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

INTELLECTUAL VENTURES II LLC, Plaintiff, v. SPRINT SPECTRUM L.P., NEXTEL OPERATIONS, INC., ERICSSON INC., TELEFONAKTIEBOLAGET LM ERICSSON, and ALCATEL-LUCENT USA INC., Defendants.	Civil Case No.: 2:17-cv-662 **JURY TRIAL DEMANDED**

COMPLAINT

Plaintiff Intellectual Ventures II LLC for its Complaint against defendants Sprint Spectrum, L.P. (d/b/a Sprint PCS), Nextel Operations, Inc., Ericsson Inc., Telefonaktiebolaget LM Ericsson, and Alcatel-Lucent USA Inc. hereby alleges as follows:

THE PARTIES

1. Intellectual Ventures II LLC ("IV") is a Delaware limited liability company with its principal place of business at 3150 139th Ave SE, Bellevue, Washington.

2. Sprint Spectrum L.P. d/b/a Sprint PCS ("Sprint PCS") is a Delaware limited partnership with its principal place of business at 6200 Sprint Parkway, Overland Park, Kansas 66251.

3. Nextel Operations, Inc. ("Nextel") is a corporation organized and existing under the laws of Delaware with its principal place of business at 6200 Sprint Parkway, Overland Park, Kansas 66251.

4. Sprint PCS and Nextel will be referred to collectively as "Sprint" or "the Sprint Defendants." The Sprint Defendants operate one or more wireless telecommunications networks to provide wireless telecommunications services under brand names including but not limited to "Sprint."

5. Ericsson Inc. ("Ericsson") is a Delaware corporation with its principal place of business at 6300 Legacy Drive, Plano, Texas 75024.

6. Telefonaktiebolaget LM Ericsson ("LM Ericsson"), the parent corporation of Ericsson, is a company organized under the laws of Sweden with its principal place of business at Torshamsgatan 23, Kista, 164 83 Stockholm, Sweden. Ericsson and LM Ericsson will be referred to collectively as "the Ericsson Defendants."

7. Alcatel-Lucent USA Inc. ("ALU") is a Delaware corporation with principal places of business at 600-700 Mountain Avenue, Murray Hill, NJ 07974 and 601 Data Drive, Plano, TX 75075.

NATURE OF ACTION

8. This is a civil action for infringement of U.S. Patent Nos. 8,682,357, 8,897,828, 8,953,641, 9,320,018, 9,532,330, and 9,681,466 ("Patents-in-Suit") arising under the patent laws of the United States, 35 U.S.C. § 1 *et seq.*

JURISDICTION AND VENUE

9. This Court has subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a) because it arises under the patent laws of the United States.

10. This Court has personal jurisdiction over the Sprint Defendants, both of which have committed acts of infringement in this judicial district in violation of 35 U.S.C. § 271. In particular, they have performed infringing methods, and made and used infringing systems for providing wireless telecommunications services. The Sprint Defendants derive substantial revenue from the sale and use of infringing products and services in this district.

11. The Sprint Defendants maintain a significant physical presence in this judicial district. For example, there are numerous Sprint retail stores within this judicial district, including in each of Allen, Beaumont, Denton, Flower Mound, Frisco, Lufkin, Plano, Texarkana, and Tyler, Texas. The purpose of these stores is to sell user devices, including cell phones, and telecommunications services to be provided by the Sprint Defendants.

12. This Court has personal jurisdiction over the Ericsson Defendants, both of which, upon information and belief, have committed acts of infringement in this judicial district in violation of 35 U.S.C. § 271. The Ericsson Defendants derive substantial revenue from the sale of infringing services and products distributed within this district and expect or should reasonably expect their actions to have consequences within this district.

13. The Ericsson Defendants maintain a significant physical presence in this judicial district. Ericsson's headquarters is located at 6300 Legacy Drive, Plano, Texas 75024, which is within this judicial district. Ericsson is wholly-owned and controlled by LM Ericsson and acts as the agent for LM Ericsson in making sales, servicing equipment, and otherwise carrying out the operations of LM Ericsson in North America. LM Ericsson and/or its affiliates manufacture wireless telecommunications equipment and then arrange with Ericsson to import those products into the United States for installation in the Sprint Defendants' network. Upon information and

belief, representatives of LM Ericsson regularly visit this district in their supervisory capacity over Ericsson. At all times relevant hereto, Ericsson was acting as the agent of LM Ericsson.

14. This Court has personal jurisdiction over ALU, which, upon information and belief, has committed acts of infringement in this judicial district, either directly, indirectly, or through related companies acting as their agents, in violation of 35 U.S.C. § 271.

15. ALU maintains a significant physical presence in this judicial district, including a principal place of business located at 601 Data Drive, Plano, TX 75075.

16. Joinder of the defendants in this action is proper under 35 U.S.C. § 299(a). IV's right to relief against the defendants for their infringement of the Patents-in-Suit arises out of the same series of transactions or occurrences, namely their cooperation in planning, developing, testing, operating, and maintaining the Sprint Defendants' Long Term Evolution ("LTE") network. No claim is made in this complaint against the Ericsson Defendants or ALU in relation to products or services sold to other wireless carriers.

17. Venue is proper in this judicial district. All of the relevant defendants reside in this judicial district within the meaning of 28 U.S.C. § 1400(b). The Sprint Defendants, Ericsson Inc., and Alcatel-Lucent USA have committed acts of infringement within this district and have regular and established places of business here. LM Ericsson is a foreign corporation, and pursuant to 28 U.S.C. § 1391(c)(3), may be sued in any judicial district. The residency of LM Ericsson is disregarded under § 1391(c)(3) when determining where the action may be brought.

THE PATENTS-IN-SUIT

18. On March 25, 2014, the United States Patent and Trademark Office ("PTO") issued United States Patent Number 8,682,357 ("`357 Patent"), entitled "Paging in a wireless network." IV is the assignee and owner of the right, title, and interest in and to the `357 Patent,

including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

19. On November 25, 2014, the PTO issued United States Patent Number 8,897,828 ("`828 Patent"), entitled "Power control in a wireless communication system." IV is the assignee and owner of the right, title, and interest in and to the `828 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

20. On February 10, 2015, the PTO issued United States Patent Number 8,953,641 ("`641 Patent"), entitled "Methods and apparatus for multi-carrier communications with variable channel bandwidth." IV is the assignee and owner of the right, title, and interest in and to the `641 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

21. The parent of the `641 Patent, United States Patent Number 7,787,431 ("`431 Patent"), was challenged by the Ericsson Defendants in two *inter partes* reviews, IPR2014-01195 and IPR2015-01664. In two final written decisions, 10 of the 12 claims tried were found not unpatentable.

22. On April 19, 2016, the PTO issued United States Patent Number 9,320,018 ("`018 Patent"), entitled "Scheduling data transmissions in a wireless network." IV is the assignee and owner of the right, title, and interest in and to the `018 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

23. On December 27, 2016, the PTO issued United States Patent Number 9,532,330 ("`330 Patent"), entitled "Paging in a wireless network." IV is the assignee and owner of the

right, title, and interest in and to the `330 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

24. On June 13, 2017, the PTO issued United States Patent Number 9,681,466 ("`466 Patent"), entitled "Scheduling transmissions on channels in a wireless network." IV is the assignee and owner of the right, title, and interest in and to the `466 Patent, including the right to assert all causes of action arising under said patent and the right to any remedies for infringement of it, including past damages.

