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20 BELL NORTHERN RESEARCH, LLC

21 **IN THE UNITED STATES DISTRICT COURT**
22 **SOUTHERN DISTRICT OF CALIFORNIA**

23 BELL NORTHERN RESEARCH,
24 LLC,

25 Plaintiff,

26 v.

27 LG ELECTRONICS, INC., LG
28 ELECTRONICS U.S.A. INC., and LG
ELECTRONICS MOBILE
RESEARCH U.S.A., LLC

Defendants.

C.A. No. '18CV2864 LAB LL

COMPLAINT FOR PATENT
INFRINGEMENT

JURY TRIAL DEMANDED

COMPLAINT FOR PATENT INFRINGEMENT

1
2 Plaintiff Bell Northern Research, LLC (“BNR”) as and for its complaint against
3 LG Electronics, Inc., LG Electronics U.S.A., Inc., and LG Electronics Mobile
4 Research U.S.A., LLC, (collectively, “LG” or “Defendant”) alleges as follows:

5 **PARTIES**

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

8 2. On information and belief, Defendant LG Electronics, Inc. (“LGE”) is a
9 corporation organized under the laws of Seoul, South Korea, having a principal place
10 of business at LG Twin Towers, Seoul, Seoul 150-721, South Korea, and may be
11 served through its registered agent Corporation Service Company (which will do
12 Business in California as CSC – Lawyers Incorporating Service), 2710 Gateway Oaks
13 Dr., Suite 150N, Sacramento, CA 95833.

14 3. On information and belief, Defendant LG Electronics U.S.A., Inc. (“LG US”)
15 is a corporation organized under the laws of Delaware, having a principal place of
16 business at 1000 Sylvan Ave., Englewood Cliffs, New Jersey, and may be served
17 through its registered agent Unitized States Corporation Company, 251 Little Falls
18 Drive, Wilmington Delaware, 19808.

19 4. On information and belief, Defendant LG Electronics Mobile Research
20 U.S.A. LLC. (“LGMR”) is a limited liability company organized under the laws of
21 California, having a principal place of business at 10225 Willow Creek Rd. San Diego,
22 California 92131, and may be served through its registered agent Corporation Service
23 Company (which will do Business in California as CSC – Lawyers Incorporating
24 Service), 2710 Gateway Oaks Dr., Suite 150N, Sacramento, CA 95833.

JURISDICTION AND VENUE

1
2 5. This action arises under the patent laws of the United States, Title 35 of the
3 United States Code. Accordingly, this Court has subject matter jurisdiction under 28
4 U.S.C. §§ 1331 and 1338(a).

5 6. This Court has personal jurisdiction over Defendant. Defendant has
6 conducted and does conduct business within the State of California. Defendant has
7 purposefully and voluntarily availed itself of the privileges of conducting business in
8 the United States, in the State of California, and in the Southern District of California
9 by continuously and systematically placing goods into the stream of commerce through
10 an established distribution channel with the expectation that they will be purchased by
11 consumers in the Southern District of California. LGMR has a principal place of
12 business in San Diego, California. Further, LG US has sought to transfer cases to this
13 District, noting that LG US has “significant and numerous connections with the
14 Southern District of California.” *See* Defs.’ LG Electronics, Inc. and LG Electronics
15 U.S.A., Inc.’s Mot. Sever and Transfer Venue to the Southern District of California,
16 Dkt. 54 at 1–2, *Parthenon Unified Memory Architecture LLC v. HTC Corp.*, No. 2:14-
17 cv-00690-RSP (E.D. Tex. Dec. 3, 2014) (Attached as **Exhibit A**). Further, as a result
18 of a merger in August 2018 with LG Electronics Mobilecomm U.S.A., Inc.
19 (“LGMobile”) into LG US, LG US has significant facilities and business operations in
20 the Southern District of California, including at 10225 Willow Creek Road, San Diego,
21 CA, LGMobile’s former principal place of business and still-existing LG property.

22 7. LG US and LGMR are registered to do business in California and maintains
23 an agent for service of process there, as well as having authorized retailers for the
24 accused products in this judicial district. Plaintiff’s cause of action arises directly from
25 Defendant’s business contacts and other activities in the State of California and the
26 Southern District of California.

1 8. Defendant has derived substantial revenues from its infringing acts occurring
2 within the State of California and within this District.

