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

BELL NORTHERN RESEARCH, LLC, Plaintiff, v. SAMSUNG ELECTRONICS CO., LTD, and SAMSUNG ELECTRONICS AMERICA, INC., Defendants.	Civil Action No. 2:19-cv-00286 **JURY TRIAL DEMANDED**

BELL NORTHERN RESEARCH, LLC'S
COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Bell Northern Research, LLC ("BNR") as and for its complaint against Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, "Samsung" or "Defendant") alleges as follows:

PARTIES

1. Bell Northern Research, LLC is a Delaware limited liability company with a principal place of business of 401 N. Michigan Avenue, Chicago, IL 60611.

2. On information and belief, Defendant Samsung Electronics Co., Ltd. ("SEC") is a corporation organized under the laws of the Republic of Korea, having a principal place of business listed at 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea.

3. On information and belief, Defendant Samsung Electronics America, Inc. ("SEA") is a corporation organized under the laws of New York, with a principal place of business in the Eastern District of Texas at 1301 E. Lookout Drive, Richardson, Texas 75082, and 6625 Excellence Way, Plano, Texas 75023. SEA has publicly indicated that in early 2019, it will be centralizing multiple offices in a new location in the Eastern District of Texas at the Legacy

Central office campus, located at or near 6550 Chase Oaks Blvd., Plano, Texas 75023.[1] Defendant SEA may be served with process through its registered agent C T Corporation System, 1999 Bryan St., Suite 900, Dallas, Texas 75201-3136.

4. SEC designs, manufactures, and provides to the United States and other markets a wide variety of products and services, including consumer electronics, mobile phones, tablets, laptops and other personal computers, televisions, and other devices that use wireless communication technology.

5. On information and belief, SEA is a wholly-owned subsidiary of SEC and is responsible for domestic sales and distribution of Samsung's consumer electronics products, including the accused products in this case.

6. On information and belief, Samsung Telecommunications America, LLC ("STA") merged with SEA on January 1, 2015. Prior to the merger with SEA, STA was involved in the sale and distribution of Samsung's consumer electronics in the United States. SEA is the successor-in-interest for claims against STA.

JURISDICTION AND VENUE

7. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

8. This Court has personal jurisdiction over Defendant. Defendant has conducted and continues to regularly conduct business within the State of Texas. Defendant has purposefully and voluntarily availed itself of the privileges of conducting business in the United States, in the

[1] *See* [https://news.samsung.com/us/samsung-electronics-america-open-flagship-north-texas-campus/], last accessed August 22, 2019.

State of Texas, and in the Eastern District of Texas by continuously and systematically placing goods into the stream of commerce through an established distribution channel with the expectation that they will be purchased by consumers in the Eastern District of Texas. Defendant directly and/or through intermediaries (including distributors, sales agents, and others), ship, distribute, offer for sale, sell, advertise, and/or use their products (including, but not limited to, the products that are accused of patent infringement in this lawsuit) in the United States, the State of Texas, and the Eastern District of Texas.

9. SEA is registered to do business in Texas and maintains an agent for service of process there. SEA maintains a principal place of business within the Eastern District of Texas, in the city of Richardson and another place of business within the District in the city of Plano. Together, these two locations within the District have over a thousand employees.

10. Moreover, Defendants have authorized retailers that offer and sell accused products on its behalf in this judicial district. These include Walmart, at 1701 E. End Blvd. N., Marshall, Texas 75670; Sprint, at 1806 E. End Blvd. Ste. 100, Marshall, Texas 75670; Target, at 3092 N Eastman Rd., Longview, Texas 75605, and Best Buy, at 422 W Loop 281, Longview, Texas 75605, among many others. Plaintiff's cause of action arises directly from Defendant's business contacts and other activities in the State of Texas and the Eastern District of Texas.

11. Defendant has derived substantial revenues from its infringing acts occurring within the State of Texas and within this District.

12. Venue is proper as to SEC under 28 U.S.C. § 1391(c)(3) in that it is not a resident of the United States and may, therefore, be sued in any judicial district. *Brunette Mach. Works, Ltd. v. Kockum Indus., Inc*., 406 U.S. 706, 714 (1972).

13. Venue is proper as to SEA under 28 U.S.C. § 1400(b) because SEA has committed acts of infringement in this District and has regular and established places of business within this District. *TC Heartland LLC v. Kraft Foods Grp. Brands LLC*, 137 S. Ct. 1514, 1521 (2017). Specifically, SEA maintains offices at 1301 E. Lookout Drive, Richardson, Texas 75082, and 6625 Declaration Drive, Plano, Texas 75023.

14. SEC and SEA have not disputed this District's personal jurisdiction over them in other recent patent infringement actions. *See, e.g.*, Answer [ECF 15] at ¶ 10, *Richardson v. Samsung Electronics Co.*, No. 6:17-cv-428 (E.D. Tex. Oct. 20, 2017); Answer [ECF 16] at ¶ 9, *Immersion Corp. v. Samsung Electronics America*, No. 2:17-cv-572 (E.D. Tex. Oct. 24, 2017).

15. Joinder of Defendants is proper because Defendants are related parties who are either jointly and severally liable for infringement, or who make, use, sell, offer for sale, or import the same or similar products accused of patent infringement. Further, upon information and belief, Defendants use the same underlying hardware and/or software in their infringing products and therefore the factual question of infringement will substantially overlap between Defendants. Further, Plaintiff anticipates that there will be substantial overlap during the discovery process.

16. Defendants have committed acts of infringement in this District giving rise to this action and do business in this District, including making sales and/or providing service and support for its respective customers in this District. Defendants purposefully and voluntarily sold one or more of the infringing products with the expectation that they would be purchased by consumers in this District. These infringing products have been and continue to be purchased by consumers in this District. Defendants have committed acts of patent infringement within the United States, the State of Texas, and the Eastern District of Texas.

THE BNR PATENT PORTFOLIO

A. Bell Northern Research

17. Bell Northern Research is the successor in interest to a key portfolio of telecommunications-related intellectual property developed at leading telecom innovators, such as Agere Systems Inc. ("Agere"), LSI Corporation ("LSI"), Renesas Electronics Corporation, and Broadcom Corporation ("Broadcom").

18. Key figures of BNR previously served in leadership roles within the intellectual property departments of Agere, LSI, and Nortel Networks (US and Canadian entities). They continued in similar roles with Rockstar Consortium, the entity created by the winning bidders of Nortel's bankruptcy patent auction, where they managed Nortel's former patent portfolio, a portfolio which many of them had spent years developing and monetizing for Nortel.

19. BNR was formed in 2017 to manage a portfolio of telecommunication -related intellectual property acquired from Broadcom.

B. The BNR Patents

20. The BNR portfolio comprises hundreds of patents that reflect important developments in telecommunications that were invented and refined by leading technology research companies, including Agere, LSI, and Broadcom. These include U.S. Patent Nos. 7,319,889; 8,204,554; 8,416,862; 7,957,450; 8,792,432; 7,039,435; 6,549,792; and 7,945,285 (collectively, these eight patents comprise the "Asserted Patents").

21. In 2002, Lucent Technologies, Inc., having its roots with Bell Laboratories and AT&T Corporation, spun off Agere. Agere was merged into LSI in 2007, which was in turn acquired by Avago Technologies ("Avago") in 2014. In 2016, Avago purchased Broadcom and assumed its name to become the current Broadcom Inc.

22. Portions of the BNR portfolio are presently licensed and/or were previously licensed to leading technology companies.

23. In 2011, Samsung itself paid for a license to the patents in BNR's portfolio, including the following five Asserted Patents: U.S. Patent Nos. 7,319,889; 8,204,554; 7,039,435; 6,549,792; and 7,945,285. That license expired at the end of 2018, and Samsung has thus far refused to renew its expired license to these patents it previously paid to license, or to license the remaining Asserted Patents that Samsung also knows it infringes. For these reasons and those that follow, Samsung's infringement of BNR's Asserted Patents is knowing, willful, and egregious.

PATENT PROSECUTION AND EXAMINATION

24. Examiners at the United States Patent and Trademark Office ("USPTO") review patent applications to determine whether a claimed invention should be granted a patent. In general, the most important task of a patent examiner is to review the technical information disclosed in a patent application and to compare it to the state of the art. This involves reading and understanding a patent application, and then searching the prior art to determine what technological contribution the application teaches the public. A patent is a reward for informing the public about specific technical details of a new invention. The work of a patent examiner includes searching prior patents, scientific literature databases, and other resources for prior art. Then, an examiner reviews the claims of the patent application substantively to determine whether each complies with the legal requirements for granting of a patent. A claimed invention must meet patentability requirements including statutory subject matter, novelty, inventive step or non-obviousness, industrial application (or utility) and sufficiency of disclosure, and examiners must apply federal laws (Title 35 of the United States Code), rules, judicial precedents, and guidance from agency administrators.

25. All examiners must have a college degree in engineering or science. Examiners are assigned to “Art Units,” typically groups of 8-15 Examiners in the same area of technology. Thus, by way of required background and work experience, Examiners have special knowledge and skill concerning the technologies examined by them and in their particular Art Unit.

26. The basic steps of the examination consist of:

- reviewing patent applications to determine if they comply with basic format, rules and legal requirements;
- determining the scope of the invention claimed by the inventor;
- searching for relevant technologies to compare similar prior inventions with the invention claimed in the patent application; and
- communicating findings as to the patentability of an applicant's invention via a written action to inventors/patent practitioners.

27. Communication of findings as to patentability are done by way of one or more Office Actions in which the Examiner accepts or rejects proposed claims filed by the applicant(s) and provides reasons for rejections. The applicant(s) are then permitted to file a Response to Office Action, in which claims may be amended to address issues raised by the Examiner, or the applicant states reasons why the Examiner’s findings are incorrect. If an applicant disagrees with a Final Rejection by an Examiner, the applicant may file an appeal with the Patent Trial and Appeal Board (“PTAB”). If the USPTO determines the application meets all requirements, a patent is duly allowed, and after an issue fee is paid, the patent is issued. A patent duly issued by the USPTO is presumptively valid and becomes the property of the inventor(s) or assignee(s).

28. A “Continuation Application” is one where, typically after allowance but in any event prior to issuance, the inventor applies for a second, related patent. A Continuation employs substantially the same invention disclosure as the previous, allowed application, but seeks new or different claims.

ASSERTED PATENTS

A. The Goris Patents

29. BNR is the owner by assignment of U.S. Patent No. 7,319,889 (the "'889 patent"). The '889 Patent is entitled "System and Method for Conserving Battery Power in a Mobile Station." The '889 Patent issued on January 15, 2008. A true and correct copy of the '889 Patent is attached as **Exhibit A**.

30. BNR is also the owner by assignment of U.S. Patent No. 8,204,554 (the "'554 patent"). The '554 Patent is entitled "System and Method for Conserving Battery Power in a Mobile Station." The '554 Patent issued on June 19, 2012. A true and correct copy of the '554 Patent is attached as **Exhibit B**.

31. The inventors of the '889 Patent and the '554 Patent (collectively, the "Goris Patents") are Norman Goris and Wolfgang Scheit.

32. The '889 Patent is a continuation of U.S. Patent No. 7,113,811, filed on June 17, 2003. The '554 Patent is a continuation of the '889 Patent.

33. The Goris Patents generally relate to "mobile station[s]…having a reduced power consumption under certain operating conditions." Ex. B col. 1:14-17.

34. The claimed inventions in the Goris Patents are directed to methods and systems that allow a mobile station, such as a cellular phone, to conserve power – for example, to extend the amount of time for the station to operate on battery power.

35. The background sections of the Goris Patents describe the need for battery power conservation:

> Usually the stand-by time, as well as the talk-time, of a mobile station depend on the lifetime of a (rechargeable) battery inserted within the mobile station and hence, on the load and/or on the capacity of the battery…Increasing of the capacity of the battery would increase the lifetime of the mobile station, but batteries having increased capacities are often larger, heavier or more expensive, none of which are desirable attributes for a

> portable, affordable mobile station. Accordingly, what is needed in the art is a way to prolong the lifetime of a mobile station without having to use a battery with an increased capacity.

Ex. B col. 1:27-37; Ex. C col. 1:27-37.

36. The Goris Patents describe the reduced power consumption resulting from the invention. For example:

> Thus, by reducing the power consumption of the display of an activated telephone set in case the display is not needed, i.e., in particular during a telephone call, current is saved instead of needlessly consumed from the (rechargeable) battery. Accordingly, the spared available battery power may be significant, especially for color displays, resulting in an overall increasement of the stand-by and/or talk time of the telephone set.

Ex. B col. 1:47-54; Ex. C col. 1:48-55.

37. Reducing a device's power consumption is increasingly important and beneficial, as the devices on the market continue to grow in complexity and functionality, demanding more and more power to operate their various features, including audiovisual and connectivity tasks.

38. The preferred embodiments of the invention "are adapted to switch-off the display [of a telephone set] in response to a detection that the set…is attached near to an object, in particular to the ear." Ex. A col. 1:55-58; Ex. B. col. 1:56-69.

39. The '889 Patent contains two independent claims and thirteen total claims, covering various methods and systems. Claim 1 reads:

> A mobile station, comprising:
>
> a display;
>
> a proximity sensor adapted to generate a signal indicative of proximity of an external object; and
>
> a microprocessor adapted to:
>
> (a) determine whether a telephone call is active;
>
> (b) receive the signal from the proximity sensor; and

> (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object; wherein:
>
> the telephone call is a wireless telephone call;
>
> the microprocessor reduces power to the display while the signal indicates the proximity of the external object only if the microprocessor determines that the wireless telephone call is active; and
>
> the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless telephone call.

40. The ’554 Patent contains three independent claims and fourteen total claims, covering various methods and systems. Claim 1 reads:

> A mobile station, comprising:
>
> a display;
>
> a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and
>
> a microprocessor adapted to:
>
> (a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call;
>
> (b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor;
>
> (c) receive the signal from the activated proximity sensor; and
>
> (d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists.