FACTUAL BACKGROUND

Intellectual Ventures

25. Intellectual Ventures Management, LLC ("Intellectual Ventures") was founded in 2000. Since its founding, Intellectual Ventures has been deeply involved in the business of invention. Intellectual Ventures creates inventions and files patent applications for those inventions; it collaborates with others to develop and patent inventions; and it acquires and licenses patents from individual inventors, universities, and other institutions. A significant aspect of Intellectual Ventures' business is managing the plaintiff Intellectual Ventures II LLC. Intellectual Ventures has paid more than half a billion dollars to inventors and has generated more than $3 billion dollars through the licensing of intellectual property.

26. Intellectual Ventures conducts research in, among other areas, photonics, nanotechnology, electronics, environmental testing, metallurgical analysis, new satellite antennas built on electromagnetic metamaterials technology, and next-generation nuclear power technologies. These technologies are being commercialized by venture-backed start-up

companies and, in 2017 alone, start-up companies incubated at Intellectual Ventures and based on technologies invented there have raised more than $100 million dollars in venture funding.

27. In addition to developing technologies for commercial application in the developed world, Intellectual Ventures works with governments, NGOs, and academic and research organizations from all over the world, leveraging IV's inventions to make commercialization of life-saving inventions in the developing world feasible. This work is done through Global Good, a collaboration between Intellectual Ventures and Bill Gates, and has created technologies including the Arktek™ passive vaccine storage device. In 2016, Arktek was awarded the United States Patents & Trademark Office's "Patents for Humanity" Award for using technology to meet global humanitarian challenges.

28. Intellectual Ventures' business includes purchasing important inventions from individual inventors and institutions and then licensing the inventions to those who need them. Through this business, Intellectual Ventures enables inventors to reap a financial reward from their innovations, which is often a difficult task for individual inventors.

The Sprint Network

29. The Sprint Defendants are in the business of providing wireless telephone services to customers throughout the United States, including the state of Texas, under the Sprint brand. In conjunction with their partners, the Ericsson Defendants and ALU, the Sprint Defendants have deployed a wireless network according to the LTE telecommunications standard.

30. As a result of the expansion of their LTE network, the Sprint Defendants have been enormously successful in increasing their customer base. By the end of the first quarter of

2017, the Sprint Defendants had approximately 59 million wireless customers nationwide, and their net operating revenue for fiscal year 2016 was nearly $33.3 billion.

31. Much of the equipment installed in the accused LTE network was acquired from the Sprint Defendants' longtime business partners, the Ericsson Defendants and ALU, which design, manufacture, import and sell LTE telecommunications equipment, including LTE base stations, known as eNodeBs.

32. On August 3, 2012, Intellectual Ventures provided notice to various Nokia entities and the Nokia family of companies more generally that Intellectual Ventures had acquired the IPWireless portfolio of patents, including the patent applications that matured into the `357, `828, `018, `330, and `466 Patents. On January 7, 2016, as the result of a successful public offering, Nokia acquired a controlling interest in ALU.

33. Upon information and belief, the Sprint Defendants are currently engaged in testing and rolling out LTE services generally referred to as 4.5G, 4.9G, and 5G with all of their radio access network vendors. Testing is currently underway with respect to one or more of these advanced systems, which upon information and belief, incorporate infringing technology.

Sprint's Vendor Partnerships

34. The partnership between the Sprint and Ericsson Defendants extends beyond a customer-and-supplier relationship. Their partnership also includes outsourcing the day-to-day operation of the Sprint LTE network to the Ericsson Defendants, as well as jointly developing and deploying next generation LTE technology.

35. More specifically, starting in 2009, the Sprint Defendants outsourced the day-to-day operation of its network to Ericsson. (http://abcnews.go.com/Business/story?id=8046767&page=1). Under the terms of this contract,

Ericsson "provides day-to-day maintenance and monitoring of the network of cell towers and call switching equipment," while the Sprint Defendants "maintain[] ownership and control of the [Sprint] network, including future investment and strategy." To facilitate this transfer of control to Ericsson, the Sprint Defendants transferred 6,000 employees to Ericsson. The Ericsson Defendants touted this contract as "proof point of a long-term partnership between Sprint and Ericsson." This contract enabled the Sprint Defendants to reduce network costs by an estimated 20 percent. (https://www.wirelessweek.com/news/2016/07/sprint-taking-ericsson-employees-part-managed-services-deal.) The overall value of this operations contract was valued between $4.5 and $5 billion. (http://abcnews.go.com/Business/story?id=8046767&page=1.)

36. In 2016, the Sprint and Ericsson Defendants announced that they had renewed portions of the 2009 contract. (https://www.ericsson.com/en/press-releases/2016/7/sprint-and-ericsson-renew-portions-of-managed-services-partnership). Both the Sprint and Ericsson Defendants touted this renewal of this contract as a continuation of their long-running partnership. (https://eurocomms.com/industry-news/11712-ericsson-takes-reduced-managed-services-role-with-sprint.) As a result of this partnership, Ericsson is liable for infringement in relation to the use of equipment provided by third-party vendors, including ALU.

37. The Sprint and Ericsson Defendants are also jointly developing and deploying next-generation LTE networks. For example, in March 2017, the Sprint and Ericsson Defendants carried out the industry's first demonstration of gigabit time division duplex LTE ("LTE-TDD") system over 60 MHz of spectrum at the 2017 Mobile World Congress. (https://www.ericsson.com/en/press-releases/2017/2/sprint-and-ericsson-to-demonstrate-live-high-speed-gigabit-class-data-speeds-over-lte-tdd.) According to Ericsson, "Gigabit LTE-TDD will be a key technology to enable users to enjoy data-intensive services and advanced features

and applications on Sprint's LTE Plus network at higher speeds for an enhanced user experience." The Sprint Defendants claim that this technology will allow Sprint customers "to have a great experience using 4K and even 8K TV and applications such as HD Virtual Reality on the Sprint LTE Plus network."

38. Upon information and belief, the Sprint Defendants are testing and working with the Ericsson Defendants and ALU or its successor in interest in the Nokia family of companies to implement 4.5G, 4.9G, and/or 5G technology. Upon information and belief, these systems incorporate or will incorporate one or more of the infringing technologies described below.

COUNT I

Infringement of the `357 Patent by All Defendants

39. Paragraphs 1 through 38 are incorporated by reference as if fully restated herein.

40. The Sprint Defendants own, maintain, operate, and use mobile telecommunication networks in conformance with 3rd Generation Partnership Project ("3GPP") LTE related standards. *See, e.g.*, https://www.ericsson.com/res/docs/2015/ericsson-3gpp-submission-study-whitepaper-may-2015.pdf, coverage.sprint.com. The Sprint network includes eNodeB devices and other equipment provided by the Ericsson Defendants and ALU. The Sprint Defendants also sell LTE-compliant phones to their subscribers for use in accessing the Sprint network pursuant to telecommunications service contracts. *See* www.sprint.com/en/shop/cell-phones. The Ericsson Defendants and ALU install, test, and service eNodeBs and other equipment within Sprint's LTE network.