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

6 10. Venue is proper as to LG Electronics Mobile Research U.S.A., LLC. under
7 28 U.S.C. § 1400(b) because LGMR has committed acts of infringement in this
8 District and has a regular and established place of business within this District. *TC*
9 *Heartland LLC v. Kraft Foods Grp. Brands LLC*, 137 S. Ct. 1514, 1521 (2017).
10 Specifically, LGMR has admitted and/or attested that its principal place of business is
11 within this District—namely, San Diego, California—through pleadings and in its
12 California Secretary of State filings.

13 11. Venue is proper as to LG Electronics U.S.A., Inc. under 28 U.S.C. § 1400(b)
14 because LGUS has committed acts of infringement in this District and has a regular
15 and established place of business within this District. *TC Heartland LLC v. Kraft*
16 *Foods Grp. Brands LLC*, 137 S. Ct. 1514, 1521 (2017). Specifically, LG US has
17 attested that it has significant and numerous connections with the Southern District of
18 California and has sought to have cases transferred to this District. *See Exhibit A* at 2.
19 This includes the property and employees from LGMobile after LGMobile's merger
20 into LGUS. *See Certificate of Merger Between LG Electronics U.S.A., Inc. and LG*
21 *Electronics Mobilecomm U.S.A., Inc. (Attached as Exhibit B)*. Further, LG US admits
22 that it sells throughout the United States, including California, non-mobile products
23 including televisions, Blu-ray players, home theater equipment, refrigerators, washers
24 and dryers and that it is registered to do business in the State of California. *See id.* at 4
25 n.2. Thus, following LGMobile's merger into LG US, LG US sells both the mobile and
26 non-mobile infringing products. *See Exhibit A* at 2–4 & 4 n.2.

27 12. Joinder of Defendants is proper because Defendants are related parties who
28 are either jointly and severally liable for infringement, or who make, use, sell, offer for

1 sale, or import the same or similar accused products that practice the same Wi-Fi
2 and/or or LTE related patents. Further, upon information and belief, Defendants use
3 the same underlying hardware and/or software in their infringing products and
4 therefore the factual question of infringement will substantially overlap between
5 Defendants. Further, Plaintiff anticipates that there will be substantial overlap during
6 the discovery process.

7 13. Defendant has committed acts of infringement in this District giving rise to
8 this action and does business in this District, including making sales and/or providing
9 service and support for its respective customers in this District. Defendant purposefully
10 and voluntarily sold one or more of its infringing products with the expectation that
11 they would be purchased by consumers in this District. These infringing products have
12 been and continue to be purchased by consumers in this District. Defendant has
13 committed acts of patent infringement within the United States, the State of California,
14 and the Southern District of California.

15 **THE BNR PORTFOLIO**

16 **A. Bell Northern Research**

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

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

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

1 **B. The BNR Patents**

2 17. The BNR portfolio comprises patents that reflect important developments in
3 telecommunications that were invented and refined by leading technology research
4 companies, including Agere, LSI, and Broadcom. These include U.S. Patent Nos.
5 7,990,842; 8,416,862; 7,957,450; 6,941,156; 8,792,432; 7,039,435; 6,549,792, and
6 7,945,285 (collectively, the “Asserted Patents”).

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

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

13 **PATENT PROSECUTION AND EXAMINATION**

14 20. Examiners at the United States Patent and Trademark Office (“USPTO”)
15 review patent applications to determine whether a claimed invention should be granted
16 a patent. In general, the most important task of a patent examiner is to review the
17 technical information disclosed in a patent application and to compare it to the state of
18 the art. This involves reading and understanding a patent application, and then
19 searching the prior art to determine what technological contribution the application
20 teaches the public. A patent is a reward for informing the public about specific
21 technical details of a new invention. The work of a patent examiner includes searching
22 prior patents, scientific literature databases, and other resources for prior art. Then, an
23 examiner reviews the claims of the patent application substantively to determine
24 whether each complies with the legal requirements for granting of a patent. A claimed
25 invention must meet patentability requirements including statutory subject matter,
26 novelty, inventive step or non-obviousness, industrial application (or utility) and
27 sufficiency of disclosure, and examiners must apply federal laws (Title 35 of the
28

1 United States Code), rules, judicial precedents, and guidance from agency
2 administrators.

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

8 22. The basic steps of the examination consist of:

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

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

25 24. A patent duly allowed and issued by the USPTO is presumptively valid and
26 becomes the property of the inventor(s) or assignee(s).

