can operate on compatible Wi-Fi networks. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

402. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial.

403. Verizon has had knowledge and notice of the '894 Patent and its infringement since (i) at least June 2015, when it received the 2015 Wi-Fi Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, and (ii) at least, and through, the filing and service of the Complaint. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

404. Upon information and belief, Verizon's infringement of the '894 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '894 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWENTY-THREE
Infringement of U.S. Patent No. 8,654,881

405. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

406. On February 18, 2014, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,654,881 B2 (“the ’881 Patent”), entitled “Method and apparatus for transceiving data in a MIMO system.” A true and correct copy of that patent is attached as Exhibit 23.

407. Sol IP is the exclusive licensee of the ’881 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

408. Claims of the ’881 Patent, such as claims 1 and 13, are essential to certain Wi-Fi Standards, including IEEE 802.11ac (and later), which include inventions covered by the ’881 Patent. Such inventions are reflected in the claimed apparatuses and methods for transmitting physical layer protocol data, such as in claims 1 and 13.

409. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others, products and services that practice one or more claims of the ’881 Patent literally or under the doctrine of equivalents (hereafter “’881 Accused Instrumentalities”). At a minimum, such ’881 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to transmit physical layer protocol data in accordance with IEEE 802.11ac (or later).

410. Verizon has directly infringed and continues to directly infringe the ’881 Patent in violation of 35 U.S.C. § 271(a) by making, using, offering for sale, selling, or importing, without authorization, the ’881 Accused Instrumentalities.

411. For example, Verizon sells the Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (and later), thereby infringing at least claim 13 of the ’881 Patent.

412. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '881 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, with knowledge and the specific intent that its efforts will result in the direct infringement of the '881 Patent.

413. For example, Verizon took active steps to encourage customers and end users to utilize Wi-Fi networks in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '881 Patent, including by encouraging users to operate Accused Usage Devices and Accused Sale Devices on Wi-Fi networks, and encouraging users to operate Accused Usage Devices and Accused Sale Devices as Wi-Fi access points, despite knowing of the patent and the fact that such usage of Wi-Fi networks in accordance with IEEE 802.11ac (and later) will cause the user to use their mobile device in a manner that infringes the patent.

414. Such active steps include, for example, the dissemination of the '881 Accused Instrumentalities; the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products; and the imposition of data limits, bandwidth throttling, charges for data or excess data usage, or other constraints on the use of cellular data and encouraging the use of Wi-Fi data by customers and end users, with knowledge and the specific intent that its efforts will result in the direct infringement of the '881 Patent.

415. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '881 Patent and how those steps induce infringement of that patent.

416. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '881 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

417. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with IEEE 802.11ac (and later), and that such functionality infringes the '881 Patent, including claim 1.

418. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '881 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with IEEE 802.11ac (and later) specifically so that they can operate on compatible Wi-Fi networks. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

419. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial.

420. Verizon has had knowledge and notice of the '881 Patent and its infringement since (i) at least June 2015, when it received the 2015 Wi-Fi Notice Letter, and/or when it received subsequent correspondence identifying the patent, and (ii) at least, and through, the filing and service of the Complaint. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

421. Upon information and belief, Verizon's infringement of the '881 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '881 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWENTY-FOUR
Infringement of U.S. Patent No. 9,900,067

422. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

423. On February 20, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,900,067 B2 ("the '067 Patent"), entitled "Method and apparatus for transceiving data in a MIMO system." A true and correct copy of that patent is attached as Exhibit 24.

424. 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.

425. Claims of the '067 Patent, such as claims 1, 10, 31, and 38, are essential to certain Wi-Fi Standards, including IEEE 802.11ac (and later), which include inventions covered by the '067 Patent. Such inventions are reflected in the claimed apparatuses and methods for transmitting or receiving physical layer protocol data, such as in claims 1, 10, 31, and 38.

426. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others, products and services that practice one or more claims of the '067 Patent literally or under the doctrine of equivalents (hereafter "'067 Accused Instrumentalities"). At a minimum, such '067 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are

configured to transmit or receive physical layer protocol data in accordance with IEEE 802.11ac (or later).

427. Verizon has directly infringed and continues to directly infringe the '067 Patent in violation of 35 U.S.C. § 271(a) by making, using, offering for sale, selling, or importing, without authorization, the '067 Accused Instrumentalities.

428. For example, Verizon sells the Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (and later), thereby infringing at least claims 10 and 38 of the '067 Patent.

429. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '067 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, with knowledge and the specific intent that its efforts will result in the direct infringement of the '067 Patent.

430. For example, Verizon took active steps to encourage customers and end users to utilize Wi-Fi networks in the United States in a manner it knows will directly infringe each element of at least claims 1 and 31 of the '067 Patent, including by encouraging users to operate Accused Usage Devices and Accused Sale Devices on Wi-Fi networks, and encouraging users to operate Accused Usage Devices and Accused Sale Devices as Wi-Fi access points, despite knowing of the patent and the fact that such usage of Wi-Fi networks in accordance with IEEE 802.11ac (and later) will cause the user to use their mobile device in a manner that infringes the patent.

431. Such active steps include, for example, the dissemination of the '067 Accused Instrumentalities; the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products; and the imposition of data limits, bandwidth throttling, charges for data or excess data usage, or other constraints on the use of cellular data and encouraging the use of Wi-Fi data by customers and end users, with knowledge and the specific intent that its efforts will result in the direct infringement of the '067 Patent.

432. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '067 Patent and how those steps induce infringement of that patent.

433. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '067 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

434. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with IEEE 802.11ac (and later), and that such functionality infringes the '067 Patent, including claims 1 and 31.

435. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '067 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with IEEE 802.11ac (and later) specifically so that they can operate on compatible Wi-Fi networks. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

436. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial.

437. Verizon has had knowledge and notice of the '067 Patent and its infringement since (i) at least June 2015, when it received the 2015 Wi-Fi Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, and (ii) at least, and through, the filing and service of the Complaint. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

438. Upon information and belief, Verizon's infringement of the '067 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '067 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

COUNT TWENTY-FIVE
Infringement of U.S. Patent No. 10,045,256

439. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

440. On August 7, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 10,045,256 B2 ("the '256 Patent"), entitled "Method for transmitting data frame in wireless local area network and apparatus for the same." A true and correct copy of that patent is attached as Exhibit 25.

441. Sol IP is the exclusive licensee of the '256 Patent and holds all substantial rights to that patent, including the sole right to sue and recover for any and all infringements.

442. Claims of the '256 Patent, such as claims 1, 7, 12, and 17, are essential to certain Wi-Fi Standards, including IEEE 802.11ac (and later), which include inventions covered by the

'256 Patent. Such inventions are reflected in the claimed apparatuses and methods for transmitting or receiving physical layer protocol data, such as in claims 1, 7, 12, and 17.

443. Verizon has and continues, without authorization, to make, use, offer for sale, sell, or import, and/or to induce and contribute to the same by others, products and services that practice one or more claims of the '256 Patent literally or under the doctrine of equivalents (hereafter "'256 Accused Instrumentalities"). At a minimum, such '256 Accused Instrumentalities include all Accused Usage Devices and Accused Sale Devices that are configured to transmit or receive physical layer protocol data in accordance with IEEE 802.11ac (or later).

444. Verizon has directly infringed and continues to directly infringe the '256 Patent in violation of 35 U.S.C. § 271(a) by making, using, offering for sale, selling, or importing, without authorization, the '256 Accused Instrumentalities.

445. For example, Verizon sells the Accused Sale Devices that are configured to communicate in accordance with IEEE 802.11ac (and later), thereby infringing at least claims 1 and 17 of the '256 Patent.

446. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '256 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, with knowledge and the specific intent that its efforts will result in the direct infringement of the '256 Patent.

447. For example, Verizon took active steps to encourage customers and end users to utilize Wi-Fi networks in the United States in a manner it knows will directly infringe each

element of at least claims 7 and 12 of the '256 Patent, including by encouraging users to operate Accused Usage Devices and Accused Sale Devices on Wi-Fi networks, and encouraging users to operate Accused Usage Devices and Accused Sale Devices as Wi-Fi access points, despite knowing of the patent and the fact that such usage of Wi-Fi networks in accordance with IEEE 802.11ac (and later) will cause the user to use their mobile device in a manner that infringes the patent.

448. Such active steps include, for example, the dissemination of the '256 Accused Instrumentalities; the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products; and the imposition of data limits, bandwidth throttling, charges for data or excess data usage, or other constraints on the use of cellular data and encouraging the use of Wi-Fi data by customers and end users, with knowledge and the specific intent that its efforts will result in the direct infringement of the '256 Patent.

449. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '256 Patent and how those steps induce infringement of that patent.

450. In addition, Verizon has indirectly infringed and continues to indirectly infringe the '256 Patent in violation of 35 U.S.C. § 271(c) by selling or offering to sell in the United States, or importing into the United States, the Accused Sale Devices with knowledge that they are especially designed or adapted to operate in a manner that infringes that patent and despite the fact that the infringing technology or aspects of the Accused Sale Devices are not a staple article of commerce suitable for substantial non-infringing use.

451. For example, Verizon knew that the functionality included in the Accused Sale Devices enables each to communicate in accordance with IEEE 802.11ac (and later), and that such functionality infringes the '256 Patent, including claims 7 and 12.

452. The infringing aspects of the Accused Sale Devices can be used only in a manner that infringes the '256 Patent and thus have no substantial non-infringing uses. Those instrumentalities communicate in accordance with IEEE 802.11ac (and later) specifically so that they can operate on compatible Wi-Fi networks. The infringing aspects of those instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

453. Verizon's acts of infringement have caused and continue to cause damage to Sol IP, and Sol IP is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial.

454. Verizon has had knowledge and notice of the '256 Patent and its infringement since (i) at least June 2015, when it received the 2015 Wi-Fi Notice Letter, and/or when it received subsequent correspondence identifying the patent or its application, and (ii) at least, and through, the filing and service of the Complaint. Despite this knowledge, Verizon continued to commit the aforementioned infringing acts.

455. Upon information and belief, Verizon's infringement of the '256 Patent is willful and deliberate, entitling Sol IP to the recovery of increased damages under 35 U.S.C. § 284. Verizon has infringed and continues to infringe the '256 Patent despite the risk of infringement being either known or so obvious that it should have been known to Verizon.

DEMAND FOR JURY TRIAL

456. Sol IP hereby demands a jury trial pursuant to Federal Rule of Civil Procedure 38.

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