41. Wireless transmissions between an eNodeB and a User Equipment ("UE," *e.g.*, a Smart Phone) include downlink transmissions from the eNodeB to the UE and uplink transmissions from the UE to the eNodeB. 3rd Generation Partnership Project; Technical

Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 8), 3GPP TS 36.300 V8.9.0 (2009-06) and all other versions thereof ("TS 36.300") §§ 5-6. Each UE periodically enters an idle mode, which is a sleep mode used to conserve power and radio resources whenever a UE is not engaged in operations that require more frequent communication with an eNodeB. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode (Release 8) 3GPP TS 36.304 V8.2.0 (2008-05) and all other versions thereof ("TS 36.304") § 7.1. During idle mode, the UE monitors only one subframe per a given time cycle for a Downlink Control Information ("DCI") message having an identifier associated with the UE. *See id.*; *see also* 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures (Release 8), 3GPP TS 36.213 V8.8.0 (2009-09) and all other versions thereof ("TS 36.213").

42. When a UE is to awaken from idle mode, the eNodeB receives a paging procedure message relating to the UE from other equipment in the Sprint network. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP), 3GPP TS 36.413 V8.4.0 (2008-12) and all other versions thereof ("TS 36.413") §§ 8.5, 9.1.6. In response to receiving the paging procedure message, the eNodeB sends a DCI message carrying information in a subframe assigned to a group of UEs including the UE that is to be awakened. TS 36.304 § 7.1. The DCI message includes an allocation of resources for a shared channel that is to be read subsequently by all UEs in the group. *See* TS 36.213 § 7.1; *see also* 3rd Generation

Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and Channel Coding, 3GPP TS 36.212 V8.8.0 (2009-12) and all other versions thereof ("TS 36.212") §§ 5.3.3.1.3 & 5.3.3.1.4. If the UE recognizes an identifier in its assigned subframe, it looks in the allocation of resources on the shared channel for a paging message. *See* TS 36.213 § 7.1; *see also* 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol Specification (Release 8), 3GPP TS 36.331 V8.5.0 (2009-03) and all other versions thereof ("TS 36.331") § 6.2.2. If the paging message includes the UE's International Mobile Subscriber Identity ("IMSI") or Temporary Mobile Subscriber Identity ("TMSI"), the UE awakens from idle mode. *Id.*

43. On information and belief, the Sprint Defendants, Ericsson Defendants, and ALU have directly infringed at least claims 11 and 30 of the `357 patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs and other equipment in Sprint's network to effect the paging of an idle UE device in the manner described above.

44. The Sprint Defendants have also directly infringed, and continue to infringe, at least claim 47 of the `357 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by Sprint subscribers in a manner that results in control of the above-described paging process. The Sprint Defendants are directly responsible for all functions performed by each UE that relate to communicating with the Sprint network. The Sprint Defendants direct and control all communication operations of UEs in the Sprint network by using an eNodeB to send signals to page an idle UE through the above-described paging process. In many cases, Sprint sells UEs to its subscribers along with provision of telecom services. Sprint also requires that in order to communicate with its network, each UE must comply with

certain LTE standards. Thus, the operations of UEs in the Sprint network are "attributable to" the Sprint Defendants for purposes of establishing direct infringement of claim 47 of the `357 Patent. *See Akamai Techs., Inc. v. Limelight Networks, Inc.*, 797 F.3d 1020, 1022-23 (Fed. Cir. 2015).

45. Moreover, Sprint directly infringes claim 47 because Sprint "conditioned receipt of a benefit" (*i.e.,* the ability of each Sprint subscriber to enjoy Sprint's LTE telecom services) upon use of an LTE-compliant UE monitoring and responding to DCI messages and other signals sent by eNodeBs in Sprint's network, and Sprint established the "manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting specific DCI messages, paging messages, and other signals to the UE in accordance with the above-described paging process. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A Sprint subscriber could not possibly enjoy the benefits of Sprint's LTE telecom services without using an LTE-compliant UE that monitors for and responds to specific DCI messages, paging messages, and other signals sent by eNodeBs in the manner specified above. Thus, Sprint is liable for directly infringing at least claim 47 under 35 U.S.C. § 271(a).

46. The Sprint Defendants have also induced infringement of at least claim 47 by Sprint subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for Sprint subscribers to communicate with the Sprint network, along with instructions that induce Sprint subscribers to perform the steps of claim 47 upon using UEs to communicate with the Sprint network.

47. On information and belief, the Sprint Defendants take active steps to induce infringement of claim 47 by Sprint subscribers, knowing that those steps will induce, encourage,

and facilitate direct infringement by Sprint subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send DCI messages along with other signals to cause a UE to monitor for and receive such messages and signals and awaken from idle mode, and also by requiring use of LTE-compliant UEs specifically for the purpose of performing the infringing paging functions recited in claim 47.

48. By way of at least this Complaint, the Sprint Defendants know of the `357 patent and perform acts that they know, or should know, induce the direct infringement of claim 47 of the `357 Patent by Sprint subscribers. Thus, the Sprint Defendants are indirectly liable for infringement of at least claim 47 pursuant to 35 U.S.C. §§ 271(b).

49. On information and belief, the Ericsson Defendants and ALU have induced infringement of at least claims 11 and 30 by the Sprint Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 11 and 30 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the Sprint Defendants to perform the claimed methods, along with instructions that induce the Sprint Defendants to perform the claimed methods.

50. On information and belief, the Ericsson Defendants and ALU take active steps to induce infringement of at least claims 11 and 30 by the Sprint Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the Sprint Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to receive paging messages from other equipment in the Sprint network and to send signals to page an idle UE, providing Sprint with instructions on the use of the above-described paging feature, and participating in the installation, configuration, operation, and

maintenance of eNodeB equipment in Sprint's network specifically for the purpose of performing the infringing methods.

51. On information and belief, the Ericsson Defendants and ALU know or should know that such activities induce the Sprint Defendants to infringe at least claims 11 and 30 of the `357 Patent by performing the claimed methods from at least the date of the filing of this Complaint.

52. On information and belief, the Ericsson Defendants and ALU also contribute to the infringement of at least claims 11 and 30 by the Sprint Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants and ALU that contribute to the infringement of the Sprint Defendants include providing eNodeB hardware and software modules that are capable of implementing the above-described paging feature. The accused paging software is especially adapted for use in the infringing paging functions, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants and ALU know or should know that such activities contribute to the Sprint Defendants' infringement of at least claims 11 and 30 by performing the claimed methods.

53. By way of at least this Complaint, the Ericsson Defendants and ALU know of the `357 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 11 and 30 of the `357 Patent by the Sprint Defendants. Thus, the Ericsson Defendants and ALU are indirectly liable for infringement of at least claims 11 and 30 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

54. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `357 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all

Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `357 Patent and that the `357 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `357 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `357 Patent.