27 25. A “Continuation Application” is one where, typically after allowance but in
28 any event prior to issuance, the inventor applies for a second, related patent. A

1 Continuation employs substantially the same invention disclosure as the previous,
2 allowed application, but seeks new or different claims.

3 **ASSERTED PATENTS**

4 **A. The Wireless Computer Networking Patents**

5 1) Overview of U.S. Patent No. 7,990,842

6 26. BNR is the owner by assignment of U.S. Patent No. 7,990,842 (the “’842
7 Patent”). The ’842 Patent is entitled “Backward-Compatible Long Training Sequences
8 for Wireless Communication Networks.” The ’842 Patent issued on August 2, 2011. A
9 true and correct copy of the ’842 Patent is attached as **Exhibit C**.

10 27. The inventors of the ’842 Patent are Jason Trachewsky and Rajendra Moorti.

11 28. The ’842 Patent is a continuation of U.S. Patent No. 7,646,703 filed on July
12 26, 2005.

13 29. The ’842 Patent claims priority to at least Provisional Application Nos.
14 60/591,104 filed on July 27, 2004, and 60/634,102 filed on December 8, 2004.

15 30. The ’842 Patent is generally related to wireless communication systems. In
16 particular, the ’842 Patent is concerned with the 802.11 standard and helping ensure
17 backward compatibility with prior versions of that standard. The specification explains
18 that:

19 Different wireless devices in a wireless communication system may be
20 compliant with different standards or different variations of the same standard.
21 For example, 802.11a an extension of the 802.11 standard, provides up to 54
22 Mbps in the 5 GHz band. 802.11b, another extension of the 802.11 standard,
23 provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4
24 GHz band. 802.11g, another extension of the 802.11 standard, provides 20+
25 Mbps in the 2.4 GHz band. 802.11n, a new extension of 802.11, is being
26 developed to address, among other [*sic*] thins, higher throughput and
27 compatibility issues. An 802.11a compliant communications device may reside
28 in the same WLAN as a device that is compliant with another 802.11 standard.
When devices that are compliant with multiple versions of the 802.11 standard
are in the same WLAN, the devices that are compliant with older versions are
considered to be legacy devices. To ensure backward compatibility with legacy
devices, specific mechanisms must be employed to insure that the legacy

1 devices know when a device that is compliant with a newer version of the
2 standard is using a wireless channel to avoid a collision.

3 New implementations of wireless communication protocol enable higher speed
4 throughput, while also enabling legacy devices which might be only compliant
5 with 802.11a or 802.11g to communicate in Systems which are operating at
6 higher speeds.

7 '842 Patent at Col. 1:50-2:7.

8 31. The 802.11a and 802.11g standard utilize what is known as the orthogonal
9 frequency division multiplexing (OFDM) encoding scheme. "OFDM is a frequency
10 division multiplexing modulation technique for transmitting large amounts of digital
11 data over a radio wave" and works by spreading a single data stream over a band of
12 Sub-carriers, each of which is transmitted in parallel." '842 Patent at Col. 2:10-15.

13 32. The 802.11 standard includes "training sequences" that synchronize data
14 transfer between a wireless sender and a receiver.

15 33. The background section of the '842 Patent specifies the "need to create a
16 long training sequence of minimum peak-to-average ratio that uses more Sub-carriers
17 without interfering with adjacent channels." '842 Patent at Col. 2:37-39.

18 34. The '842 Patent teaches a long training sequence of minimum peak-to-
19 average power ratio that is usable by "legacy devices in order to estimate channel
20 impulse response and to estimate carrier frequency offset between a transmitter and a
21 receiver." '842 Patent at Col. 2:39-43.

22 35. One important technical advance and improvement offered by the inventive
23 expanded long training sequence of minimum peak-to-average power ratio is
24 "decrease[d] power back-off" ('842 Patent at Col. 4:4-6), which is the reduction of
25 output power when reducing the input power. The invention may also "be used by
26 802.11a or 802.11g devices for estimating the channel impulse response and by a
27 receiver for estimating the carrier frequency offset between the transmitter clock and
28 receiver clock." '842 Patent at Col. 4:6-10. Further, the invention contributes to higher
data throughput by carrying data on multiple subcarriers.