41. The above-disclosed claim limitations from the Goris Patents comprise various elements, including, e.g., a display, a proximity sensor, and a microprocessor adapted to determine whether a telephone call is active, receive signals from the proximity sensor, and

reduce power to the display under certain conditions. These claims, as a whole, provide significant benefits and improvements to reduce a mobile station's power consumption, relative to the prior art.

42. The examination of the '889 Patent required over a year and a half, from the date of the filing of the patent application on September 6, 2006, through the issue date of January 15, 2008.

43. Two Patent Examiners were involved in examining the application that matured into the '889 Patent, namely, Examiner Kamran Afshar and Examiner George Eng.

44. Although the publicly available prosecution history of the '889 Patent does not contain a complete summary of various patent examiner searches, it indicates that Examiner Afshar conducted prior art and/or other searches using at least the patent examiner system Examiner Automated Search Tool ("EAST"), and performed searches on at least January 17, January 29, June 25, July 19, September 24, and October 11, 2007. The Patent Examiners formally cited at least five separate references during the prosecution of the '889 Patent.

45. Between the prior art references located by and cited by the Patent Examiners, and the references submitted by the applicants and considered by the Patent Examiners during the prosecution of the '889 Patent, at least 24 patent references were formally considered by the Patent Examiners, as indicated on the front two pages of the issued '889 Patent.

46. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, in this instance, the art cited by the Patent Examiners is representative of considerable other art located by the USPTO and not cited. Further on information and belief, it is the practice of the USPTO to discuss in its Office Actions those

references of which the Patent Examiners are aware that most closely resemble the claimed inventions.

47. On October 11, 2007, the USPTO issued a Notice of Allowance as to all of claims 1-13 presently in the ’889 Patent.

48. The issued claims from the ’889 Patent are patentably distinct from the at least 24 references identified and/or discussed during prosecution. That is, each of the 14 claims, as a whole—which include, e.g., a display, a proximity sensor, and a microprocessor adapted to determine whether a telephone call is active, receive signals from the proximity sensor, and reduce power to the display under certain conditions —were found to be patentably distinct from at least the 24 formally identified references.

49. The references cited during the examination of the ’889 Patent all represent patentably distinct and in some instances prior art means or methods to reduce power consumption by a device. By allowing the claims of the ’889 Patent, each of the claims in the ’889 Patent, as a whole was shown to be inventive, novel, and innovative over at least the 24 formally identified references.

50. As each claim as a whole from the ’889 Patent is inventive, novel, and innovative as compared to several specific patents and other publications, each claim as a whole, constitutes more than the application of well-understood, routine, and conventional activities.

51. As of July 18, 2018, the ’889 Patent or one of its family members has been cited as pertinent prior art by a USPTO examiner or an applicant during the prosecution of at least 45 issued patents and published applications—including during the prosecution of patent applications filed by leading technology companies such as Samsung, LGE, Qualcomm, Apple, Kyocera, Motorola, Lenovo, and Mediatek.

52. The ’889 patent claims priority to no later than June 17, 2003. The technology disclosed and claimed in the ’889 Patent was not then well-understood, routine or conventional because the prior art did not teach reducing battery usage for an electronic device by using a proximity sensor to reduce power consumption by the display during a phone call. To the contrary, the technology claimed in the ’889 Patent was well ahead of the state of the art at the time of the invention because it presented a way for device manufacturers and their contractors to prolong the life of a mobile station without having to use a battery with an increased capacity.

53. The examination of the ’554 Patent required over four and a half years, from the date of the filing of the patent application on November 27, 2007, through the issue date of June 19, 2012.

54. Two Patent Examiners were involved in examining the application that matured into the ’554 Patent, namely, Examiner Kamran Afshar and Examiner Kathy Wang-Hurst.

55. Although the publicly available prosecution history of the ’554 Patent does not contain a complete summary of various patent examiner searches, it indicates that Examiner Afshar conducted prior art and/or other searches using at least the patent examiner system Examiner Automated Search Tool (“EAST”), and performed searches on at least April 21 and December 21, 2010. It also shows that Examiner Wang-Hurst conducted prior art and/or other searches using at least the EAST system on at least July 28 and December 11, 2011; and February 16 and 17, 2012. The Patent Examiners formally cited at least 4 separate references during the prosecution of the ’554 Patent.

56. Between the prior art references located by and cited by the Patent Examiners, and the references submitted by the applicants and considered by the Patent Examiners during the prosecution of the ’554 Patent, at least 38 patent references and 9 non-patent references were

formally considered by the Patent Examiners, as indicated on the front two pages of the issued ’554 Patent.

57. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, in this instance, the art cited by the Patent Examiners is representative of considerable other art located by the USPTO and not cited. Further on information and belief, it is the practice of the USPTO to discuss in its Office Actions those references of which the Patent Examiners are aware that most closely resemble the claimed inventions.

58. On February 23, 2012, the USPTO issued a Notice of Allowance as to all of claims 1-14 presently in the ’554 Patent.

59. The issued claims from the ’554 Patent are patentably distinct from the at least 47 references identified and/or discussed during prosecution. That is, each of the 14 claims, as a whole—which include, e.g., a display, a proximity sensor, and a microprocessor adapted to determine whether a telephone call is active, receive signals from the proximity sensor, and reduce power to the display under certain conditions —were found to be patentably distinct from at least the 47 formally identified references.

60. The references cited during the examination of the ’554 Patent all represent patentably distinct and in some instances prior art means or methods to reduce power consumption by a device. By allowing the claims of the ’554 Patent, each of the claims in the ’554 Patent, as a whole was shown to be inventive, novel, and innovative over at least the 47 formally identified references.

61. As each claim as a whole from the ’554 Patent is inventive, novel, and innovative as compared to several specific patents and other publications, each claim as a whole, constitutes more than the application of well-understood, routine, and conventional activities.

62. As of July 18, 2018, the ’554 Patent or one of its family members has been cited as pertinent prior art by a USPTO examiner or an applicant during the prosecution of at least 45 issued patents and published applications—including during the prosecution of patent applications filed by leading technology companies such as Samsung, LGE, Qualcomm, Apple, Kyocera, Motorola, Lenovo, and Mediatek.

63. The ’554 patent claims priority to no later than June 17, 2003. The technology disclosed and claimed in the ’554 Patent was not then well-understood, routine or conventional because the prior art did not teach reducing battery usage for an electronic device by using a proximity sensor to reduce power consumption by the display during a phone call. To the contrary, the technology claimed in the ’554 Patent was well ahead of the state of the art at the time of the invention because it presented a way for device manufacturers and their contractors to prolong the life of a mobile station without having to use a battery with an increased capacity.

B. The Wireless Computer Networking Patents

1) <u>Overview of U.S. Patent No. 8,416, 862</u>

64. BNR is the owner by assignment of U.S. Patent No. 8,416,862 (the “’862 patent”). The ’862 Patent is entitled “Efficient Feedback of Channel Information in a Closed Loop Beamforming Wireless Communication System.” The ’862 Patent issued on April 9, 2013. A true and correct copy of the ’862 Patent is attached as **Exhibit C.**

65. The inventors of the ’862 patent are Carlos Aldana and Joonsuk Kim.

66. The ’862 Patent is a continuation-in-part of U.S. Patent 7,738,583, filed on June 28, 2005. The ’862 also claims priority to at least Provisional Application Nos. 60/673,451, filed on April 21, 2005 and 60/698,686, filed on July 13, 2005.

67. The ’862 Patent is generally related to wireless communication systems and more particularly to wireless communications using beamforming. *See* ’862 Patent at Col. 1:19–22.

68. The description of related art section of the patent identifies that, to properly implement beamforming, the transmitter must know the properties of the channel over which the wireless communication is conveyed. *See* ’862 Patent at Col. 3:14–25. Further, the size of the feedback information required to be sent back to the transmitting wireless device may be so large that the channel may change before the entire feedback information is received by the transmitter. *See* ’862 Patent at Col. 3:14–25. One approach is to decompose the channel and send information only relating to a calculated value of the transmitter’s beamforming matrix as the feedback information, but under this approach, even in a 2x2 MIMO wireless communication system, the data is still too large for practical application. *See* ’862 Patent at Col. 3:27–47.

69. Thus, the ’862 patent identifies a need “for a method and apparatus for reducing beamforming feedback information in wireless communications.” *See* ’862 Patent at Col. 3:49–51.

70. The claimed inventions in the ’862 Patent are directed to improved efficiencies in transmitting feedback of transmitter beamforming information, particularly using polar coordinates. *See* ’862 Patent, Col. 15:34–16:6. One of the important technical advantages and improvements offered by the inventive, improved feedback transmission is a decrease in the amount of data required to send the feedback information to the transmitting wireless transmitter. *See id.*

71. The ’862 Patent contains three independent claims and twenty total claims, covering various methods and systems. Claim 1 reads:

> A method for feeding back transmitter beamforming information from a receiving wireless communication device to a transmitting wireless communication device, the method comprising:
>
> the receiving wireless communication device receiving a preamble sequence from the transmitting wireless device;
>
> the receiving wireless device estimating a channel response based upon the preamble sequence;
>
> the receiving wireless device determining an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U);
>
> the receiving wireless device decomposing the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information; and
>
> the receiving wireless device wirelessly sending the transmitter beamforming information to the transmitting wireless device.

72. The above-disclosed claim limitations from the ’862 Patent comprise various elements, including, e.g., a receiving wireless device capable of determining an estimated transmitter beamforming unitary matrix, decomposing an estimated transmitter beamforming unitary matrix to produce transmitter beamforming information, and the ability to send the transmitter beamforming information to the transmitting wireless device. This claim, as a whole, provides significant benefits and improvements discussed previously that directly impact the ability to efficiently transmit beamforming feedback information to the transmitting wireless device, relative to the prior art.

73. The examination of the ’862 Patent required over seven and a half years, from the date of the filing of the patent application on September 28, 2005, through the issue date of April 9, 2013.

74. Two Patent Examiners were involved in examining the application that matured into the ’862 Patent, namely, Examiner Shuwang Liu and Examiner Michael Neff.

75. Although the publicly available prosecution history of the ’862 Patent does not contain a complete summary of various patent examiner searches, it indicates that Examiner Neff conducted prior art and/or other searches using at least the patent examiner system Examiner Automated Search Tool (“EAST”), and performed searches on at least July 24-25, 2008, June 1, 2009, October 9, 2009, and December 17, 2012. The Patent Examiners formally cited at least 5 separate references during the prosecution of the ’862 Patent.

76. Between the prior art references located by and cited by the Patent Examiners, and the references submitted by the applicants and considered by the Patent Examiners during the prosecution of the ’862 Patent, at least 5 patent references and 1 non-patent reference were formally considered by the Patent Examiners, as indicated on the front page of the issued ’862 Patent.

77. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, in this instance, the art cited by the Patent Examiners is representative of considerable other art located by the USPTO and not cited. Further on information and belief, it is the practice of the USPTO to discuss in its Office Actions those references of which the Patent Examiners are aware that most closely resemble the claimed inventions.

78. On December 28, 2012, the USPTO issued a Notice of Allowance as to all of claims 1-20 presently in the ’862 Patent.

79. The issued claims from the ’862 Patent are patentably distinct from the at least 6 references identified and/or discussed during prosecution. That is, each of the 20 claims, as a

whole—which include, e.g., a receiving wireless device capable of determining an estimated transmitter beamforming unitary matrix, decomposing an estimated transmitter beamforming unitary matrix to produce transmitter beamforming information, and the ability to send the transmitter beamforming information to the transmitting wireless device—were found to be patentably distinct from at least the 6 formally identified references.

80. The references cited during the examination of the ’862 Patent all represent patentably distinct and in some instances prior art means or methods to create focused antenna beams by shifting a signal in time or phase to provide gain of the signal in a desired direction and to attenuate the signal in other directions. *See* ’862 Patent, Col. 2:66–3:13. By allowing the claims of the ’862 Patent, each of the claims in the ’862 Patent, as a whole was shown to be inventive, novel, and innovative over at least the 6 formally identified references.

81. As each claim as a whole from the ’862 Patent is inventive, novel, and innovative as compared to several specific patents and other publications, each claim as a whole, constitutes more than the application of well-understood, routine, and conventional activities.

82. As of July 18, 2018, the ’862 Patent or one of its family members has been cited as pertinent prior art by a USPTO examiner or an applicant during the prosecution of at least 10 issued patents and published applications—including during the prosecution of patent applications filed by leading technology companies such as LGE, Samsung, Texas Instruments, and Nokia.

83. The ’862 patent claims priority to no later than April 21, 2005. The technology disclosed and claimed in the ’862 Patent was not then well-understood, routine or conventional. To the contrary, the technology claimed—namely, as discussed above, the ability to provide

efficient (e.g. less data) feedback for a channel during beamforming--in the ’862 Patent was well ahead of the state of the art at the time of the invention.

2) Overview of U.S. Patent No. 7,957,450

84. BNR is the owner by assignment of U.S. Patent No. 7,957,450 (the “’450 Patent”). The ’450 Patent is entitled “Method and System for Frame Formats for MIMO Channel Measurement Exchange.” The ’450 Patent issued on June 7, 2011. A true and correct copy of the ’450 Patent is attached as **Exhibit D**.

85. The inventors of the ’450 Patent are Christopher Hansen, Carlos Aldana, and Joonsuk Kim.

86. The ’450 Patent is a continuation of U.S. Patent No. 7,564,914 filed on February 7, 2005.

87. The ’450 Patent claims priority to Provisional Application No. 60/636,255 filed on December 14, 2004.

88. The ’450 Patent is generally related to “multiple antenna multiple output (MIMO) systems… in which mobile terminals incorporate smart antenna systems comprising multiple transmit antenna and multiple receive antenna. Col. 1:54-57. The specification explains that “[s]ignal fading is a significant problem in wireless communications systems, often leading to temporary loss of communications at mobile terminals.” Col. 1:63-54.