COUNT II

Infringement of the `828 Patent by All Defendants

55. Paragraphs 1 through 54 are incorporated by reference as if fully restated herein.

56. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE communicating with an eNodeB in a cell must obtain permission from the eNodeB to use uplink resources that are shared by all UEs in the cell. *Id*. When the eNodeB detects that a UE needs to send uplink data, it sends a DCI message to the UE indicating a grant of specified uplink resources. *See* TS 36.213 §§ 3, 6.8, and 7.1.6. In each instance of infringement, the DCI message also carries a Transmit Power Control ("TPC") command indicating a power adjustment value. *Id.* § 5.3.3.1.1. During operation in an accumulation mode, the TPC commands require that power adjustment values must be accumulated with previously transmitted values. TS 36.213 §§ 5.1.1.1. When accumulation mode is not enabled, the values carried by the TPC commands are not accumulated. *Id*. As a result of sending TPC

commands and other signals in the manner described above, the eNodeBs in Sprint's network control power levels of signals received from UEs at the eNodeB. *Id*.

57. On information and belief, the Sprint Defendants, Ericsson Defendants, and ALU have directly infringed at least claims 15 and 29 of the `828 Patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs in Sprint's network to control power levels of signals generated at UEs in the manner described above.

58. The Sprint Defendants have also directly infringed, and continue to infringe, at least claim 1 of the `828 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by Sprint subscribers in a manner that results in control of uplink power transmission levels. The Sprint Defendants are directly responsible for all functions performed by each UE communicating with the Sprint network. The Sprint Defendants direct and control all communication operations of UEs in the Sprint network by using an eNodeB to send TPC commands and other signals to control the power levels. In many cases, Sprint sells UEs to its subscribers along with provision of telecom services. Sprint also requires that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the Sprint network are "attributable to" the Sprint Defendants for purposes of establishing direct infringement of claim 1 of the `828 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

59. Moreover, Sprint directly infringes claim 1 because Sprint "conditioned receipt of a benefit" (*i.e.*, the ability of each Sprint subscriber to enjoy Sprint's LTE telecom services) upon use of an LTE-compliant UE responding to uplink power control commands and other signals sent by eNodeBs in Sprint's network, and Sprint established the "manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of

LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting TPC commands and other signals to the UE. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A Sprint subscriber could not possibly enjoy the benefits of Sprint's LTE telecom services without using an LTE-compliant UE that responds to TPC commands and other signals sent by eNodeBs in the specified manner. Thus, Sprint is liable for directly infringing claim 1 under 35 U.S.C. § 271(a).

60. The Sprint Defendants have also induced infringement of at least claim 1 by Sprint subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for the subscribers to communicate with the Sprint network, along with instructions that induce Sprint subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claim 1 upon interaction with the Sprint network.

61. On information and belief, the Sprint Defendants take active steps to induce infringement of claim 1 by Sprint subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by Sprint subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send TPC commands along with other signals to cause a UE to control uplink power in an infringing manner, and also by requiring use of LTE-compliant phones specifically for the purpose of performing the infringing uplink power control functions recited in claim 1.

62. By way of at least this Complaint, the Sprint Defendants know of the `828 patent and perform acts that they know, or should know, induce the direct infringement of claim 1 of the `828 Patent by Sprint subscribers. Thus, the Sprint Defendants are liable for indirect infringement of at least claim 1 pursuant to 35 U.S.C. §§ 271(b).

63. On information and belief, the Ericsson Defendants and ALU have induced infringement of at least claims 15 and 29 by the Sprint Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 15 and 29 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the Sprint Defendants to perform the claimed methods, along with instructions that induce the Sprint Defendants to perform the claimed methods.

64. On information and belief, the Ericsson Defendants and ALU take active steps to induce infringement of at least claims 15 and 29 by the Sprint Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the Sprint Defendants in violation of 35 U.S.C. § 271(b). Upon information and belief, such active steps include, but are not limited to, configuring eNodeB equipment to send TPC commands and other signals that control power levels, providing Sprint with instructions on the use of the accused power control feature, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in Sprint's network specifically for the purpose of performing the infringing methods.

65. On information and belief, the Ericsson Defendants and ALU know or should know that such activities induce the Sprint Defendants to infringe at least claims 15 and 29 of the `828 Patent by performing the claimed methods, from at least the date of the filing of this Complaint.

66. On information and belief, the Ericsson Defendants and ALU also contribute to the infringement of at least claims 15 and 29 by the Sprint Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants and ALU that contribute to the infringement of the Sprint Defendants include providing eNodeB hardware and software modules that are capable of

controlling uplink power levels in the manner described above. The accused power control software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants and ALU know or should know that such activities contribute to the Sprint Defendants' infringement of at least claims 15 and 29 by performing the claimed methods.

67. By way of at least this Complaint, the Ericsson Defendants and ALU know of the `828 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 15 and 29 of the `828 Patent by the Sprint Defendants. Thus, the Ericsson Defendants and ALU are indirectly liable for infringement of at least claims 15 and 29 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

68. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `828 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `828 Patent and that the `828 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `828 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `828 Patent.

COUNT III

Infringement of the `641 Patent by the Sprint and Ericsson Defendants

69. Paragraphs 1 through 68 are incorporated by reference as if fully restated herein.

70. Broadly speaking, the `641 Patent claims devices and methods for communicating from a cell tower to a cell phone in a modern LTE cellular network, often referred to as a "4G-LTE" network. The `641 Patent claims generally include the ability to use a variable channel bandwidth over which that communication occurs. *See, e.g.*, `641 Patent at Abstract. This ability gives cellular network operators (like the Sprint and Ericsson Defendants) the flexibility they need to maximize the quality, speed and capacity of their networks, despite limits on the amounts amount of frequency spectrum and number of cell towers that are available in any single place. *See generally* `641 Patent at 1:31-2:03.

71. The Sprint Defendants own, maintain, operate, and use a mobile telecommunication network in conformance with 3GPP LTE-related standards. *See, e.g.*, https://www.ericsson.com/ res/docs/2015/ericsson-3gpp-submission-study-whitepaper-may-2015.pdf; https://www.Sprint.com/coverage/4g-lte-network. The Ericsson Defendants also operate at least part of the Sprint network. The Sprint network includes LTE-compliant base stations (such as cell phone towers) comprising LTE-compliant eNodeB devices that are provided by Ericsson. Upon information and belief, the Sprint network also includes other equipment provided and/or installed by Ericsson. The Sprint Defendants also import and sell LTE-compliant UEs (or "mobile stations," such as cell phones) to subscribers and/or set up subscribers' mobile stations for use in accessing the Sprint network pursuant to telecommunications service contracts. *See, e.g.*, www.Sprint.com/cell-phones.

72. LTE downlink signals from an eNodeB base station to a mobile station use orthogonal frequency division multiple access (OFDMA) over an operating channel with a center frequency. *See, e.g.*, 3GPP Technical Specification Group Radio Access Network Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE) radio transmission and reception (Release 8), 3GPP TS 36.101 V8.11.0 (2010-10), and all other versions thereof ("TS 36.101") § 5; 3GPP Technical Specifications Group Radio Access Network E-UTRA Base Station (BS) radio transmission and Reception (Release 8), 3GPP TS 36.104 V.8.10.0 (2010-06), and all other versions thereof ("TS 36.104") § 5; 3GPP Technical Specification Group Radio Access Network E-UTRA LTE Physical Layer – General Description (Release 8), 3GPP TS 36.201 V.8.3.0 (2009-03), and all other versions thereof § 4.2.1. The center frequency can vary within the frequency spectrum ranges permitted by the Technical Standards and the ranges licensed by the government or leased for the network. *See* TS 36.101 § 5.5; TS 36.104 § 5.5, 5.7.2-3. The downlink signal is an E-UTRA signal comprising multiple subcarriers which carry data and control channels. *See* 3GPP Technical Specification Group Radio Access Network; E-UTRA Physical Channels and Modulation (Release 8), 3GPP TS 36.211 V.8.9.0 (2009-12), and all other versions thereof ("TS 36.211") § 6.2.1.