1 36. The '842 Patent contains one independent claim and 20 total claims, covering
2 various apparatuses. Claim 1 reads:

3 A wireless communications device, comprising:

4 a signal generator that generates an extended long training sequence; and

5 an Inverse Fourier Transformer operatively coupled to the signal generator,

6 wherein the Inverse Fourier Transformer processes the extended long training
7 sequence from the signal generator and provides an optimal extended long
training sequence with a minimal peak-to-average ratio, and

8 wherein at least the optimal extended long training sequence is carried by a
9 greater number of Subcarriers than a standard wireless networking configuration
10 for an Orthogonal Frequency Division Multiplexing scheme.

11 37. The above-disclosed claim limitations from the '842 Patent comprise various
12 elements, including, e.g., a signal generator and an Inverse Fourier Transformer. This
13 claim, as a whole, provides significant benefits and improvements discussed
14 previously that directly impact and improve interoperability with devices operating on
15 legacy versions of the 802.11 standard, relative to the prior art.

16 38. The examination of the '842 Patent took nearly a year and a half, from the
17 filing of the patent application on January 8, 2010, through the issue date of August 2,
18 2011.

19 39. The publicly available prosecution history for the '842 Patent indicates that a
20 single patent examiner was involved in examining the application that matured into the
21 '842 Patent, namely, Examiner Andrew Lee.

22 40. Between any prior art references located by the Patent Examiner, and the
23 references submitted by the applicants and considered by the Patent Examiner during
24 the prosecution of the '842 Patent, at least 10 patent references were formally
25 considered by the Patent Examiner, as indicated on the front page of the issued '842
26 Patent.

27 41. On information and belief, it is the practice of the USPTO not to cite
28 excessive cumulative art, in other words, in this instance, the art cited by the

1 Applicants is representative of considerable other art located by the USPTO and not
2 cited. Further on information and belief, it is the practice of the USPTO to discuss in
3 its Office Actions those references of which the Patent Examiners are aware that most
4 closely resemble the claimed inventions.

5 42. On or about April 18, 2011, the USPTO issued a Notice of Allowance as to
6 all of claims 1-20 presently in the '842 Patent.

7 43. The issued claims from the '842 Patent are patentably distinct from the
8 references identified and/or discussed during prosecution. That is, each of the claims,
9 as a whole were found to be patentably distinct from the formally identified references.

10 44. The references cited during the examination of the '842 Patent all represent
11 patentably distinct and in some instances may constitute prior art means or methods for
12 synchronizing data transfer in wireless devices. By allowing the claims of the '842
13 Patent, each of the claims in the '842 Patent, as a whole, was shown to be inventive,
14 novel, and innovative over at least the 10 formally identified references.

15 45. As each claim as a whole from the '842 Patent is inventive, novel, and
16 innovative as compared to the specified patents and other publications, each claim, as a
17 whole constitutes more than the application of well-understood, routine, and
18 conventional activities.

19 46. As of July 23, 2018, the '842 Patent has been cited as pertinent prior art by a
20 USPTO examiner or an applicant during the prosecution of at least 3 issued patents
21 and published applications—including during the prosecution of patent applications
22 filed by leading technology companies such as Samsung.

23 47. The '842 patent claims priority to at least provisional applications filed on
24 July 27, 2004 and December 8, 2004. The technology disclosed and claimed in the
25 '842 Patent was not then well-understood, routine or conventional. The invention
26 allows higher throughput by increasing data transmitted by a wireless device, which
27 translates to faster file transfers for end users.

2) Overview of U.S. Patent No. 8,416, 862

1
2 48. BNR is the owner by assignment of U.S. Patent No. 8,416,862 (the “’862
3 patent”). The ’862 Patent is entitled “Efficient Feedback of Channel Information in a
4 Closed Loop Beamforming Wireless Communication System.” The ’862 Patent issued
5 on April 9, 2013. A true and correct copy of the ’862 Patent is attached as **Exhibit D.**

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

7 50. The ’862 Patent is a continuation-in-part of U.S. Patent 7,738,583, filed on
8 June 28, 2005. The ’862 also claims priority to at least Provisional Application Nos.
9 60/673,451, filed on April 21, 2005 and 60/698,686, filed on July 13, 2005.