89. The specification explains that “One of the most pervasive forms of fading is known as multipath fading, in which dispersion of transmitted signals due to incident reflections from buildings and other obstacles, results in multiple versions of the transmitted signals arriving at a receiving mobile terminal. The multiple versions of the transmitted signal may interfere with each other and may result in a reduced signal level detected at the receiving mobile terminal. When versions of the transmitted signal are 180o degree out of phase they may cancel each other

such that a signal level of 0 is detected. Locations where this occurs may correspond to 'dead zones' in which communication to the wireless terminal is temporarily lost." Col. 1:65-2:9.

90. "Another important type of fading is related to motion. When a transmitting mobile terminal, or a receiving mobile terminal is in motion, the Doppler phenomenon may affect the frequency of the received signal. The frequency of the received signal may be changed by an amount which is a function of the velocity at which a mobile terminal is moving. Because of the Doppler effect, ISI may result when a mobile terminal is in motion, particularly when the mobile terminal is moving at a high velocity." Col. 2:34-37.

91. In order to improve signal reception and reduce interference, many certain wireless communication devices utilize beamforming technology, whose aim is to focus the transmission of wireless signals in a specific direction to improve reception. Instead of broadcasting wireless signals uniformly in all directions, beamforming devices attempt to direct wireless signals to specific devices to achieve a better signal to noise ratio. *See* Col. 1:35-53.

92. "One of the challenges in beamforming is that the multiplicative scale factors which are applied to transmitted and received signals may be dependent upon the characteristics of the communications medium between the transmitting mobile terminal and the receiving mobile terminal. A communications medium, such as a radio frequency (RF) channel between a transmitting mobile terminal and a receiving mobile terminal, may be represented by a transfer system function, H. The relationship between a time varying transmitted signal, x(t), a time varying received signal, y(t), and the systems function may be represented as shown in equation [1]: $y(t)=Hxx(t)+ n(t)$, where n(t) represents noise which may be introduced as the signal travels through the communications medium and the receiver itself. In MIMO systems, the elements in equation[1] may be represented as vectors and matrices. If a transmitting mobile terminal

comprises M transmitting antenna, and a receiving mobile terminal comprises N receiving antenna, then y(t) may be represented by a vector of dimensions Nx1, x(t) may be represented by a vector of dimensions Mx1, n(t) by a vector of dimensions Nx1, and H may be represented by a matrix of dimensions NxM. In the case of fast fading, the transfer function, H, may itself become time varying and may thus also become a function of time, H(t). Therefore, individual coefficients, hij(t), in the transfer function H(t) may become time varying in nature." Col. 3:49-4:9.

93. Beamforming is challenging because focusing the transmission of wireless signals must be adjusted as the relative positions of the transmitting and receiving wireless device positions change relative to one another. Thus, information about the RF channel used to transmit information must be adapted or else "information loss between the transmitting mobile terminal and the receiving mobile terminal may result." Col. 4:22-24.

94. Existing methods and techniques, such as channel reciprocity, for estimating RF channel characteristics were insufficient because "differences in the electronic circuitry between the respective transmitting mobile terminal and receiving mobile terminal such that, in some cases, there may not be channel reciprocity." Col. 5:16:25.

95. The '450 addresses the shortcomings in the prior art by disclosing "a method for communicating information in a communication system may comprise transmitting data via a plurality of radio frequency (RF) channels utilizing a plurality of transmitting antenna, receiving feedback information via at least one of the plurality of RF channels, and modifying a transmission mode based on the feedback information. Feedback information may be requested utilizing at least one of the plurality of transmitting antenna via at least one of the plurality of RF channels. The number of transmitting antenna utilized during the transmitting of data may be

modified based on the feedback information. The transmission characteristics of data transmitted via at least one of the plurality of transmitting antenna may be modified based on the feedback information. Specific feedback information may be requested in request messages." Col. 5:56-6:3.

96. Furthermore, the specification discloses that "a receiving mobile terminal may perform a singular value decomposition (SVD) on the channel estimate matrix, and subsequently transmit SVD-derived feedback information to the transmitting mobile terminal. Utilizing SVD may increase the amount of computation required at the receiving mobile terminal but may reduce the quantity of information which is transmitted to the transmitting mobile terminal via the RF channel in comparison to transmitting the entire channel estimate matrix." Col. 8:1-10.

97. The '450 Patent contains four independent claims and 22 total claims, covering various methods and systems. Claim 1 reads:

> A method for communication, the method comprising:
>
> computing a plurality of channel estimate matrices based on signals received by a mobile terminal from a base station, via one or more downlink RF channels, wherein said plurality of channel estimate matrices comprise coefficients derived from performing a singular value matrix decomposition (SVD) on said received signals; and
>
> transmitting said coefficients as feedback information to said base station, via one or more uplink RF channels.

98. The examination of the '450 Patent took nearly two years, from the filing of the patent application on July 20, 2009, through the issue date of June 7, 2011.

99. The publicly available prosecution history for the '450 Patent indicates that a single patent examiner was involved in examining the application that matured into the '450 Patent, namely, Examiner Khai Tran.

100. Between any prior art references located by the Patent Examiner, and the references submitted by the applicants and considered by the Patent Examiner during the prosecution of the ’450 Patent, at least two patent references were formally considered by the Patent Examiner, as indicated on the front page of the issued ’450 Patent. Furthermore, Patent Office procedure dictate that for continuations, such as the ’450 Patent, the prior art of record from the examination of the parent patent is part of the record in a continuation application. See Manual of Patent Examining Procedure (“MPEP”) at §609.02 (8th ed., Rev. 7, July 2008) (“The examiner of the continuing application will consider information which has been considered by the Office in the parent application.”). Thus, the prior art considered in U.S. Patent No. 7,564,914 (the parent of the ’450 Patent) was also considered by the Examiner.

101. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, in this instance, the art cited by the Applicants is representative of considerable other art located by the USPTO and not cited. Further on information and belief, it is the practice of the USPTO to discuss in its Office Actions those references of which the Patent Examiners are aware that most closely resemble the claimed inventions.

102. On or about December 27, 2010, the USPTO issued a Notice of Allowance as to all of claims 1-22 presently in the ’450 Patent.

103. The issued claims from the ’450 Patent are patentably distinct from the references identified and/or discussed during prosecution. That is, each of the claims, as a whole were found to be patentably distinct from the formally identified references.

104. The references cited during the examination of the ’450 Patent all represent patentably distinct and in some instances may constitute prior art means or methods for communicating information in wireless systems and devices. By allowing the claims of the ’450

Patent, each of the claims in the ’450 Patent, as a whole, was shown to be inventive, novel, and innovative over at least the formally identified references.

105. As each claim as a whole from the ’450 Patent is inventive, novel, and innovative as compared to the specified patents and other publications, each claim, as a whole constitutes more than the application of well-understood, routine, and conventional activities.

106. As of September 25, 2018, the ’450 Patent has been cited as pertinent prior art by a USPTO examiner or an applicant during the prosecution of at least two issued patents and published applications—including during the prosecution of patent applications filed by leading technology companies such as Sharp.

107. The ’450 patent claims priority to at least one provisional application filed on December 14, 2004.

108. The technology disclosed and claimed in the ’450 Patent was not then well-understood, routine or conventional. The invention allows for improved beamforming in wireless communication devices, which translates to improved device performance and information transfer for end users.

C. The RACH Message Prioritization Patent

109. BNR is the owner by assignment of U.S. Patent No. 8,792,432 (the “’432 Patent”). The ’432 Patent is entitled “Prioritizing RACH Message Contents.” The ’432 Patent issued on July 29, 2014. A true and correct copy of the ’432 Patent is attached as **Exhibit E**.

110. The inventors of the ’432 patent are Brian Martin and Keiichi Kubota.

111. The ’432 Patent is generally related to wireless communication systems. In particular, the ’432 Patent is concerned with the portion of the 3GPP standard that addresses Random Access Channel (“RACH”) procedures. RACH procedures are used by various radio

technologies for User Equipment ("UE")—e.g., a mobile device—to gain contention-based access to a network. *See* '432 Patent at Col. 1:5–9, 31-44.

112. The '432 Patent particularly addresses the prioritization of information sent from a mobile device, e.g., a cellular phone, to a base station, e.g., a cell tower, regarding the RACH characteristics of neighboring base stations. *See* '432 Patent at Col. 1:58–2:44.

113. The background section of the patent identifies that prior art RACH signaling did not generally allow for sufficient message space to include neighbor cell measurements for both inter-frequency and intra-frequency cell neighbors, within the constraints of a Radio Resource Control ("RRC") connection request message. If sufficient space were lacking, the default was to transmit only the inter-frequency neighbor cell measurements, and to drop the information about intra-frequency neighbor cell measurements, and other RACH message information, which otherwise would have been included. This resulted in the cell network station not receiving intra-frequency neighbor measurements or other information, even if that information was more necessary and relevant for the cell station to receive. The patent specifically identifies as deficient the current 3GPP standards in effect at the time. *See* '432 Patent at Col. 2:7–44.

114. Thus, the '432 patent identifies a need to "allow the [mobile device] to include neighbor cell measurements for both inter-frequency and intra-frequency neighbors in its UL RACH message." *See* '432 Patent at Col. 2:36–38.

115. The claimed inventions in the '432 Patent are directed to prioritization of information transmitted from a user device to a base station in a RACH RRC connection message, within the space constraints of that message. *See* '432 Patent at Col. 1:58–2:44. One of the important technical advantages and improvements offered by the inventive, improved prioritization is that the mobile device is enabled to prioritize the content of the RRC connection request message

more efficiently. The invention also avoids network features being redundant, unusable, or unreliable, and permits the RRC connection request to be used in future implementations of the 3GPP standards. *See* '432 Patent at Col. 1:50–2:5.

116. The '432 Patent contains four independent claims and fourteen total claims, covering various methods and systems. Claim 12 reads:

> A method comprising:
> receiving, by a user equipment, a broadcast indication indicating whether to prioritize inter-frequency or intra-frequency neighbor cell measurements for inclusion in an uplink connection request message to be sent on a random access channel; and
>
> constructing the uplink connection request message which includes measurements that are prioritized in accordance with the broadcast indication so as not to exceed a maximum size of the uplink connection request message;
>
> in which one value of the indication directs that the inter-frequency neighbor cell measurements are prioritized over the intra-frequency neighbor cell measurement results for inclusion in the uplink connection request message; and a different value of the indication or omission of the indication directs that the intra-frequency neighbor cell measurements are prioritized over the inter-frequency neighbor cell measurements for inclusion in the uplink connection request message, and
>
> in which the indication is within an information element of system information received on a broadcast channel from an access node of a UTRAN or an E-UTRAN wireless system, and the uplink connection request message is a Radio Resource Control Connection Request message.

117. The above-disclosed claim limitations from the '432 Patent comprise various elements, including, e.g., receiving on a mobile device ("user equipment") a broadcast indication indicating prioritization of neighbor cell measurements to be sent on a RACH uplink message, and constructing the uplink connection message in accordance with that prioritization. This claim, as a whole, provides significant benefits and improvements discussed previously that directly impact the ability to transmit neighbor cell measurements to a base station in accordance with network priorities, while staying within the confines of the Radio Resource Control Connection Request message.

118. The examination of the ’432 Patent required over three years, from the filing of the patent application on February 14, 2011, through the issue date of July 29, 2014.

119. Two Patent Examiners were involved in examining the application that matured into the ’432 Patent, namely, Examiner Andrew Lai and Assistant Examiner Sumitra Ganguly.

120. Although the publicly available prosecution history of the ’432 Patent does not contain a complete summary of various patent examiner searches, it indicates that the examiners conducted prior art and/or other searches using at least the patent examiner system Examiner Automated Search Tool (“EAST”), and performed searches on at least March 9, 2013, and October 2, 2013. The Patent Examiners formally cited at least 13 separate references during the prosecution of the ’432 Patent.

121. Between the prior art references located by and cited by the Patent Examiner, and the references submitted by the applicants and considered by the Patent Examiners during the prosecution of the ’432 Patent, at least 13 were formally considered by the Patent Examiner, including five U.S. patents, two foreign patents, and six other publications, as indicated on the front page of the issued ’432 Patent.

122. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, in this instance, the art cited by the Patent Examiners is representative of considerable other art located by the USPTO and not cited. Further on information and belief, it is the practice of the USPTO to discuss in its Office Actions those references of which the Patent Examiners are aware that most closely resemble the claimed inventions.

123. During the prosecution process, the USPTO rejected the application as being anticipated by U.S. Patent No. 6,845,238 (Mueller), as well as being obvious over Mueller in view of U.S. Patent Application 2008/0045213 (Norris).

124. On April 4, 2014, the USPTO issued a Notice of Allowance as to all of claims 1-14 presently in the ’432 Patent.

125. The issued claims from the ’432 Patent are patentably distinct from the at least 13 references identified and/or discussed during prosecution. That is, each of the 14 claims, as a whole—which include, e.g., receiving on a mobile device a broadcast indication indicating prioritization of neighbor cell measurements to be sent on a RACH uplink message, and constructing the uplink connection message in accordance with that prioritization—were found to be patentably distinct from at least the 13 formally identified references.

126. The references cited during the examination of the ’432 Patent all represent patentably distinct and in some instances prior art means or methods to communicate neighboring cell information. By allowing the claims of the ’432 Patent, each of the claims in the ’432 Patent, as a whole was shown to be inventive, novel, and innovative over at least the 13 formally identified references.

127. As each claim as a whole from the ’432 Patent is inventive, novel, and innovative as compared to several specific patents and other publications, each claim as a whole, constitutes more than the application of well-understood, routine, and conventional activities.

128. As of July 25, 2018, the ’432 Patent, or one of its family members, has been cited as pertinent prior art by a USPTO examiner or an applicant during the prosecution of at least five issued patents or published applications, including during the prosecution of patent applications filed by leading technology companies such as Qualcomm, Ericsson, and Huawei.