73. An eNodeB base station and a mobile station must first establish an initial connection or a handoff connection. The base station transmits and the mobile station receives signals of a broadcast channel in a first band or "core band" centered at the center frequency of the operating channel. *See* TS 36.211 § 6.6.4; TS 36.212 §§ 4, 4.2; TS 36.300 § 5.1. The core band has 6 subcarrier groups or resource blocks comprising 72 subcarriers with a fixed spacing at 15kHz. *See* TS 36.300 § 5.1, TS 36.104 §§ 5.6, 6.2.4; TS 36.211 §§ 6.2.3, 6.6.4; TS 36.300 § 5.1.1. The core band includes broadcast information and primary and secondary

synchronization information which the mobile stations use to synchronize with the eNodeB base station. *See* TS 36.211 §§ 6.1.2, 6.11.1, TS 36.213 § 4; TS 36.304 § 5.1.

74. Following the connection between the eNodeB base station and the mobile station, the eNodeB base station can then downlink data (web pages, photographs, video, etc.) to the mobile station over the operating channel. The operating channel has a second band whose bandwidth is transmitted in the broadcast information and which can have six possible values—1.4, 3, 5, 10, 15, or 20 MHz—each of which includes the core band. TS 36.104 § 5.6; TS 36.101 § 5.6.1, TS 36.211 § 6.6.4; TS 36.300 § 5.1; TS 36.331 §§ 6.2.1, 6.2.2. These six different bandwidths include different numbers of subcarriers; thus, a variable operating channel bandwidth is realized by adjustment of the number of useable subcarriers.

75. In the Sprint network, eNodeB base stations are configured to and do select a channel bandwidth between some or all of the six possible channel bandwidths, depending on which center frequency is being used, on which eNodeB base station and cell is being used, and on how the eNodeB has been set up, and on how the network is operated. This occurs when, for example, an eNodeB base station is commissioned or configured to transmit a downlink signal at a particular operating channel bandwidth, when an eNodeB base station is reconfigured to transmit a downlink signal at a different operating channel bandwidth, when an eNodeB base station has multiple cells with different operating channel bandwidths, and when an eNodeB base station initially communicates with a mobile station over a core bandwidth and subsequently communicates with a mobile station over the larger operating channel bandwidth.

76. In addition, another method of operating the Sprint network (and configuration of eNodeB base stations) is called "carrier aggregation." Carrier aggregation is a part of fifth-generation or "5G" technology. Carrier aggregation aggregates different LTE carriers into

virtual carriers with broader bandwidths. Upon information and belief, the Sprint and/or the Ericsson Defendants have used, tested, and/or intend to deploy eNodeB base stations in the network that adjust the number of useable subcarriers and realize a variable operating channel bandwidth using carrier aggregation.

77. On information and belief, the Sprint and Ericsson Defendants have directly infringed at least claim 1 of the `641 Patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs and other equipment in Sprint's network as discussed above.

78. The Sprint Defendants have directly infringed at least claim 11 of the `641 Patent under 35 U.S.C. § 271(a) by selling infringing LTE-compliant phones and other UEs to their own subscribers.

79. The Sprint Defendants have directly infringed, and continue to infringe, at least claims 6, 11, and 25 of the `641 Patent under 35 U.S.C. § 271(a) because they "condition[] receipt of a benefit" (i.e., the ability of each Sprint subscriber to enjoy Sprint's LTE telecom services) upon use of an LTE-compliant mobile station, and because they established the "manner or timing of that performance" by providing LTE-compliant mobile stations to subscribers along with LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), in accordance with the claims. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A subscriber could not possibly enjoy the benefits of the network without using an LTE-compliant mobile station that practices the claims.

80. Moreover, the operations of eNodeB base stations and mobile stations in the Sprint network are "attributable to" the Sprint and Ericsson Defendants because they require operations in accordance with the LTE standards and that infringe at least claims 6 and 25 of the

`641 Patent. *Id.* Thus, the Sprint Defendants have directly infringed at least claims 6 and 25 of the `641 Patent under 35 U.S.C. § 271(a).

81. The Sprint Defendants have also induced infringement of at least claims 6, 11, and 25 of the `641 Patent by Sprint subscribers in violation of 35 U.S.C. § 271(b) by selling (or requiring use of) LTE complaint UEs necessary for the subscribers to communicate with the Sprint network, along with instructions that induce Sprint subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claims 6, 11, and 25 upon interaction with the Sprint network.

82. On information and belief, the Sprint Defendants take active steps to induce infringement of claims 6, 11, and 25 by Sprint subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by Sprint subscribers in violation of 35 U.S.C. § 271(b). Such active steps of inducement include, but are not limited to, advertising, selling, and otherwise furnishing (or requiring use of) LTE-compliant UEs necessary for Sprint subscribers to communicate with the Sprint network (with instructions on their use), including furnishing eNodeB base stations for use by subscribers' LTE-compliant UEs, configuring subscriber UEs, and otherwise providing subscribers with the ability to automatically access the Sprint network.

83. By way of at least this Complaint, the Sprint Defendants know of the `641 patent and perform acts that they know, or should know, induce the direct infringement of claims 6, 11, and 25 of the `641 Patent by Sprint subscribers. Thus, the Sprint Defendants are indirectly liable for infringement of at least claims 6, 11, and 25 pursuant to 35 U.S.C. §§ 271(b).

84. On information and belief, the Ericsson Defendants have directly infringed claim 1 under 35 U.S.C. § 271(a), by selling eNodeBs and related equipment to Sprint and by making and using the infringing Sprint equipment during the course of installation and maintenance.

85. On information and belief, the Ericsson Defendants have induced infringement of at least claim 1 of the `641 Patent, by the Sprint Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claim 1 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the Sprint Defendants to use the claimed devices and networks, along with instructions that induce the Sprint Defendants use the claimed devices and networks.

86. On information and belief, the Ericsson Defendants take active steps to induce infringement of at least claim 1 by the Sprint Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the Sprint Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, providing Sprint with instructions on the use of the accused features, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in Sprint's network specifically for the purpose of using the claimed equipment.

87. On information and belief, the Ericsson Defendants know or should know that such activities induce the Sprint Defendants to infringe at least claim 1 of the `641 Patent by using the claimed devices and networks, from at least the date of the filing of this Complaint.

88. On information and belief, the Ericsson Defendants also contribute to the infringement of at least claim 1 by the Sprint Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants that contribute to the infringement of the Sprint Defendants include providing eNodeB hardware and software modules that are capable of operating in the

manner described above. The accused eNodeB software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants know or should know that such activities contribute to the Sprint Defendants' infringement of at least claim 1 by the claimed equipment.

89. By way of at least this Complaint, the Ericsson Defendants know of the `641 Patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of at least claims 1 of the `641 Patent. Thus, the Ericsson Defendants are indirectly liable for infringement of at least claim 1 of the `641 Patent pursuant to 35 U.S.C. §§ 271(b) and 271(c).