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

13 52. The description of related art section of the patent identifies that, to properly
14 implement beamforming, the transmitter must know the properties of the channel over
15 which the wireless communication is conveyed. *See* ’862 Patent at Col. 3:14–25.
16 Further, the size of the feedback information required to be sent back to the
17 transmitting wireless device may be so large that the channel may change before the
18 entire feedback information is received by the transmitter. *See* ’862 Patent at Col.
19 3:14–25. One approach is to decompose the channel and send information only relating
20 to a calculated value of the transmitter’s beamforming matrix as the feedback
21 information, but under this approach, even in a 2x2 MIMO wireless communication
22 system, the data is still too large for practical application. *See* ’862 Patent at Col. 3:27–
23 47.

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

27 54. The claimed inventions in the ’862 Patent are directed to improved
28 efficiencies in transmitting feedback of transmitter beamforming information,

1 particularly using polar coordinates. *See* '862 Patent, Col. 15:34–16:6. One of the
2 important technical advantages and improvements offered by the inventive, improved
3 feedback transmission is a decrease in the amount of data required to send the
4 feedback information to the transmitting wireless transmitter. *See id.*

5 55. The '862 Patent contains three independent claims and twenty total claims,
6 covering various methods and systems. Claim 1 reads:

7 A method for feeding back transmitter beamforming information from a
8 receiving wireless communication device to a transmitting wireless
9 communication device, the method comprising:

10 the receiving wireless communication device receiving a preamble sequence
11 from the transmitting wireless device;

12 the receiving wireless device estimating a channel response based upon the
13 preamble sequence;

14 the receiving wireless device determining an estimated transmitter
15 beamforming unitary matrix (V) based upon the channel response and a
16 receiver beamforming unitary matrix (U);

17 the receiving wireless device decomposing the estimated transmitter
18 beamforming unitary matrix (V) to produce the transmitter beamforming
19 information; and

20 the receiving wireless device wirelessly sending the transmitter
21 beamforming information to the transmitting wireless device.

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

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

4 58. Two Patent Examiners were involved in examining the application that
5 matured into the '862 Patent, namely, Examiner Shuwang Liu and Examiner Michael
6 Neff.

7 59. Although the publicly available prosecution history of the '862 Patent does
8 not contain a complete summary of various patent examiner searches, it indicates that
9 Examiner Neff conducted prior art and/or other searches using at least the patent
10 examiner system Examiner Automated Search Tool ("EAST"), and performed
11 searches on at least July 24-25, 2008, June 1, 2009, October 9, 2009, and December
12 17, 2012. The Patent Examiners formally cited at least 5 separate references during the
13 prosecution of the '862 Patent.

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

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

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

27 63. The issued claims from the '862 Patent are patentably distinct from the at
28 least 6 references identified and/or discussed during prosecution. That is, each of the

1 20 claims, as a whole—which include, e.g., a receiving wireless device capable of
2 determining an estimated transmitter beamforming unitary matrix, decomposing an
3 estimated transmitter beamforming unitary matrix to produce transmitter beamforming
4 information, and the ability to send the transmitter beamforming information to the
5 transmitting wireless device—were found to be patentably distinct from at least the 6
6 formally identified references.

7 64. The references cited during the examination of the '862 Patent all represent
8 patentably distinct and in some instances prior art means or methods to create focused
9 antenna beams by shifting a signal in time or phase to provide gain of the signal in a
10 desired direction and to attenuate the signal in other directions. *See* '862 Patent, Col.
11 2:66–3:13. By allowing the claims of the '862 Patent, each of the claims in the '862
12 Patent, as a whole was shown to be inventive, novel, and innovative over at least the 6
13 formally identified references.

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

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

23 67. The '862 patent claims priority to no later than April 21, 2005. The
24 technology disclosed and claimed in the '862 Patent was not then well-understood,
25 routine or conventional. To the contrary, the technology claimed—namely, as
26 discussed above, the ability to provide efficient (e.g. less data) feedback for a channel
27 during beamforming--in the '862 Patent was well ahead of the state of the art at the
28 time of the invention.