129. The ’432 patent claims priority to no later than February 14, 2011. The technology disclosed and claimed in the ’432 Patent was not then well-understood, routine or conventional. To the contrary, the technology claimed in the ’432 Patent was well ahead of the state of the art at the time of the invention. As described above, the prior technology regarding sharing of neighboring cell information prioritized inter-frequency information above intra-frequency information in all cases, and did not allow for prioritizing intra-frequency or other RACH message information if the RRC connection request message were space-constrained. The ’432 Patent resolves that problem.

D. The Proximity-Based Power Regulation Patent

130. BNR is the owner by assignment of U.S. Patent No. 7,039,435 (the “’435 Patent”). The ’435 Patent is entitled “Proximity Regulation System for Use with a Portable Cell Phone and a Method of Operation Thereof.” The ’435 Patent issued on May 2, 2006. A true and correct copy of the ’435 Patent is attached as **Exhibit F**.

131. The inventors of the ’435 Patent are Richard McDowell and Philip Mooney.

132. The application that resulted in the issuance of the ’435 Patent was filed on September 28, 2001.

133. The ’435 Patent is generally related to a proximity regulation system and associated methods that adjust transmit power under certain conditions, for use with a portable cell phone. The specification explains that:

> To address the [] deficiencies of the prior art, the present invention provides a proximity regulation system for use with a portable cell phone. In one embodiment, the proximity regulation system includes a location sensing subsystem that is configured to determine a location of the portable cell phone proximate a user. A power governing subsystem is coupled to the location sensing subsystem and configured to determine a proximity transmit power level of the portable cell phone based on the location.

‘435 Patent at Col. 2:1-11.

134. The background section of the ’435 Patent describes the shortcomings of the prior art:

> Typically, the quality of service of a cell phone is proportional to the transmit power level of the cell phone. Though no definite proof has been determined, health concerns have arisen due to the power used to transmit the radio frequency of cell phones when operated close to the body of a cell phone user. …Cell phone users still want the best possible quality of service from their cell phone. However, health concerns regarding the transmit power of cell phones are now beginning to affect some users. Manufacturers have tried several options to relieve the fears of consumers. One such option involves permanently reducing the power of the transmitter in cellphones. Though this may be perceived as a safety advantage to some customers, unfortunately, this also reduces the quality of service of the cell phone. Another option for consumers is the use of cell phones with a base that typically allows a higher transmit power level of up to three watts….These type of cell phones, however, do not allow the flexibility demanded by consumers that is found in the use of a portable cell phone.

’435 Patent at Col. 1:33-62.

135. The ’435 Patent identifies the need “in the art [for] a system and method to automatically reduce the transmit power level of a portable cell phone when located near a human body thereby decreasing the perception of health risks associated with the use thereof.” ’435 Patent at Col. 1:62-67.

136. The ’435 Patent addresses that need by allowing for adjustment of a power governing subsystem based on a location sensing subsystem, to determine a proximity transmit power level of a cell phone based on location. See, e.g., ’435 Patent at Col. 2:1-39.

137. The ’435 Patent contains one independent claim and nine total claims, covering portable cell phone apparatuses. Claim 1 reads:

> A portable cell phone, comprising:
>
> a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower, and
>
> a proximity regulation system, including:
>
> > a location sensing subsystem that determines a location of said portable cell phone proximate a user; and

> a power governing subsystem, coupled to said location sensing subsystem, that determines a proximity transmit power level of said portable cell phone based on said location and determines a transmit power level for said portable cell phone based on said network adjusted transmit power level and said proximity transmit power level.

138. The above-disclosed claim limitations from the ’435 Patent comprise various elements, including, e.g., a proximity regulation system that contains both a location sensing subsystem to determine location proximate a user and a power governing subsystem that adjusts transmit power level of a cell phone based on location. This claim, as a whole, provides significant benefits and improvements discussed previously that directly adjusts power levels to address certain health concerns based on cell phone usage.

139. The examination of the ’435 Patent took over four years, from the filing of the patent application on September 28, 2001, through the issue date of May 2, 2006.

140. The publicly available prosecution history for the ’435 Patent indicates that a single patent examiner was involved in examining the application that matured into the ’435 Patent, namely, Examiner Sonny Trinh.

141. Between any prior art references located by the Patent Examiner, and the references submitted by the applicants and considered by the Patent Examiner during the prosecution of the ’435 Patent, at least 16 U.S. and foreign patent references were formally considered by the Examiner, as indicated on the front page of the issued ’435 Patent.

142. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, in this instance, the art cited by the Applicants is representative of considerable other art located by the USPTO and not cited. Further on information and belief, it is the practice of the USPTO to discuss in its Office Actions those references of which the Patent Examiners are aware that most closely resemble the claimed inventions.

143. On or about November 18, 2005, the USPTO issued a Notice of Allowance as to all of claims 1-9 presently in the ’435 Patent.

144. The issued claims from the ’435 Patent are patentably distinct from the references identified and/or discussed during prosecution. That is, each of the claims, as a whole were found to be patentably distinct from the formally identified references.

145. The references cited during the examination of the ’435 Patent all represent patentably distinct and in some instances may constitute prior art means or methods for manipulating power levels of a cell phone. By allowing the claims of the ’435 Patent, each of the claims in the ’435 Patent, as a whole, was shown to be inventive, novel, and innovative over at least the 16 formally identified references.

146. As each claim as a whole from the ’435 Patent is inventive, novel, and innovative as compared to the specified patents and other publications, each claim, as a whole constitutes more than the application of well-understood, routine, and conventional activities.

147. As of October 1, 2018, the ’435 Patent or a family member has been cited as pertinent prior art by a USPTO examiner or an applicant during the prosecution of at least 110 issued patents and published applications—including during the prosecution of patent applications filed by leading technology companies such as Apple, Google, Samsung, and Qualcomm.

148. The ’435 patent claims priority to no later than September 28, 2001, its filing date. The technology disclosed and claimed in the ’435 Patent was not then well-understood, routine or conventional. The invention allows an automatic way to regulate transmit power levels in a cell phone depending on the cell phone’s location and/or proximity in order to avoid harmful health effects.

E. The Accelerometer-Influenced Communication Device Patent

149. BNR is the owner by assignment of U.S. Patent No. 6,549,792 (the "'792 Patent"). The '792 Patent is entitled "Accelerometer Influenced Communication Device." The '792 patent issued on April 15, 2003. A true and correct copy of the '792 Patent is attached as **Exhibit G.**

150. The inventors of the '792 Patent are Joseph Cannon and James Johanson.

151. The application that resulted in the issuance of the '792 Patent was filed on June 25, 1999.

152. The '792 Patent is generally related to utilizing accelerometers to aid in the operation of communication devices, including wireless (cellular) telephones.

153. The '792 Patent specification explains that "wireless telephones, such as cordless telephones and cellular telephones," operate differently from "conventional wired telephone service" (also referred to as "wired plain old telephone service (POTS)"). Col. 1:11-12,14-16.

154. The '792 Patent specification states that such differences between the operation of wireless and wired telephones "may cause confusion or inconvenience" to the user. Col. 1:49-51. Examples wherein these differences may cause inconvenience include a user picking up a wireless telephone and having to activate a user input unit to answer the incoming call; failure to activate the user input unit may cause the user difficulty as the telephone continues to ring. Col.1:51-60.

155. The specification discloses "an operational aspect of a communication device [] adapted to be influenced by an output of the accelerometer." Col. 1:66 -2:2. In one embodiment, the controller of a wireless telephone "is adapted to receive an output from the accelerometer to affect a state of the wireless transceiver" (Col. 2:7-11) and in another embodiment, a method of operating a communication device "includes the steps of determining a motion characteristic of

the communication device, and affecting an operational aspect of the [device] based on the motion characteristics." Col. 2:12-16.

156. The '792 Patent specification discloses several examples of the benefits of the invention, including instances where the accelerometer provides an output indicating that the motion characteristics of the handset have changed "such as by transitioning from a stationary position to motion, the controller causes the transceiver to transition to an off-hook state." Col. 4:42-46. Accordingly, "an operational aspect of the communication device is affected based on this motion characteristic, such as by a control action taken by a controller. Exemplary operational aspects are a transition from an off-hook state to an on-hook state and a transition from an on-hook state to an off-hook state." Col. 5:64-6:2. The decision of the controller may be influenced by a motion, the direction of motion, or a comparison of the sensed motion to a motion history. Col. 6:10-15.

157. The '792 Patent contains eleven independent claims and twenty-one total claims, covering various apparatuses and methods. Claim 9 reads:

> A wireless telephone handset, comprising:
>
> a wireless transceiver;
>
> a controller; and
>
> an accelerometer,
>
> wherein the controller is adapted to receive an output from the accelerometer showing an active movement of said wireless telephone and affect a state of said wireless transceiver based on a change in motion history.

158. The above-disclosed claim limitations from the '792 Patent comprise various elements, including, e.g., an accelerometer and a controller, wherein the controller is adapted to receive an output from the accelerometer showing movement of the wireless telephone and thus

affecting a state of the wireless telephone. This claim provides benefits and improvements that directly impact and improve operability of wireless telephones, relative to the prior art.

159. The examination of the ’792 Patent took nearly four years, from the filing of the patent application on June 25, 1999, through the issue date of April 15, 2003.

160. The publicly available prosecution history for the ’792 Patent indicates that two Examiners were involved in examining the application that matured into the ’792 Patent, namely Examiner Lana Le and Examiner Daniel Hunter.

161. At least 8 patent references were formally considered by during the prosecution of the ’792 Patent, as indicated on the front page of the issued ’792 Patent.

162. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, as in this instance, the art cited by the Applicants is representative of considerable other art located by the USPTO and not cited. Further, on information and belief, it is the practice of the USPTO to discuss in Office Actions those references of which the Examiners are aware that most closely resemble the claimed invention.

163. On or about November 25, 2002, the USPTO issued a Notice of Allowability to all of claims 1-21 presently in the ’792 Patent.

164. The issued claims from the ’792 Patent are patentably distinct from the references identified and/or discussed during prosecution. That is, each of the claims, as a whole, were found to be patentably distinct from the formally identified references.

165. The references cited during the examination of the ’792 Patent all represent patentably distinct and in some instances may constitute prior art means or methods of utilizing accelerometers to aid in the operation of communication devices. By allowing the clams of the

’792 Patent, each of the claims in the ’792 Patent, as a whole, was shown to be inventive, novel, and innovative over at least the 8 formally identified references.

166. As each claim as a whole from the ’792 Patent is inventive, novel, and innovative as compared to the specified patents and other publications, each claim, as a whole constitutes more than the application of well-understood, routine, and conventional activities.

167. As of December 18, 2018, the ’792 Patent has been cited as pertinent prior art by a USPTO examiner or an applicant during prosecution of at least 97 issued patents and published applications – including during prosecution of patent applications filed by leading technology companies such as Nokia Corporation, Research In Motion, Samsung, Motorola, Google and Facebook.

168. The ’792 Patent claims priority to June 25, 1999. The technology disclosed and claimed in the ‘792 Patent was not then well-understood, routine or conventional. To the contrary, the technology claimed – namely, adapting a controller to receive an output from the accelerometer and affecting the state of the handset based on various aspects, including a change in motion history – was well ahead of the state of the art at the time of the invention.

F. The Telephone Handset with Bit Stream Player Patent

169. BNR is the owner by assignment of U.S. Patent No. 7,945,285 (the “’285 Patent”). The ’285 Patent is entitled “Integrating a Digital Encoded-Audio Bit Stream Player in a Radio-Frequency Telephone Handset.” The ’285 patent issued on May 17, 2011. A true and correct copy of the ’285 Patent is attached as **Exhibit H.**

170. The inventors of the ’285 Patent are Qinghong Cao, Liang Jin, Wenzhe Luo, Jian Wu, and Zhigang Ma.

171. The ’285 Patent is a continuation of U.S. Patent No. 7,702,363 filed on October 7, 2004, which is a continuation of Application No. 09/447,284, filed on November 23, 1999.

172. The ’285 Patent is generally related to integrating a digital encoded-audio bit stream player in a radio-frequency (RF) telephone handset, wherein the handset is switched from performing as a telephone to performing as an audio bit stream player and back under certain conditions.

173. The ’285 Patent specification explains that prior art “[c]ordless telephones have been conventionally limited to conversational use, e.g., for establishing a telephone calls…” and “[f]or other functions outside of telephony (particularly portable functions), a user is required to obtain a separate device, and carry around both.” Col. 1:46-51. Therefore, in November of 1999, there existed a need to expand the use of portable telephones “beyond that afforded by conventional cordless telephones.” Col. 1:56-57.

174. The specification discloses methods and apparatuses for “integrating a digital encoded-audio bit stream player in a radio frequency (RF) telephone handset.” Col. 2:3-5, 2:38-40. In one embodiment:

> An RF connection is established between the RF telephone handset and an RF unit connected to a network, wherein communications between the RF telephone handset and the network pass through the RF unit. The RF telephone handset is switched from performing as a telephony device to performing as a digital encoded audio bit stream player. Digital encoded-audio bit stream music is played from the RF telephone handset. The digital encoded-audio bit stream music playing from the digital encoded-audio bit stream player is muted when the RF telephone handset receives a telephone call. The RF telephone handset is Switched from performing as a digital encoded audio bit stream player to performing as a telephony device while the telephone call is active.

Col. 2:5-18.

175. The ’285 Patent specification describes the benefits of this invention in view of the challenges presented by the prior art. For example, it describes that, in the prior art, a person wanting to listen to music and still be accessible by telephone while walking, jogging, or biking in his or her neighborhood would need to carry a remote handset *and* a music player, and listening to the music player “makes it difficult at best to hear the audible ringing of the cordless

telephone." Col. 4:58-67. An embodiment of the invention, on the other hand, "allows the user to make and receive telephone calls using a cordless telephone portion of the MP3 cordless telephone, and to listen to audio bit stream music using an audio bit stream (e.g., MP3) player portion of the same MP3 cordless telephone without the risk of missing a telephone call because they did not hear a separate telephone ringing." Col. 4:4-11.