90. The Sprint and Ericsson Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `641 Patent, which has been duly issued by the PTO and is presumed valid. For example, the Sprint and Ericsson Defendants participated in litigation regarding the parent patent of the `641 Patent. Similarly, the Ericsson Defendants were petitioners in two *inter partes* review trials concerning the same parent patent of the `641 Patent (i.e., the `431 Patent), and in those proceedings were informed of a child of the `641 Patent, of the relationship between the parent and the child (which includes the `641 Patent), of claim constructions relevant to the `641 Patent claims, and that the PTAB held that at least one element of claim 1 (and the other independent claims) of the `641 Patent was not found in the prior art. Upon information and belief, the Sprint Defendants were similarly aware of the two *inter partes* review trials. Moreover, service of this Complaint provides notice of infringement hereafter. In addition, since at least the filing of this action, the Sprint and Ericsson Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `641 Patent and that the `641

Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `641 Patent. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `641 Patent.

COUNT IV

Infringement of the `018 Patent by All Defendants

91. Paragraphs 1 through 92 are incorporated by reference as if fully restated herein.

92. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE, and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE communicating with an eNodeB in a cell must obtain permission from the eNodeB to use uplink resources that are shared by all UEs in the cell. *Id*. When the eNodeB detects that a UE needs to send uplink data, it sends a DCI message to the UE indicating a grant of specified uplink resources (an "allocation message"). *See* TS 36.213 §§ 3, 6.8, and 7.1.6.

93. The eNodeB and/or other equipment in the Sprint network establishes bearers for data flows to be transmitted over the radio interface between the eNodeB and a UE. TS 36.300 § 13. Different bearers may have different quality of service requirements appropriate for corresponding data flows. *Id.* The eNodeB also communicates a Prioritized Bit Rate (PBR) for each bearer that the eNodeB establishes for transmission from the UE to the eNodeB. TS 36.331 §§ 4.4, 6.2. The UE uses the PBR for each logical channel to iteratively calculate another value, B_j, for that channel. *See* 3rd Generation Partnership Project; LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 8),

3GPP TS 36.321 V8.8.0 (2010-02), and all other versions thereof ("TS 36.321") § 5.4.3.1. B_j increases at defined time intervals by a value specified by the PBR, and decreases as data is transmitted from the UE to the eNodeB. *Id.* The UE transmits data from logical channels having a B_j greater than zero before transmitting data from logical channels having a B_j less than or equal to zero. *Id.*

94. On information and belief, the Sprint Defendants, Ericsson Defendants, and ALU have directly infringed at least claims 12 and 20 of the `018 Patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs in Sprint's network to communicate PBR for logical channels, to send allocation messages to UEs and to receive data from UEs.

95. The Sprint Defendants have also directly infringed, and continue to infringe, at least claim 24 of the `018 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by Sprint subscribers in a manner that results in prioritizing logical channels according to claim 24. The Sprint Defendants are directly responsible for all functions performed by each UE communicating with the Sprint network. The Sprint Defendants direct and control all communication operations of UEs in the Sprint network by using an eNodeB to send PBR and allocation messages. In many cases, Sprint sells UEs to its subscribers along with provision of telecom services. Sprint also requires that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the Sprint network are "attributable to" the Sprint Defendants for purposes of establishing direct infringement of claim 24 of the `018 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

96. Moreover, the Sprint Defendants directly infringe claim 24 because Sprint "conditioned receipt of a benefit" (*i.e.*, the ability of each Sprint subscriber to enjoy Sprint's LTE telecom services) upon use of an LTE-compliant UE responding to PBR and allocation messages

sent by eNodeBs in Sprint's network, and Sprint established the "manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting PBR and allocation messages to the UE. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A Sprint subscriber could not possibly enjoy the benefits of Sprint's LTE telecom services without using an LTE-compliant UE that responds to PBR and allocation messages sent by eNodeBs in the specified manner. Thus, the Sprint Defendants are liable for directly infringing claim 24 under 35 U.S.C. § 271(a).

97. The Sprint Defendants have also induced infringement of at least claim 24 by Sprint subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for the subscribers to communicate with the Sprint network, along with instructions that induce Sprint subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claim 24 upon interaction with the Sprint network.

98. On information and belief, the Sprint Defendants take active steps to induce infringement of claim 24 by Sprint subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by Sprint subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send PBR and allocation messages to cause a UE to prioritize logical channels in an infringing manner, and also by requiring use of LTE-compliant phones specifically for the purpose of performing the logical channel prioritization functions recited in claim 24.

99. By way of at least this Complaint, the Sprint Defendants know of the `018 patent and perform acts that they know, or should know, induce the direct infringement of claim 24 of

the `018 Patent by Sprint subscribers. Thus, the Sprint Defendants are indirectly liable for infringement of at least claim 24 pursuant to 35 U.S.C. §§ 271(b).

100. On information and belief, the Ericsson Defendants and ALU have induced infringement of at least claims 12 and 20 by the Sprint Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 12 and 20 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the Sprint Defendants to perform the claimed methods, along with instructions that induce the Sprint Defendants to perform the claimed methods.

101. On information and belief, the Ericsson Defendants and ALU take active steps to induce infringement of at least claims 12 and 20 by the Sprint Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the Sprint Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to send PBR information and allocation messages, providing Sprint with instructions on the use of the accused features, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in Sprint's network specifically for the purpose of performing the infringing methods.

102. On information and belief, the Ericsson Defendants and ALU know or should know that such activities induce the Sprint Defendants to infringe at least claims 12 and 20 of the `018 Patent by performing the claimed methods, from at least the filing of this Complaint.

103. On information and belief, the Ericsson Defendants and ALU also contribute to the infringement of at least claims 12 and 20 by the Sprint Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants and ALU that contribute to the infringement of the Sprint Defendants include providing eNodeB hardware and software modules that are capable of

transmitting a PBR and allocating bandwidth in the manner described above. The accused eNodeB software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants and ALU know or should know that such activities contribute to the Sprint Defendants' infringement of at least claims 12 and 20 by performing the claimed methods.

104. By way of at least this Complaint, the Ericsson Defendants and ALU know of the `018 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 12 and 20 of the `018 Patent by the Sprint Defendants. Thus, the Ericsson Defendants and ALU are indirectly liable for infringement of at least claims 12 and 20 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

105. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `018 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `018 Patent and that the `018 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `018 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `018 Patent.

COUNT V

Infringement of the `330 Patent by All Defendants

106. Paragraphs 1 through 105 are incorporated by reference as if fully restated herein.

107. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE periodically enters an idle mode, which is a sleep mode used to conserve power and radio resources whenever a UE is not engaged in operations that require more frequent communication with an eNodeB. TS 36.304 § 7.1. During idle mode, the UE monitors only one subframe per a given time cycle for a DCI message having an identifier associated with the UE. *See id.*; *see also* TS 36.213.

108. When a UE is to awaken from idle mode, the eNodeB receives a paging procedure message relating to the UE from other equipment in the Sprint network. TS 36.413 §§ 8.5, 9.1.6. In response to receiving the paging procedure message, the eNodeB sends a DCI message carrying information in a subframe assigned to a group of UEs including the UE that is to be awakened. TS 36.304 § 7.1. The DCI message includes an allocation of resources for a shared channel that is to be read subsequently by all UEs in the group. *See* TS 36.213 § 7.1; *see also* TS 36.212 §§ 5.3.3.1.3 & 5.3.3.1.4. If the UE recognizes an identifier in its assigned subframe, it looks in the allocation of resources on the shared channel for a paging message. *See* TS 36.213 § 7.1; *see also* TS 36.331 § 6.2.2. If the paging message includes the UE's International Mobile Subscriber Identity ("IMSI") or Temporary Mobile Subscriber Identity ("TMSI"), the UE awakens from idle mode. *Id.*; TS 36.331 § 6.2.2.

109. On information and belief, the Sprint Defendants, Ericsson Defendants, and ALU have directly infringed at least claims 1 and 18 of the `330 patent under 35 U.S.C. § 271(a) by

using, installing, testing, and/or maintaining eNodeBs and other equipment in Sprint's network to effect the paging of an idle UE device in the manner described above. The Sprint Defendants have also directly infringed, and continue to infringe, at least claim 9 of the `330 Patent under 35 U.S.C. § 271(a) by selling infringing LTE-compliant phones and other UEs to their own subscribers.

110. The Sprint Defendants have also directly infringed, and continue to infringe, at least claims 9 and 26 of the `330 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by Sprint subscribers in a manner that results in control of the above-described paging process. The Sprint Defendants are directly responsible for all functions performed by each UE that relate to communicating with the Sprint network. The Sprint Defendants direct and control all communication operations of UEs in the Sprint network by using an eNodeB to send signals to page an idle UE through the above-described paging process. In many cases, Sprint sells UEs to its subscribers along with provision of telecom services. Sprint also requires that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the Sprint network are "attributable to" the Sprint Defendants for purposes of establishing direct infringement of claims 9 and 26 of the `330 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

111. Moreover, the Sprint Defendants directly infringe claims 9 and 26 because they "conditioned receipt of a benefit" (*i.e.*, the ability of each Sprint subscriber to enjoy Sprint's LTE telecom services) upon use of an LTE-compliant UE monitoring and responding to DCI messages and other signals sent by eNodeBs in Sprint's network, and Sprint established the "manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant

phones obtained elsewhere), and further by transmitting specific DCI messages, paging messages, and other signals to the UE in accordance with the above-described paging process. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A Sprint subscriber could not possibly enjoy the benefits of Sprint's LTE telecom services without using an LTE-compliant UE that monitors for and responds to specific DCI messages, paging messages, and other signals sent by eNodeBs in the manner specified above. Thus, the Sprint Defendants are liable for directly infringing claims 9 and 26 under 35 U.S.C. § 271(a).

112. The Sprint Defendants have also induced infringement of at least claims 9 and 26 by Sprint subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for Sprint subscribers to communicate with the Sprint network, along with instructions that induce Sprint subscribers to perform the steps of claim 26 upon using UEs to communicate with the Sprint network.

113. On information and belief, the Sprint Defendants take active steps to induce infringement of claims 9 and 26 by Sprint subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by Sprint subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send DCI messages along with other signals to cause a UE to monitor for and receive such messages and signals and awaken from idle mode, and also by requiring use of LTE-compliant UEs specifically for the purpose of performing the infringing paging functions recited in claims 9 and 26.

114. By way of at least this Complaint, the Sprint Defendants know of the `330 patent and perform acts that they know, or should know, induce the direct infringement of claims 9 and 26 of the `330 Patent by Sprint subscribers. Thus, the Sprint Defendants are indirectly liable for infringement of at least claims 9 and 26 pursuant to 35 U.S.C. §§ 271(b).

115. Upon information and belief, the Ericsson Defendants and ALU have directly infringed claim 1 under 35 U.S.C. § 271(a) by selling eNodeBs and related equipment to Sprint and by making and using the infringing Sprint equipment during the course of installation and maintenance.

116. On information and belief, the Ericsson Defendants and ALU have induced infringement of at least claims 1 and 18 by the Sprint Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 1 and 18 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the Sprint Defendants to perform the claimed methods and use the claimed devices, along with instructions that induce the Sprint Defendants to perform the claimed methods and use the claimed devices.

117. On information and belief, the Ericsson Defendants and ALU take active steps to induce infringement of at least claims 1 and 18 by the Sprint Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the Sprint Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to receive paging messages from other equipment in the Sprint network and to send signals to page an idle UE, providing Sprint with instructions on the use of the above-described paging feature, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in Sprint's network specifically for the purpose of performing the infringing methods and using the claimed system and equipment.

118. On information and belief, the Ericsson Defendants and ALU know or should know that such activities induce the Sprint Defendants to infringe at least claims 1 and 18 of the `330 Patent by performing the claimed methods and using the claimed devices and networks, from at least the date of the filing of this Complaint.

119. On information and belief, the Ericsson Defendants and ALU also contribute to the infringement of at least claims 1 and 18 by the Sprint Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants and ALU that contribute to the infringement of the Sprint Defendants include providing eNodeB hardware and software modules that are capable of implementing the above-described paging feature. The accused paging software is especially adapted for use in the infringing paging functions, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants and ALU know or should know that such activities contribute to the Sprint Defendants' infringement of at least claims 1 and 18 by performing the claimed methods and using the claimed system and equipment.

120. By way of at least this Complaint, the Ericsson Defendants and ALU know of the `330 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 1 and 18 of the `330 Patent by the Sprint Defendants. Thus, the Ericsson Defendants and ALU are indirectly liable for infringement of at least claims 1 and 18 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

121. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `330 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `330 Patent and that the `330 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `330 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement,

Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `330 Patent.

COUNT VI

Infringement of the `466 Patent by All Defendants

122. Paragraphs 1 through 121 are incorporated by reference as if fully restated herein.

123. Wireless transmissions between an eNodeB and a UE include downlink transmissions from the eNodeB to the UE, and uplink transmissions from the UE to the eNodeB. TS 36.300 §§ 5-6. Each UE communicating with an eNodeB in a cell must obtain permission from the eNodeB to use uplink resources that are shared by all UEs in the cell. *Id*. When the eNodeB detects that a UE needs to send uplink data, it sends a DCI message to the UE indicating a grant of specified uplink resources (an "allocation message"). *See* TS 36.213 §§ 3, 6.8, and 7.1.6.

124. When a new bearer and corresponding logical channel is set up for communication between the eNodeB and the UE, that logical channel is assigned a Prioritized Bit Rate (PBR). *See* TS 36.331 §§ 4.4, 6.2. The UE uses the PBR for each logical channel to iteratively calculate another value, B_j, for that channel. *See* TS 36.321 § 5.4.3.1. B_j increases at defined time intervals by a value specified by the PBR, and decreases as data is transmitted from the UE to the eNodeB. *Id.* The UE transmits data from logical channels having a B_j greater than zero before transmitting data from logical channels having a B_j less than or equal to zero. *Id.*

125. On information and belief, the Sprint and Ericsson Defendants have directly infringed at least claims 4 and 9 of the `466 Patent under 35 U.S.C. § 271(a) by using, installing, testing, and/or maintaining eNodeBs in Sprint's network to communicate PBR for logical channels, to send allocation messages to UEs and to receive data from UEs. The Sprint

Defendants have also directly infringed, and continue to infringe, at least claim 1 of the `466 Patent under 35 U.S.C. § 271(a) by selling infringing LTE-compliant phones and other UEs to their own subscribers.