176. The '285 Patent contains two independent claims and six total claims, covering various apparatuses and methods. Claim 1 reads:

> A method of integrating a digital encoded-audio bit stream player in a radio-frequency (RF) telephone handset, comprising:
>
> establishing an RF connection between the RF telephone handset and an RF unit connected to a network, wherein communications between the RF telephone handset and the network pass through the RF unit;
>
> switching the RF telephone handset from performing as a telephony device to performing as a digital encoded audio bit stream player;
>
> playing digital encoded-audio bit stream music from the RF telephone handset;
>
> muting the digital encoded-audio bit stream music playing from the digital encoded-audio bit stream player when the RF telephone handset receives a telephone call; and
>
> switching the RF telephone handset from performing as a digital encoded-audio bit stream player to performing as a telephony device while the telephone call is active, wherein:
>
> (i) the RF telephone handset comprises:
>
> a digital signal processor, and
>
> a digital-to-analog converter connected to the digital signal processor,
>
> (ii) the step of playing digital encoded-audio bit stream music from the RF telephone handset comprises the steps of:
>
> the digital signal processor decoding a digital encoded audio bit stream to produce a digital reconstructed audio signal,

the digital-to-analog converter converting the digital reconstructed audio signal to an analog audio signal, and

outputting the analog audio signal to the user;

(iii) the step of muting digital encoded-audio bit stream music playing from the digital encoded-audio bit stream player comprises the digital signal processor pausing decoding the digital encoded-audio bit stream; and

(iv) the method further comprises:

the digital signal processor receiving a telephone audio signal from the RF unit connected to the network,

the digital signal processor passing the telephone audio signal to the digital-to-analog converter,

the digital-to-analog converter converting the telephone audio signal to an analog audio signal, and

outputting the analog audio signal to the user.

177. The above-disclosed claim limitations from the ’285 Patent comprise various elements, including, e.g., RF telephone handset, an RF unit connected to a network, and a digital encoded-audio bit stream player integrated into the RF telephone handset that switches from playing music to muting depending on whether a call is active. This claim provides benefits and improvements that directly impact and improve the use of RF telephone handsets that play music relative to the prior art.

178. The examination of the ’285 Patent took more than one year, from the filing of the continuation patent application on February 16, 2010, through the issue date of May 17, 2011.

179. The publicly available prosecution history for the ’285 Patent indicates that one Examiner was involved in examining the application that matured into the ’285 Patent, namely Examiner Nghi H. Ly.

180. At least 57 patent references and 29 other references were formally considered by during the prosecution of the ’285 Patent, as indicated on the front two pages of the issued ’285 Patent.

181. On information and belief, it is the practice of the USPTO not to cite excessive cumulative art, in other words, as in this instance, the art cited by the Applicants is representative of considerable other art located by the USPTO and not cited. Further, on information and belief, it is the practice of the USPTO to discuss in Office Actions those references of which the Examiners are aware that most closely resemble the claimed invention.

182. On or about December 27, 2010 the USPTO issued a Notice of Allowability to all of claims 1-6 presently in the ’285 Patent.

183. The issued claims from the ’285 Patent are patentably distinct from the references identified and/or discussed during prosecution. That is, each of the claims, as a whole, were found to be patentably distinct from the formally identified references.

184. The references cited during the examination of the ’285 Patent all represent patentably distinct and in some instances may constitute prior art means or methods of integrating a digital encoded-audio bit stream player in a radio-frequency (RF) telephone handset. By allowing the clams of the ’285 Patent, each of the claims in the ’285 Patent, as a whole, was shown to be inventive, novel, and innovative over at least the formally identified references.

185. As each claim as a whole from the ’285 Patent is inventive, novel, and innovative as compared to the specified patents and other publications, each claim, as a whole constitutes more than the application of well-understood, routine, and conventional activities.

186. As of December 18, 2018, the ’285 Patent has been cited as pertinent prior art by a USPTO examiner or an applicant during prosecution of at least 58 issued patents and published applications – including during prosecution of patent applications filed by leading technology companies such as Apple, Microsoft, Nokia, and Texas Instruments.

187. The ’285 Patent claims priority to November 23, 1999. The technology disclosed and claimed in the ‘285 Patent was not then well-understood, routine or conventional. To the contrary, the technology claimed – integrating a digital encoded-audio bit stream player in a radio-frequency (RF) telephone handset, wherein the handset is switched from performing as a telephone to performing as an audio bit stream player and back under certain conditions – was well ahead of the state of the art at the time of the invention.

OVERVIEW OF ACCUSED TECHNOLOGY

A. SAMSUNG’S CELLULAR PHONE PRODUCTS

188. Samsung makes, imports, and sells cellular phones in the United States. These offerings include Samsung’s Galaxy S-series, Galaxy Note-series, Galaxy A-Series, Galaxy J-series, and Galaxy Halo, among many others. Samsung markets these phones as compliant with the 3GPP standards promulgated by standard setting body the European Telecommunications Standards Institute (“ETSI”), and markets some as compliant with the 802.11ac standards promulgated by standard setting body the Institute of Electronics and Electrical Engineers (“IEEE”). These phones also include features that offer service and device-related benefits to users, such as proximity sensors that allow power reduction to save battery, proximity sensing systems to regulate transmit power levels, accelerometers to aid in the operation of communication devices, and improved use of combination phone and music players.

B. SAMSUNG'S TABLET PRODUCTS

189. Samsung makes, imports, and sells tablet devices in the United States. These offerings include multiple versions of the Galaxy Tab and Galaxy Book series. Samsung markets each of these tablets as compliant with the 802.11ac standards promulgated by IEEE; it markets some as compliant with the 3GPP standards promulgated by ETSI. These tablets also include features that offer improved use of combination tablet/phone and music players.

C. SAMSUNG'S HOME OR OFFICE ELECTRONICS PRODUCTS

190. Samsung makes, imports, and sells home electronics, such as smart watches, laptop computers, televisions, home theater equipment, and Blu-Ray or DVD players, in the United States. Samsung markets certain of these products as compliant with the 802.11ac standards promulgated by IEEE.

COUNT 1

(Willful Infringement of U.S. Patent No. 7,319,889)

191. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

192. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed and is currently infringing one or more claims (e.g., claim 1) of the '889 Patent, in violation of 35 U.S.C. § 271(a).

193. Samsung has infringed and is currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing within this judicial district and elsewhere in the United States, without license or authority, infringing products and related products and/or processes falling within the scope of one or more claims of the '889 Patent, including claim 1 (collectively, the "'889 Accused Products").

194. By way of example only, Samsung's Galaxy S8 product is a mobile station (cellular phone) comprising a display, a proximity sensor (located at the top of the device) adapted to generate a signal indicative of proximity of an external object (e.g., a person's ear), a microprocessor adapted to (1) determine whether a wireless telephone call is active, (2) receive a signal from the proximity sensor, and (3) reduce power to the phone's display if a call is active and the signal indicates the proximity of the external object (e.g., ear). The microprocessor in the Galaxy S8 product reduces power to the display while the signal indicates the proximity of the external object (e.g., ear) only if it determines that the call is active, and the proximity sensor of the device begins detecting proximity substantially concurrently with the initiation of an outgoing call or receiving an incoming call.

Galaxy S8 User Guide.[2]

[2] Available at [http://downloadcenter.samsung.com/content/UM/201906/20190621014225616/GEN_SM-G950U_SM-G955U_EN_UM_P_9.0_041819_FINAL_AC.pdf], (last accessed August 22, 2019).

195. The Galaxy S8's display is backlit at a normal level when a user is browsing the web or sending text messages. However, when a call is active and the user brings the phone proximate to the ear, the display dims, conserving battery power.

196. By way of example only, the remainder of the '889 Accused Products include each of the limitations described in the previous paragraph with respect to the Samsung's Galaxy S8 product. For example, Samsung advertises the proximity sensor feature for each product.

197. Samsung's acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the '889 Accused Products, and related products and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 1.[3]

198. Samsung's infringement is knowing, egregious, consciously wrongful, and willful. Samsung learned of its infringement of the '889 Patent no later than the December 31, 2018 expiration of Samsung's previous license to that patent. On October 4, 2018, Mr. Dean, President of Bell Northern Research, sent a letter to Dr. Oh-Hyun Kwon, Chairman and CEO of SEC. Mr. Dean's letter identified the '889 Patent and notified Samsung that Samsung's products would infringe the patent on expiration of the license. BNR offered to meet and engage in technical and business discussions regarding both the licensed and unlicensed patents. On November 5, 2018, BNR followed up by sending additional letters. Mr. Dean sent a letter on November 7, 2018 and November 20, 2018 to Mr. MinHyung Chung, Executive Vice President of SEC and a signor of the earlier license agreement, advising him that the license was set to expire on December 31,

[3] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 1 is provided for notice pleading only and is not presented as an "exemplary" claim of all other claims in the '889 patent.

2018 and inviting Samsung to engage in discussions regarding a new license to the entire BNR portfolio—including the ’889 Patent. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the ’889 Patent and Samsung’s infringing products. Despite these efforts, and knowing that it was willfully infringing the ’889 Patent, Samsung continued to infringe the ’889 Patent by continuing to make, use, sell, and/or offer to sell the ’889 Accused Products in the United States.

199. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ’889 Patent.

200. As a result of Samsung’s infringement of the ’889 Patent, Plaintiff has been injured by Samsung’s unauthorized use of Plaintiff’s intellectual property. Plaintiff seeks monetary damages in an amount adequate to compensate for Samsung’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung’s infringing activities are enjoined by this Court.

201. Unless a permanent injunction is issued enjoining Samsung and its agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the ’889 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

COUNT 2

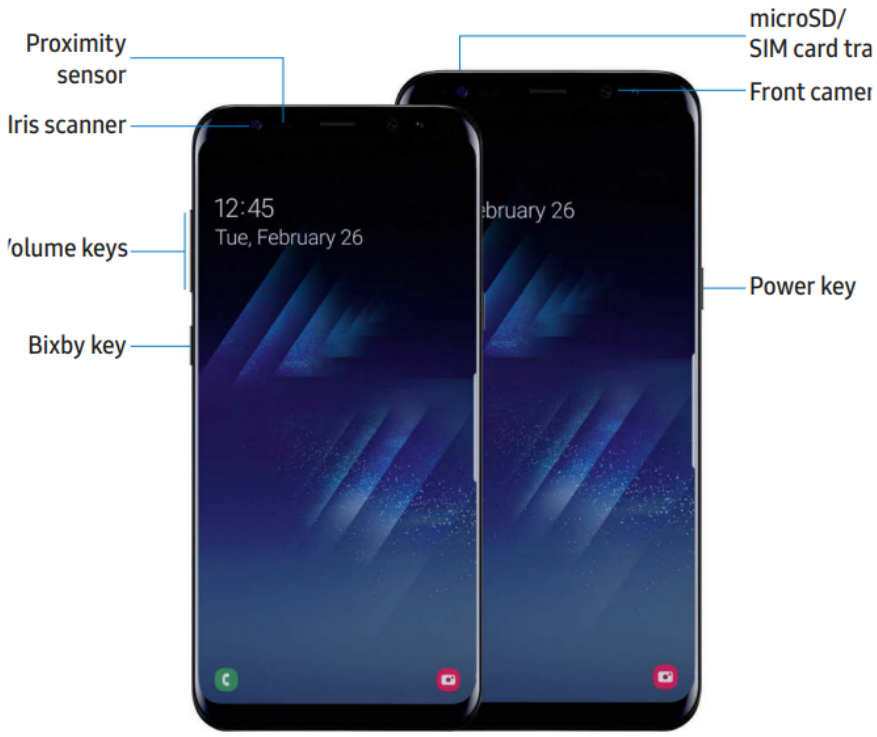
(Willful Infringement of U.S. Patent No. 8,204,554)

202. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

203. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed and is currently infringing one or more claims (e.g., claim 1) of the ’554 Patent, in violation of 35 U.S.C. § 271(a).

204. Samsung has infringed and are currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing within this judicial district and elsewhere in the United States, without license or authority, infringing products, including but not limited to and related products and/or processes falling within the scope of one or more claims of the ’554 Patent, including claim 1 (collectively, the “’554 Accused Products”).

205. By way of example only, Samsung’s Galaxy S8 product is a mobile station (cellular phone) comprising a display, a proximity sensor (located at the top of the device) adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object (e.g., a person’s ear) is proximate, and a microprocessor adapted to (1) determine, without using the proximity sensor, the existence of the second condition that a user has performed an action to initiate an outgoing call or to answer an incoming call, (2) activate the proximity sensor if the second condition exists, and (3) reduce power to the phone’s display if the signal from the activated proximity sensor indicates that the first condition (e.g., ear is proximate to the sensor) exists.



Galaxy S8 User Guide.[4]

206. The Galaxy S8's display is backlit at a normal level when a user is browsing the web or sending text messages. However, when a call is active and the user brings the phone proximate to the ear, the display dims, conserving battery power.

207. By way of example only, the remainder of the '554 Accused Products include each of the limitations described in the previous paragraph with respect to the Samsung's Galaxy S8 product. For example, Samsung advertises the proximity sensor feature for each product.

[4] Available at [http://downloadcenter.samsung.com/content/UM/201906/20190621014225616/GEN_SM-G950U_SM-G955U_EN_UM_P_9.0_041819_FINAL_AC.pdf], (last accessed August 22, 2019).

208. Samsung's acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the '554 Accused Products, and related products and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 1.[5]

209. Samsung's infringement is knowing, egregious, consciously wrongful, and willful. Samsung learned of its infringement of the '554 Patent no later than the December 31, 2018 expiration of Samsung's previous license to that patent. On October 4, 2018, Mr. Dean, President of Bell Northern Research, sent a letter to Dr. Oh-Hyun Kwon, Chairman and CEO of SEC. Mr. Dean's letter identified the '554 Patent and notified Samsung that its products would infringe the patent on expiration of the license. BNR offered to meet and engage in technical and business discussions regarding both the licensed and unlicensed patents. On November 5, 2018, BNR followed up by sending additional letters. Mr. Dean sent a letter on November 7, 2018 and November 20, 2018 to Mr. MinHyung Chung, Executive Vice President of SEC and a signor of the earlier license agreement, advising him that the license was set to expire on December 31, 2018 and inviting Samsung to engage in discussions regarding a new license to the entire BNR portfolio—including the '554 Patent. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the '554 Patent and Samsung's infringing products. Despite these efforts, and knowing that it was willfully infringing the '889 Patent, Samsung continued to infringe the '554 Patent by continuing to make, use, sell, and/or offer to sell the '554 Accused Products in the United States.

[5] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 1 is provided for notice pleading only and is not presented as an "exemplary" claim of all other claims in the '554 patent.

210. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ’554 Patent.

211. As a result of Samsung’s infringement of the ’554 Patent, Plaintiff has been injured by Samsung’s unauthorized use of Plaintiff’s intellectual property. Plaintiff seeks monetary damages in an amount adequate to compensate for Samsung’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung’s infringing activities are enjoined by this Court.

212. Unless a permanent injunction is issued enjoining Samsung and their agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the ’554 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

COUNT 3

(Willful Infringement of U.S. Patent No. 8,416,862)

213. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

214. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed and is currently infringing one or more claims (*e.g.*, claim 9) of the ’862 Patent, in violation of 35 U.S.C. § 271(a).

215. Samsung has infringed and is currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing within this judicial district and elsewhere in the United States, without license or authority, infringing products and related products and/or processes falling within the scope of one or more claims of the ’862 Patent, including claim 9 (collectively, the “’862 Accused Products”).

216. The ’862 Accused Products, including but not limited to those identified in the preceding paragraph, comply with the 802.11ac Standard.

217. The 802.11ac Standard was introduced on or about December 2013.

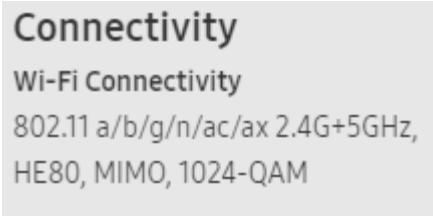
218. The 802.11ac Standard provides a definition and standardization for channel sounding for beamforming for Multiple Input Multiple Output (“MIMO”) RF radio links, including how a receiving wireless device communicates channel sounding to a base station. Beamforming requires the use of a steering matrix that improves the reception to the beamformee. The 802.11ac Standard provides a specific way to compress the beamforming feedback matrix by the beamformee, and how to determine and decompose the estimated transmitter beamforming unitary matrix and compressed into angles for efficient transmission to the beamformer, which generates a next steering matrix. *See* 802.11-2016 at 19.3.12.

219. Devices implementing beamforming standardizations according to 802.11ac must be able to generate the channel feedback information to a beamformer to generate a steering matrix, as described. Thus, all 802.11ac compliant devices with beamforming capabilities include a module operable to transmit feedback beamforming information to a beamformer by determining and then decomposing an estimated transmitter beamforming unitary matrix, at least by using information from the transmitted HT-LTF’s which are part of the PHY preamble. All 802.11ac compliant devices with beamforming capabilities must then be able to determine beamforming feedback matrices and compress those into the form of angles, to be sent to the beamformer.

220. The beamformee calculates a beamforming unitary matrix based upon the channel response and a receiver beamforming unitary matrix. See 802.11-2016 at 19.3.12.3.6. Thus, all 802.11ac Standard compliant devices, including the ’862 Accused Products are operable to feedback channel information to a beamformer based on information in a preamble sequence

from the transmitting wireless device, to calculate transmitter beamforming information and compressing that information in the form of angles and sending this information to the beamforming transmitting wireless device.

221. By way of example only, the Samsung Galaxy S10 product is a receiving wireless device (cellular phone) that is advertised as complying with the 802.11ac Standard.



Samsung Galaxy S10 Specifications.[6] In addition, the device includes 2 x 2 MU-MIMO capability,[7] which indicates that it performs beamforming and complies with the beamforming portions of the 802.11ac standard.

222. Because of its compliance with the beamforming portions of 802.11ac, Samsung's Galaxy S10 contains modules operable to feedback channel information to a beamformer based on information in a preamble sequence from the transmitting wireless device, to calculate transmitter beamforming information and compressing that information in the form of angles and sending this information to the beamforming transmitting wireless device.

[6] Available at [https://www.samsung.com/us/mobile/phones/galaxy-s/galaxy-s10-128gb-unlocked-sm-g973uzbaxaa/#specs] (last accessed August 22, 2019).
[7] "Samsung Announces the Galaxy S10: 10th Anniversary Trio," AnandTech (February 20, 2019), available at [https://www.anandtech.com/show/13960/samsung-announces-the-galaxy-s10-10th-anniversary-trio] (last accessed August 22, 2019).

223. The remainder of the ’862 Accused Products include each of the limitations described in the previous paragraph with respect to the Samsung’s Galaxy S10 product. For example, each of those products complies with the beamforming portions of the 802.11ac standard.

224. Samsung’s acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the ’862 Accused Products, and related products and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 9.[8]

225. Samsung’s infringement is knowing, egregious, consciously wrongful, and willful. Unlike certain of the other Asserted Patents, Samsung did not hold a previous license to the ’862 Patent. Samsung learned of its infringement of the ’862 Patent no later than February 9, 2018, in a letter from Mr. Dean, President of Bell Northern Research, to Dr. Oh-Hyun Kwon, Chairman and CEO of SEC. Mr. Dean’s letter identified the ’862 Patent and notified Samsung that Samsung’s products infringe the patent. Mr. Dean identified exemplary products by name. BNR offered to meet and present a detailed presentation to Samsung, describing the infringement. On March 29, 2018, October 4, 2018 and November 5, 2018, BNR followed up by sending additional letters. Mr. Dean sent letters on November 7, 2018 and November 20, 2018 to Mr. MinHyung Chung, Executive Vice President of SEC and a signor of the earlier license agreement, advising him that the license was set to expire on December 31, 2018 and inviting Samsung to engage in discussions regarding a new license to the entire BNR portfolio—including the ’862 Patent. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the ’862 Patent and Samsung’s infringing

[8] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 9 is provided for notice pleading only and is not presented as an “exemplary” claim of all other claims in the ’862 patent.

products. Despite these efforts, and knowing that it was infringing the ’862 Patent, Samsung continued to infringe the ’862 Patent by continuing to make, use, sell, and/or offer to sell the ’862 Accused Products in the United States.

226. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ’862 Patent.

227. As a result of Samsung’s infringement of the ’862 Patent, Plaintiff has been injured by Samsung’s unauthorized use of Plaintiff’s intellectual property. Plaintiff seeks monetary damages in an amount adequate to compensate for Samsung’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung’s infringing activities are enjoined by this Court. BNR is willing to abide by any applicable FRAND obligations.

228. Unless a permanent injunction is issued enjoining Samsung and its agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the ’862 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

COUNT 4

(Willful Infringement of U.S. Patent No. 7,957,450)

229. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

230. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed and is currently infringing one or more claims (*e.g.*, claim 11) of the ’450 Patent, in violation of 35 U.S.C. § 271(a).

231. Samsung has infringed and is currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing

within this judicial district and elsewhere in the United States, without license or authority, infringing products and related products and/or processes falling within the scope of one or more claims of the ’450 Patent, including claim 1 (collectively, the “’450 Accused Products”).

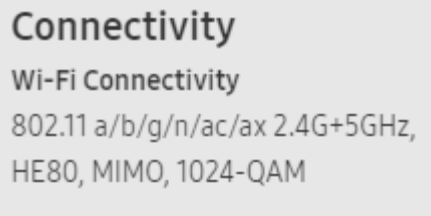
232. The ’450 Accused Products, including but not limited to those identified in the preceding paragraph, comply with the 802.11ac Standard per Samsung’s product literature and/or publicly available information.

233. The 802.11ac Standard was introduced on or about December 2013.

234. The 802.11ac Standard provides for a “compressed beamforming feedback matrix” and specifies that “[i]n compressed beamforming feedback matrix, the beamformee shall remove the specie-time stream CSD in Table 19-10 from the measured channel before computing a set of matrices for feedback to the beamformer.” See 802.11-2016 at 19.3.12.3.6. Furthermore, “[t]he beamforming feedback matrices, V(k), found by the beamformee are compressed in the form of angles, which are sent to the beamformer.” See 802.11-2016 at 19.3.12.3.6. Devices implementing the beamforming standardization according to 802.11ac must be capable of providing compressed beamforming feedback matrices as set forth above.

235. Upon information and belief, singular value decomposition (SVD) is the most common approach to calculate transmitter weights for beamforming matrices. Furthermore, using the matrix V calculated by SVD results in maximum likelihood performance with a linear receiver, which greatly simplifies receiver design.

236. By way of example only, the Samsung Galaxy S10 product is a receiving wireless device (cellular phone) that is advertised as complying with the 802.11ac Standard.



Samsung Galaxy S10 Specifications.[9] In addition, the device includes 2 x 2 MU-MIMO capability,[10] which indicates that it performs beamforming and complies with the beamforming portions of the 802.11ac standard.

237. Because of its compliance with the beamforming portions of 802.11ac, Samsung's Galaxy S10 contains modules operable to compute one or more channel estimate matrices from signals received from a base station, wherein the channel estimate matrices contain coefficients derived from performing singular value matrix decomposition operations on the signals received from the base station.

238. The remainder of the '450 Accused Products include each of the limitations described in the previous paragraph with respect to the Samsung Galaxy S10 product. For example, each of those products complies with the beamforming portions of the 802.11ac standard.

239. Samsung's acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the '450 Accused Products, and related products and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 1.[11]

[9] Available at [https://www.samsung.com/us/mobile/phones/galaxy-s/galaxy-s10-128gb-unlocked-sm-g973uzbaxaa/#specs] (last accessed August 22, 2019).
[10] "Samsung Announces the Galaxy S10: 10th Anniversary Trio," AnandTech (February 20, 2019), available at phttps://www.anandtech.com/show/13960/samsung-announces-the-galaxy-s10-10th-anniversary-trio] (last accessed August 22, 2019).
[11] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 1 is provided for notice pleading only and is not presented as an "exemplary" claim of all other claims in the '450 patent.

240. Samsung's infringement is knowing, egregious, consciously wrongful, and willful. Unlike certain of the other Asserted Patents, Samsung did not hold a previous license to the '862 Patent. Samsung learned of its infringement of the '450 Patent no later than January 3, 2019, in an email letter from Mr. Dean, President of Bell Northern Research, to Mr. Hyucksun Kwon, Manager at SEC's Licensing Team, Intellectual Property Center. Mr. Dean's email identified the '450 Patent and notified Samsung that Samsung's products infringe the patent. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the '450 Patent and Samsung's infringing products. Despite these efforts, and knowing that it was infringing the '450 Patent, Samsung continued to infringe the '450 Patent by continuing to make, use, sell, and/or offer to sell the '450 Accused Products in the United States.

241. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '450 Patent.

242. As a result of Samsung's infringement of the '450 Patent, Plaintiff has been injured by Samsung's unauthorized use of Plaintiff's intellectual property. Plaintiff seeks monetary damages in an amount adequate to compensate for Samsung's infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung's infringing activities are enjoined by this Court. BNR is willing to abide by any applicable FRAND obligations.

243. Unless a permanent injunction is issued enjoining Samsung and its agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the '450 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

COUNT 5

(Willful Infringement of U.S. Patent No. 8,792,432)

244. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

245. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed and is currently infringing one or more claims (*e.g.*, claim 12) of the ’432 Patent, in violation of 35 U.S.C. § 271(a).

246. Samsung has infringed and is currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing within this judicial district and elsewhere in the United States, without license or authority, infringing products and related products and/or processes falling within the scope of one or more claims of the ’432 Patent, including claim 12 (collectively, the “’432 Accused Products”).

247. The ’432 Accused Products, including but not limited to those identified in the preceding paragraph, comply with the 3GPP TS 25.331 standard, Version 11.4.0 Release 11 (the “TS 25.331 v.11.4.0 Standard”) or later, per Samsung’s product literature.

248. The TS 25.331 v.11.4.0 Standard was introduced on or about February 2013.

249. The TS 25.331 v.11.4.0 Standard provides a protocol specification for Universal Mobile Telecommunications System (“UTMS”) Radio Resource Control (“RRC”) standards. This includes the function of and informational elements to be included in RRC Connection Request messages.

250. The TS 25.331 v.11.4.0 Standard requires that compliant devices be capable of receiving the network’s RACH reporting priority, indicating the order of limiting intra/inter neighbor cell measurements and other information. *See* TS 25.331 v.11.4.0 at 10.3.7.136. This means that compliant devices, including the ’432 Accused Products, can receive a broadcast

indication indicating whether to prioritize inter-frequency or intra-frequency neighbor cell measurements for inclusion in an uplink connection request message to be sent on a random-access channel.

251. Devices operating in accordance with the TS 25.331 v.11.4.0 Standard transmit an uplink RRC message, which includes the measured RACH characteristics, including neighbor cell characteristics in accordance with the prioritization noted above, and does not exceed the maximum allowed message size. See TS 25.331 v.11.4.0 at 8.5.23. Therefore, any compliant devices, including the ’432 Accused Products, construct the uplink connection request message, which includes measurements that are prioritized in accordance with the broadcast indication so as not to exceed a maximum size of the uplink connection request message.