126. The Sprint Defendants have also directly infringed, and continue to infringe, at least claim 6 of the `466 Patent under 35 U.S.C. § 271(a) by directing and controlling operation of LTE-compliant UEs held by Sprint subscribers in a manner that results in prioritizing logical channels according to claim 6. The Sprint Defendants are directly responsible for all functions performed by each UE communicating with the Sprint network. The Sprint Defendants direct and control all communication operations of UEs in the Sprint network by using an eNodeB to send PBR and allocation messages. In many cases, Sprint sells UEs to its subscribers along with provision of telecom services. The Sprint Defendants also require that in order to communicate with its network, each UE must comply with certain LTE standards. Thus, the operations of UEs in the Sprint network are "attributable to" the Sprint Defendants for purposes of establishing direct infringement of claim 6 of the `466 Patent. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23.

127. Moreover, the Sprint Defendants directly infringe claim 6 because Sprint "conditioned receipt of a benefit" (*i.e.*, the ability of each Sprint subscriber to enjoy Sprint's LTE telecom services) upon use of an LTE-compliant UE responding to PBR and allocation messages sent by eNodeBs in Sprint's network, and Sprint established the "manner or timing of that performance" by providing LTE-compliant phones to its subscribers along with the provision of LTE services (or else required the subscribers to use LTE-compliant phones obtained elsewhere), and further by transmitting PBR and allocation messages to the UE. *See Akamai Techs., Inc.*, 797 F.3d at 1022-23. A Sprint subscriber could not possibly enjoy the benefits of Sprint's LTE telecom services without using an LTE-compliant UE that responds to PBR and allocation

messages sent by eNodeBs in the specified manner. Thus, the Sprint Defendants are liable for directly infringing claim 6 under 35 U.S.C. § 271(a).

128. The Sprint Defendants have also induced infringement of at least claims 1 and 6 by Sprint subscribers pursuant to 35 U.S.C. § 271(b) by selling (or requiring use of) LTE-compliant UEs necessary for the subscribers to communicate with the Sprint network, along with instructions that induce Sprint subscribers to operate the claimed "user equipment" in a manner that satisfies all of the limitations of claims 1 and 6 upon interaction with the Sprint network.

129. On information and belief, the Sprint Defendants take active steps to induce infringement of claims 1 and 6 by Sprint subscribers, knowing that those steps will induce, encourage, and facilitate direct infringement by Sprint subscribers in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, using eNodeBs to send PBR and allocation messages to cause a UE to prioritize logical channels in an infringing manner, and also by requiring use of LTE-compliant phones specifically for the purpose of performing the logical channel prioritization functions recited in claims 1 and 6.

130. By way of at least this Complaint, the Sprint Defendants know of the `466 patent and perform acts that they know, or should know, induce the direct infringement of claims 1 and 6 of the `466 Patent by Sprint subscribers. Thus, the Sprint Defendants are indirectly liable for infringement of at least claims 1 and 6 pursuant to 35 U.S.C. §§ 271(b).

131. On information and belief, the Ericsson Defendants and ALU have directly infringed claim 4 under 35 U.S.C. § 271(a) by selling eNodeBs and related equipment to Sprint and by making and using the infringing Sprint equipment during the course of installation and maintenance.

132. On information and belief, the Ericsson Defendants and ALU have induced infringement of at least claims 4 and 9 by the Sprint Defendants pursuant to 35 U.S.C. § 271(b), and committed contributory infringement of at least claims 4 and 9 pursuant to 35 U.S.C. § 271(c), by providing the hardware and software necessary for the Sprint Defendants to perform the claimed methods and use the claimed devices and networks, along with instructions that induce the Sprint Defendants to perform the claimed methods and use the claimed devices and networks.

133. On information and belief, the Ericsson Defendants and ALU take active steps to induce infringement of at least claims 4 and 9 by the Sprint Defendants, knowing that those steps will induce, encourage, and facilitate direct infringement by the Sprint Defendants in violation of 35 U.S.C. § 271(b). Such active steps include, but are not limited to, configuring eNodeB equipment to send PBR information and allocation messages, providing Sprint with instructions on the use of the accused features, and participating in the installation, configuration, operation, and maintenance of eNodeB equipment in Sprint's network specifically for the purpose of performing the infringing methods and using the claimed equipment.

134. On information and belief, the Ericsson Defendants and ALU know or should know that such activities induce the Sprint Defendants to infringe at least claims 4 and 9 of the `466 Patent by performing the claimed methods and using the claimed devices and networks, from at least the date of the filing of this Complaint.

135. On information and belief, the Ericsson Defendants and ALU also contribute to the infringement of at least claims 4 and 9 by the Sprint Defendants in violation of 35 U.S.C. § 271(c). Acts by the Ericsson Defendants and ALU that contribute to the infringement of the Sprint Defendants include providing eNodeB hardware and software modules that are capable of

transmitting a PBR and allocating bandwidth in the manner described above. The accused eNodeB software is especially adapted for use in the infringing systems, and it has no substantial non-infringing uses. On information and belief, the Ericsson Defendants and ALU know or should know that such activities contribute to the Sprint Defendants' infringement of at least claims 4 and 9 by performing the claimed methods and using the claimed equipment.

136. By way of at least this Complaint, the Ericsson Defendants and ALU know of the `466 patent and perform acts that they know, or should know, induce and/or contribute to the direct infringement of claims 4 and 9 of the `466 Patent by the Sprint Defendants. Thus, the Ericsson Defendants and ALU are indirectly liable for infringement of at least claims 4 and 9 pursuant to 35 U.S.C. §§ 271(b) and 271(c).

137. All Defendants undertook and continue their infringing actions despite an objectively high likelihood that such activities infringe the `466 Patent, which has been duly issued by the PTO and is presumed valid. For example, since at least the filing of this action, all Defendants have been aware of an objectively high likelihood that their actions constituted and continue to constitute infringement of the `466 Patent and that the `466 Patent is valid. On information and belief, Defendants could not reasonably, subjectively believe that their actions do not constitute infringement of the `466 Patent. In particular, the Defendants have been aware of the IPWireless portfolio and transaction for many years. Despite that knowledge and subjective belief, and the objectively high likelihood that their actions constitute infringement, Defendants have continued their infringing activities. As such, Defendants have willfully infringed and/or will continue to willfully infringe the `466 Patent.

DEMAND FOR JURY TRIAL

138. IV hereby demands a trial by jury on all claims and issues so triable.

PRAYER FOR RELIEF

WHEREFORE, IV respectfully requests judgment for itself and against Defendants as follows:

a. that this Court adjudge that the Defendants have infringed each of the Patents-in-Suit;

b. that this Court adjudge that the Defendants have willfully infringed each of the Patents-in-Suit;

c. that this Court ascertain and award IV damages under 35 U.S.C. § 284 sufficient to compensate for Defendants' infringement, including but not limited to infringement occurring before the filing of this lawsuit;

d. that this Court ascertain and award IV any post-judgment ongoing royalties under 35 U.S.C. § 284 as may be appropriate;

e. that this Court award any applicable pre-judgment and post-judgment interest;

f. that this Court award IV such other relief at law or in equity as the Court deems just and proper.

DATED: September 21, 2017

Respectfully submitted,

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