252. The TS 25.331 v.11.4.0 Standard sets forth protocols for transmitting the uplink RRC message and limiting the number of included neighboring cells according to the priority indicated by the network—e.g., an “InterEUTRAIntra,” indication limits the number of intra-frequency cells reported first, and an “IntraEUTRAInter” indication limits the number of inter-frequency cells reported first. *See* TS 25.331 v.11.4.0 at 8.5.23. Therefore, the broadcast indication discussed above is one in which one value of the indication directs that the inter-frequency neighbor cell measurements are prioritized over the intra-frequency neighbor cell measurement results for inclusion in the uplink connection request message; and a different value of the indication or omission of the indication directs that the intra-frequency neighbor cell measurements are prioritized over the inter-frequency neighbor cell measurements for inclusion in the uplink connection request message.

253. The TS 25.331 v.11.4.0 Standard requires the broadcast indication discussed above to be an information element of system information received on a broadcast channel from an access

node of a Universal Terrestrial Radio Access Network or an Evolved Universal Terrestrial Radio Access Network (e.g., a cell network), and, as discussed above, the uplink connection request message is a Radio Resource Control Connection Request Message. See TS 25.331 v.11.4.0 at 8.5.23, 10.2.39, 10.2.48, 10.2.48.8.22.

254. By way of example only, the Samsung Galaxy S8 product is a receiving wireless device (cellular phone) that is advertised as containing features that comply with the TS 25.331 v.11.4.0 Standard or later, including an LTE Category that complies with that version of the standard or later.

255. For example, Samsung's Galaxy S8 is advertised as containing the Qualcomm MSM8998 Snapdragon 835 processor:

Processor	MSM8998 Octa-Core, 2.35 GHz (Quad) + 1.9GHz (Quad)

Samsung Galaxy S8 Specifications.[12]

256. Qualcomm, in turn, advertises the Snapdragon 835 processor as LTE Category 16 (downlink) / Category 13 (uplink):

- Downlink: LTE Cat 16 up to 1 Gbps, 4x20 MHz carrier aggregation, up to 256-QAM
- Uplink: LTE Cat 13 up to 150 Mbps, Qualcomm® Snapdragon™ Upload+ (2x20 MHz carrier aggregation, up to 64-QAM, uplink data compression)

Qualcomm Snapdragon 835 Platform Product Brief.[13]

[12] Available at [https://www.verizonwireless.com/smartphones/samsung-galaxy-s8/#specsHeading] (last accessed August 22, 2019).
[13] Available at [https://www.qualcomm.com/media/documents/files/snapdragon-835-mobile-platform-product-brief.pdf] (last accessed August 22, 2019).

257. LTE Category 12 was added in TS 25.331 Release 11; therefore, the Samsung Galaxy S8 supports TS 25.331 v.11.4.0 or later.

258. Because Samsung's Galaxy S8 complies with the TS 25.331 v.11.4.0 Standard or later, it therefore implements the mandatory portions of that standard described above.

259. Because of its compliance with the TS 25.331 v.11.4.0 Standard or later, Samsung's Galaxy S8 receives a broadcast indication indicating whether to prioritize inter-frequency or intra-frequency neighbor cell measurements for inclusion in an uplink connection request message to be sent on a random access channel, and constructs the uplink connection request message which includes measurements that are prioritized in accordance with the broadcast indication so as not to exceed a maximum size of the uplink connection request message, in which one value of the indication directs that the inter-frequency neighbor cell measurements are prioritized over the intra-frequency neighbor cell measurement results for inclusion in the uplink connection request message, and a different value of the indication or omission of the indication directs that the intra-frequency neighbor cell measurements are prioritized over the inter-frequency neighbor cell measurements for inclusion in the uplink connection request message, and in which the indication is within an information element of system information received on a broadcast channel from an access node of a UTRAN or an E-UTRAN wireless system, and the uplink connection request message is a Radio Resource Control Connection Request message.

260. By way of example only, the remainder of the '432 Accused Products include each of the limitations described in the previous paragraph with respect to the Samsung's Galaxy S8 product. For example, those products comply with the TS 25.331 v.11.4.0 Standard or later.

261. Samsung's acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the '432 Accused Products, and related products

and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 12.[14]

262. Samsung's infringement is knowing, egregious, consciously wrongful, and willful. Unlike certain of the other Asserted Patents, Samsung did not hold a previous license to the '432 Patent. Samsung learned of its infringement of the '432 Patent no later than February 9, 2018, in a letter from Mr. Dean, President of Bell Northern Research, to Dr. Oh-Hyun Kwon, Chairman and CEO of SEC. Mr. Dean's letter identified the '432 Patent and notified Samsung that Samsung's products infringe the patent. Mr. Dean identified exemplary products by name. BNR offered to meet and present a detailed presentation to Samsung, describing the infringement. On March 29, 2018, October 4, 2018 and November 5, 2018, BNR followed up by sending additional letters. Mr. Dean sent letters on November 7, 2018 and November 20, 2018 to Mr. MinHyung Chung, Executive Vice President of SEC and a signor of the earlier license agreement, advising him that the license was set to expire on December 31, 2018 and inviting Samsung to engage in discussions regarding a new license to the entire BNR portfolio—including the '432 Patent. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the '432 Patent and Samsung's infringing products. Despite these efforts, and knowing that it was infringing the '432 Patent, Samsung continued to infringe the '432 Patent by continuing to make, use, sell, and/or offer to sell the '862 Accused Products in the United States.

[14] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 12 is provided for notice pleading only and is not presented as an "exemplary" claim of all other claims in the '432 patent.

263. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ’432 Patent.

264. As a result of Samsung’s infringement of the ’432 Patent, Plaintiff has been injured by Samsung’s unauthorized use of Plaintiff’s intellectual property. Plaintiff seeks monetary damages in an amount adequate to compensate for Samsung’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung’s infringing activities are enjoined by this Court. BNR is willing to abide by any applicable FRAND obligations.

265. Unless a permanent injunction is issued enjoining Samsung and its agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the ’432 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

COUNT 6

(Willful Infringement of U.S. Patent No. 7,039,435)

266. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

267. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed and is currently infringing one or more claims (e.g., claim 1) of the ’435 Patent, in violation of 35 U.S.C. § 271(a).

268. Samsung has infringed and is currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing within this judicial district and elsewhere in the United States, without license or authority, infringing products and related products and/or processes falling within the scope of one or more claims of the ’435 Patent, including claim 1 (the “’435 Accused Products”).

269. By way of example only, the Samsung Galaxy S10 product is a portable cell phone with (1) a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower (e.g., the circuitry coupled to the antenna, pictured below) and (2) a proximity regulation system that includes both a location sensing subsystem and a power governing subsystem, the latter of which determines a transmit power level based on a proximity transmit power level determined by the location of the cell phone proximate a user and the network adjusted transmit power level.

270. Specifically, as part of its submissions to the Federal Communications Commission ("FCC"), Defendant or one of its agents discloses test results from Specific Absorption Rate ("SAR") Testing that shows power regulation based on information received from the device's proximity sensor, whereby transmit power levels are adjusted based on proximity data. For instance, the test report submitted to the FCC for the Galaxy S10 product includes these tables showing adjusted power based on proximity:

G.3 Main Antenna Verification Summary

Table G-1
Power Measurement Verification for Main Antenna

Mechanism(s)			Mode/Band	Conducted Power (dBm)			
1st	2nd	3rd		Un-triggered (Max)	Mechanism #1 (Reduced)	Mechanism #2 (Reduced)	Mechanism #3 (Reduced)
Hotspot On	[redacted]	[redacted]	PCS CDMA	24.22	19.59	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	PCS CDMA	24.14	19.56	19.55	[redacted]
Grip	[redacted]	[redacted]	PCS CDMA	24.13	21.45	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	PCS CDMA	24.07	21.50	19.56	[redacted]
Hotspot On	[redacted]	[redacted]	GPRS 1900	25.76	23.89	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	GPRS 1900	25.77	23.86	23.87	[redacted]
Grip	[redacted]	[redacted]	GPRS 1900	25.77	23.76	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	GPRS 1900	25.72	23.75	23.76	[redacted]
Hotspot On	[redacted]	[redacted]	UMTS 1750	24.55	20.59	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	UMTS 1750	24.52	20.54	20.53	[redacted]
Grip	[redacted]	[redacted]	UMTS 1750	24.59	20.59	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	UMTS 1750	24.59	20.54	20.60	[redacted]
Hotspot On	[redacted]	[redacted]	UMTS 1900	24.62	19.63	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	UMTS 1900	24.57	19.62	19.61	[redacted]
Grip	[redacted]	[redacted]	UMTS 1900	24.61	21.42	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	UMTS 1900	24.59	21.41	19.60	[redacted]
Hotspot On	[redacted]	[redacted]	LTE FDD Band 66	24.45	20.46	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	LTE FDD Band 66	24.51	20.50	20.47	[redacted]
Grip	[redacted]	[redacted]	LTE FDD Band 66	24.48	20.55	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	LTE FDD Band 66	24.49	20.51	20.52	[redacted]
Hotspot On	[redacted]	[redacted]	LTE FDD Band 4	24.54	20.53	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	LTE FDD Band 4	24.54	20.51	20.55	[redacted]
Grip	[redacted]	[redacted]	LTE FDD Band 4	24.55	20.50	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	LTE FDD Band 4	24.49	20.54	20.52	[redacted]
Hotspot On	[redacted]	[redacted]	LTE FDD Band 25	24.58	19.49	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	LTE FDD Band 25	24.47	19.47	19.46	[redacted]
Grip	[redacted]	[redacted]	LTE FDD Band 25	24.50	20.68	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	LTE FDD Band 25	24.51	20.70	19.46	[redacted]
Hotspot On	[redacted]	[redacted]	LTE FDD Band 2	23.97	19.42	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	LTE FDD Band 2	23.89	19.41	19.40	[redacted]
Grip	[redacted]	[redacted]	LTE FDD Band 2	23.91	20.73	[redacted]	[redacted]
Grip	Hotspot On	[redacted]	LTE FDD Band 2	23.92	20.72	19.37	[redacted]
Hotspot On	[redacted]	[redacted]	LTE FDD Band 30	22.34	19.33	[redacted]	[redacted]
Hotspot On	Grip	[redacted]	LTE FDD Band 30	22.30	19.37	19.34	[redacted]
Grip	[redacted]	[redacted]	LTE FDD Band 30	22.31	20.82	[redacted]	[redacted]

Grip	[redacted]	[redacted]	LTE FDD Band 30	22.31	20.82		
Grip	Hotspot On	[redacted]	LTE FDD Band 30	22.31	20.85	19.27	
Hotspot On	[redacted]	[redacted]	LTE FDD Band 7 Ant B	23.49	20.49		
Hotspot On	Grip	[redacted]	LTE FDD Band 7 Ant B	23.58	20.48	20.50	
Grip	[redacted]	[redacted]	LTE FDD Band 7 Ant B	23.57	20.58		
Grip	Hotspot On	[redacted]	LTE FDD Band 7 Ant B	23.55	20.54	20.54	
Hotspot On	[redacted]	[redacted]	LTE FDD Band 7 Ant A	23.60	21.33		
Hotspot On	Grip	[redacted]	LTE FDD Band 7 Ant A	23.68	21.25	21.29	
Grip	[redacted]	[redacted]	LTE FDD Band 7 Ant A	23.67	21.38		
Grip	Hotspot On	[redacted]	LTE FDD Band 7 Ant A	23.66	21.32	21.33	
Hotspot On	[redacted]	[redacted]	LTE TDD Band 41 (PC3)	23.66	22.24		
Hotspot On	[redacted]	[redacted]	LTE TDD Band 41 (PC2)	26.82	22.22		
Hotspot On	Grip	[redacted]	LTE TDD Band 41 (PC2)	26.85	22.25	22.25	
Grip	[redacted]	[redacted]	LTE TDD Band 41 (PC2)	26.88	23.87		
Grip	Hotspot On	[redacted]	LTE TDD Band 41 (PC2)	26.87	23.84	22.28	
Hotspot On	[redacted]	[redacted]	LTE TDD Band 38	22.72	21.77		
Earjack Active	[redacted]	[redacted]	LTE FDD Band 25	23.95	21.00		
Earjack Active	Hotspot On	[redacted]	LTE FDD Band 25	24.14	20.95	19.15	
Earjack Active	Grip	[redacted]	LTE FDD Band 25	24.08	20.89	20.91	
Earjack Active	Hotspot On	Grip	LTE FDD Band 25	24.05	20.91	19.10	19.05
Earjack Active	Grip	Hotspot On	LTE FDD Band 25	24.04	20.92	20.95	19.08
Hotspot On	Earjack Active	[redacted]	LTE FDD Band 25	24.01	19.11	19.09	
Hotspot On	Earjack Active	Grip	LTE FDD Band 25	24.05	19.08	19.10	19.12
Hotspot On	Grip	Earjack Active	LTE FDD Band 25	24.08	19.05	19.06	19.03
Grip	Earjack Active	[redacted]	LTE FDD Band 25	24.12	20.99	20.98	
Grip	Earjack Active	Hotspot On	LTE FDD Band 25	24.15	20.97	20.99	19.17
Grip	Hotspot On	Earjack Active	LTE FDD Band 25	24.06	20.94	19.11	19.08
Earjack Active	[redacted]	[redacted]	PCS CDMA	24.00	21.20		
Earjack Active	Hotspot On	[redacted]	PCS CDMA	24.07	21.11	19.62	
Earjack Active	Grip	[redacted]	PCS CDMA	24.12	21.16	21.20	
Earjack Active	Hotspot On	Grip	PCS CDMA	24.05	21.15	19.65	19.61
Earjack Active	Grip	Hotspot On	PCS CDMA	24.03	21.17	21.23	19.57
Hotspot On	Earjack Active	[redacted]	PCS CDMA	24.10	19.69	19.67	
Hotspot On	Earjack Active	Grip	PCS CDMA	24.13	19.65	19.68	19.69
Hotspot On	Grip	Earjack Active	PCS CDMA	24.00	19.60	19.64	19.62
Grip	Earjack Active	[redacted]	PCS CDMA	24.13	21.28	21.30	
Grip	Earjack Active	Hotspot On	PCS CDMA	24.11	21.30	21.27	19.71
Grip	Hotspot On	Earjack Active	PCS CDMA	24.03	21.24	19.67	19.62

Table G-2
Distance Measurement Verification for Main Antenna

Mechanism(s)	Test Condition	Band	Distance Measurements (mm)		Minimum Distance per Manufacturer (mm)
			Moving Toward	Moving Away	
Grip	Phablet - Back Side	Mid	7	9	7
Grip	Phablet - Back Side	High	7	9	7
Grip	Phablet - Front Side	Mid	5	7	5
Grip	Phablet - Front Side	High	5	7	5
Grip	Phablet - Bottom Edge	Mid	9	11	9
Grip	Phablet - Bottom Edge	High	9	11	9

*Note: Mid band refers to: CDMA BC1, GSM1900, UMTS B2/4, LTE B2/4/25/66;
High band refers to: LTE B7 Ant A & Ant B, LTE B41 PC2, LTE B30.

SAR Compliance Test Report (submitted to the FCC on behalf of Samsung), PCTEST Engineering Laboratory, Inc., Report No. 1M1810250195-03.A3L, submitted Jan. 31, 2019.[15]

271. By way of example only, the remainder of the ’435 Accused Products include each of the limitations described in the previous paragraph with respect to the Samsung’s S10 product.

[15] Available at [https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm], FCC ID A3LSMG973U (last accessed August 22, 2019).

For example, Samsung submits data to the FCC relating to the transmit power level variations on many of those other products.

272. Samsung's acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the '435 Accused Products, and related products and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 1.[16]

273. Samsung's infringement is knowing, egregious, consciously wrongful, and willful. Samsung learned of its infringement of the '435 Patent no later than the December 31, 2018 expiration of Samsung's previous license to that patent. On October 4, 2018, Mr. Dean, President of Bell Northern Research, sent a letter to Dr. Oh-Hyun Kwon, Chairman and CEO of SEC. Mr. Dean's letter identified the '435 Patent and notified Samsung that Samsung's products would infringe the patent on expiration of the license. BNR offered to meet and engage in technical and business discussions regarding both the licensed and unlicensed patents. On November 5, 2018, BNR followed up by sending additional letters. Mr. Dean sent a letter on November 7, 2018 and November 20, 2018 to Mr. MinHyung Chung, Executive Vice President of SEC and a signor of the earlier license agreement, advising him that the license was set to expire on December 31, 2018 and inviting Defendant to engage in discussions regarding a new license to the entire BNR portfolio—including the '435 Patent. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the '435 Patent and Samsung's infringing products. Despite these efforts, and knowing that it was willfully infringing the '435

[16] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 1 is provided for notice pleading only and is not presented as an "exemplary" claim of all other claims in the '435 patent.

Patent, Samsung continued to infringe the ’435 Patent by continuing to make, use, sell, and/or offer to sell the ’435 Accused Products in the United States.

274. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ’435 Patent.

275. As a result of Samsung’s infringement of the ’435 Patent, Plaintiff has been injured by Samsung’s unauthorized use of Plaintiff’s intellectual property. Plaintiff seeks monetary damages in an amount adequate to compensate for Samsung’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung’s infringing activities are enjoined by this Court.

276. Unless a permanent injunction is issued enjoining Samsung and its agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the ’435 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

COUNT 7

(Willful Infringement of U.S. Patent No. 6,549,792)

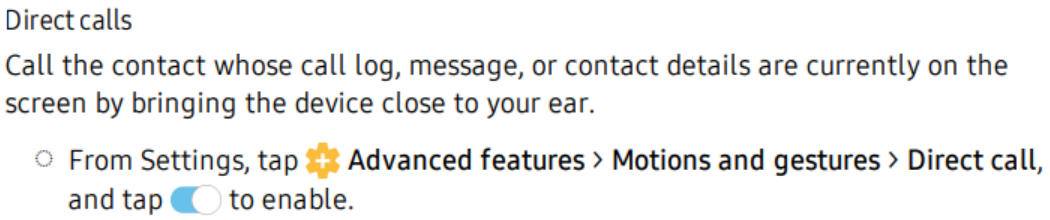
277. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

278. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed one or more claims (e.g., claim 9) of the ’792 Patent, in violation of 35 U.S.C. § 271(a).

279. Samsung has infringed and is currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing within this judicial district and elsewhere in the United States, without license or authority,

infringing products and related products and/or processes falling within the scope of one or more claims of the ’792 Patent, including claim 9 (the “’792 Accused Products”).

280. By way of example only, the Samsung Galaxy S8 product is a wireless handset, including a wireless transceiver, a controller, and an accelerometer. Accordingly, the controller in the Galaxy S8 product is adapted to receive an output from the accelerometer showing an active movement of the Galaxy S8 product and affect a state of the wireless transceiver, including transitioning to an answered call, based on a change in a motion history:



Samsung Galaxy S8 User Manual.[17]

281. More specifically, when a user of the Galaxy S8 product receives an incoming call, the call is answered by bringing it to the ear. The controller in the Galaxy S8 product is adapted to receive an output from the accelerometer showing an active movement of said wireless transceiver based on a change in motion history.

282. By way of example only, the remainder of the ’792 Accused Products include each of the limitations described in the previous paragraphs with respect to the Galaxy S8 product. For

[17] Available at [http://downloadcenter.samsung.com/content/UM/201906/20190621014225616/GEN_SM-G950U_SM-G955U_EN_UM_P_9.0_041819_FINAL_AC.pdf], (last accessed August 22, 2019).

example, in each of those products, a user can answer a call by lifting the phone to the user's ear, and such functionality is influenced by the device's accelerometer.

283. Samsung's acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the '792 Accused Products, and related products and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 1.[18]

284. Samsung's infringement is knowing, egregious, consciously wrongful, and willful. Defendant learned of its infringement of the '792 Patent no later than the December 31, 2018 expiration of Samsung's previous license to that patent. On January 3, 2019, Mr. Dean, President of Bell Northern Research, sent an email letter to Mr. Hyucksun Kwon, Manager at SEC's Licensing Team, Intellectual Property Center. Mr. Dean's letter identified the '792 Patent and notified Samsung that Samsung's products would infringe the patent on expiration of the license. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the '792 Patent and Samsung's infringing products. Despite these efforts, and knowing that it was infringing the '792 Patent, Samsung continued to infringe the '792 Patent by continuing to make, use, sell, and/or offer to sell the '792 Accused Products in the United States.

285. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '792 Patent.

286. As a result of Samsung's infringement of the '792 Patent, Plaintiff has been injured by Samsung's unauthorized use of Plaintiff's intellectual property. Plaintiff seeks monetary

[18] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 9 is provided for notice pleading only and is not presented as an "exemplary" claim of all other claims in the '792 Patent.

damages in an amount adequate to compensate for Samsung's infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung's infringing activities are enjoined by this Court.

287. Unless a permanent injunction is issued enjoining Samsung and its agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the '792 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

COUNT 8

(Willful Infringement of U.S. Patent No. 7,945,285)

288. Plaintiff re-alleges and incorporates by reference the allegations in the foregoing paragraphs as if fully set forth herein.

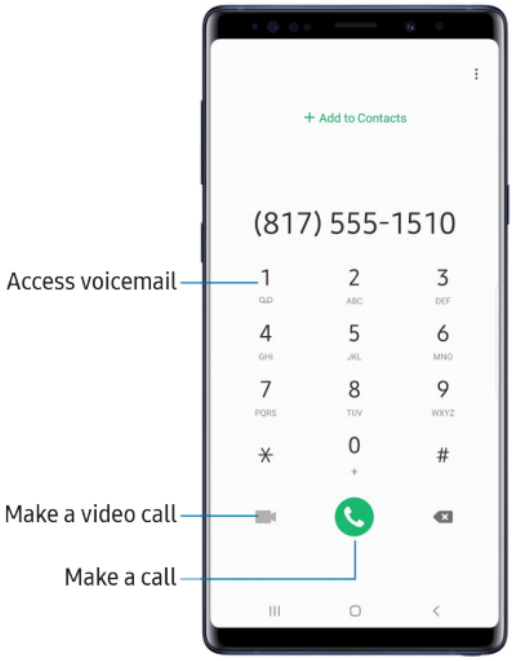
289. Plaintiff is informed and believes, and on that basis alleges, that Samsung has infringed and is currently infringing one or more claims (e.g., claim 1) of the '285 Patent, in violation of 35 U.S.C. § 271(a).

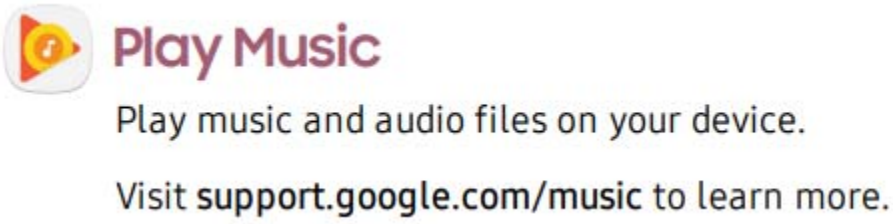
290. Samsung has infringed and is currently infringing literally and/or under the doctrine of equivalents, by, among other things, making, using, offering for sale, selling, and/or importing within this judicial district and elsewhere in the United States, without license or authority, infringing products and related products and/or processes falling within the scope of one or more claims of the '285 Patent, including claim 1 (the "'285 Accused Products").

291. By way of example only, the Samsung Galaxy S8 product is a radio-frequency (RF) telephone handset that plays digital encoded-audio bit stream music, wherein a digital signal processor decodes the audio bit stream to a digital audio signal, and then a digital-to-analog converter converts the decoded digital signal to an analog audio signal and outputs it to a user. The Galaxy S8 User Guide describes both its telephony and its music-playing capabilities:

The Phone app does more than just make telephone calls. Explore the advanced calling features. See your carrier for more information.

○ From a Home screen, tap Phone.





Samsung Galaxy S8 User Guide.[19]

292. The Galaxy S8, by way of example only, receives telephone signals from an RF unit (for example a cell phone tower, in the case of a cellular network, or a WiFi router in the case of a local area network), and the RF unit is connected to a network.

[19] Available at [http://downloadcenter.samsung.com/content/UM/201906/20190621014225616/GEN_SM-G950U_SM-G955U_EN_UM_P_9.0_041819_FINAL_AC.pdf], (last accessed August 22, 2019).

293. The Galaxy S8, by way of example only, can switch between its bit-stream music playing and telephone functionalities, and when playing music, for example, will mute the music when receiving a telephone call and continue playing the music after the call is completed or stops ringing.

294. In addition, by way of example only, the Galaxy S8 outputs analog audio signals to the user for both telephone calls and music via a digital signal processor and a digital to analog converter.

295. By way of example only, the remainder of the ’285 Accused Products include each of the limitations described in the previous paragraph with respect to the Samsung’s Galaxy S8 product. For example, each product contains similar telephony and music playing capabilities that allow switching from playing music to telephony and back to music when the call is terminated.

296. Samsung’s acts of making, using, offering for sale, selling, and/or importing infringing products, including but not limited to the ’285 Accused Products, and related products and/or processes satisfy, literally or under the doctrine of equivalents, each and every claim limitation, including but not limited to limitations of claim 1.[20]

297. Samsung’s infringement is knowing, egregious, consciously wrongful, and willful. Samsung learned of its infringement of the ’285 Patent no later than the December 31, 2018 expiration of Samsung’s previous license to that patent. On January 3, 2019, Mr. Dean, President of Bell Northern Research, sent an email letter to Mr. Hyucksun Kwon, Manager at SEC’s Licensing Team, Intellectual Property Center. Mr. Dean’s letter identified the ’285 Patent and

[20] Plaintiff expressly reserves the right to identify additional asserted claims and products in its infringement contentions in accordance with the local patent rules. Claim 1 is provided for notice pleading only and is not presented as an “exemplary” claim of all other claims in the ’285 patent.

notified Samsung that Samsung's products would infringe the patent on expiration of the license. Further, BNR participated in a meeting with Samsung on or about February 12, 2019 in Seoul, South Korea, to discuss the '285 Patent and Samsung's infringing products. Despite these efforts, and knowing that it was infringing the '285 Patent, Samsung continued to infringe the '285 Patent by continuing to make, use, sell, and/or offer to sell the '285 Accused Products in the United States.

298. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '285 Patent.

299. As a result of Samsung's infringement of the '285 Patent, Plaintiff has been injured by Samsung's unauthorized use of Plaintiff's intellectual property. Plaintiff seeks monetary damages in an amount adequate to compensate for Samsung's infringement, but in no event less than a reasonable royalty for the use made of the invention by Samsung, together with interest and costs as fixed by the Court, and Plaintiff will continue to suffer damages in the future unless Samsung's infringing activities are enjoined by this Court.

300. Unless a permanent injunction is issued enjoining Samsung and its agents, servants, employees, representatives, affiliates, and all others acting or in active concert therewith from infringing the '285 Patent, Plaintiff and its licensees will be greatly and irreparably harmed.

PRAYER FOR RELIEF

Plaintiff prays for the following relief:

A. A judgment that Samsung has infringed one or more claims of the Asserted Patents;

B. A permanent injunction enjoining Samsung and its officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all others acting in active concert or participation with Samsung, from infringing the Asserted Patents;

C. An award of damages resulting from Defendant's acts of infringement in accordance with 35 U.S.C. § 284;

D. A judgment and order finding that Samsung's acts of infringement were egregious and willful and trebling damages under 35 U.S.C. § 284;

E. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to Plaintiff its reasonable attorneys' fees against Samsung.

F. A judgment and order requiring Samsung to provide accountings and to pay supplemental damages to Plaintiff, including, without limitation, prejudgment and post-judgment interest; and

G. Any and all other relief to which Plaintiff may show itself to be entitled.

JURY TRIAL DEMANDED

Plaintiff hereby demands a trial by jury of all issues so triable.

Dated: August 22, 2019

/s/ *Paul J. Skiermont*

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