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

1
2 68. BNR is the owner by assignment of U.S. Patent No. 7,957,450 (the “’450
3 Patent”). The ’450 Patent is entitled “Method and System for Frame Formats for
4 MIMO Channel Measurement Exchange.” The ’450 Patent issued on August June 7,
5 2011. A true and correct copy of the ’450 Patent is attached as **Exhibit E**.

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

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

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

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

18 73. The specification explains that “One of the most pervasive forms of fading is
19 known as multipath fading, in which dispersion of transmitted signals due to incident
20 reflections from buildings and other obstacles, results in multiple versions of the
21 transmitted signals arriving at a receiving mobile terminal. The multiple versions of the
22 transmitted signal may interfere with each other and may result in a reduced signal
23 level detected at the receiving mobile terminal. When versions of the transmitted signal
24 are 180° degree out of phase they may cancel each other such that a signal level of 0 is
25 detected. Locations where this occurs may correspond to ‘dead zones’ in which
26 communication to the wireless terminal is temporarily lost.” Col. 1:65-2:9.

27 74. “Another important type of fading is related to motion. When a transmitting
28 mobile terminal, or a receiving mobile terminal is in motion, the Doppler phenomenon

1 may affect the frequency of the received signal. The frequency of the received signal
2 may be changed by an amount which is a function of the velocity at which a mobile
3 terminal is moving. Because of the Doppler effect, ISI may result when a mobile
4 terminal is in motion, particularly when the mobile terminal is moving at a high
5 velocity.” Col. 2:34-37.

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

12 76. “One of the challenges in beamforming is that the multiplicative scale
13 factors which are applied to transmitted and received signals may be dependent upon
14 the characteristics of the communications medium between the transmitting mobile
15 terminal and the receiving mobile terminal. A communications medium, such as a
16 radio frequency (RF) channel between a transmitting mobile terminal and a receiving
17 mobile terminal, may be represented by a transfer system function, H . The relationship
18 between a time varying transmitted signal, $x(t)$, a time varying received signal, $y(t)$,
19 and the systems function may be represented as shown in equation [1]: $y(t)=Hx(t)+$
20 $n(t)$, where $n(t)$ represents noise which may be introduced as the signal travels through
21 the communications medium and the receiver itself. In MIMO systems, the elements in
22 equation[1] may be represented as vectors and matrices. If a transmitting mobile
23 terminal comprises M transmitting antenna, and a receiving mobile terminal comprises
24 N receiving antenna, then $y(t)$ may be represented by a vector of dimensions $N \times 1$, $x(t)$
25 may be represented by a vector of dimensions $M \times 1$, $n(t)$ by a vector of dimensions
26 $N \times 1$, and H may be represented by a matrix of dimensions $N \times M$. In the case of fast
27 fading, the transfer function, H , may itself become time varying and may thus also
28

1 become a function of time, $H(t)$. Therefore, individual coefficients, $h_{ij}(t)$, in the transfer
2 function $H(t)$ may become time varying in nature.” Col. 3:49-4:9.

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

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

13 79. The ’450 addresses the shortcomings in the prior art by disclosing “a method
14 for communicating information in a communication system may comprise transmitting
15 data via a plurality of radio frequency (RF) channels utilizing a plurality of
16 transmitting antenna, receiving feedback information via at least one of the plurality of
17 RF channels, and modifying a transmission mode based on the feedback information.
18 Feedback information may be requested utilizing at least one of the plurality of
19 transmitting antenna via at least one of the plurality of RF channels. The number of
20 transmitting antenna utilized during the transmitting of data may be modified based on
21 the feedback information. The transmission characteristics of data transmitted via at
22 least one of the plurality of transmitting antenna may be modified based on the
23 feedback information. Specific feedback information may be requested in request
24 messages.” Col. 5:56-6:3.

25 80. Furthermore, the specification discloses that “a receiving mobile terminal
26 may perform a singular value decomposition (SVD) on the channel estimate matrix,
27 and subsequently transmit SVD-derived feedback information to the transmitting
28 mobile terminal. Utilizing SVD may increase the amount of computation required at

1 the receiving mobile terminal but may reduce the quantity of information which is
2 transmitted to the transmitting mobile terminal via the RF channel in comparison to
3 transmitting the entire channel estimate matrix.” Col. 8:1-10.

4 81. The ’450 Patent contains four independent claims and 22 total claims,
5 covering various methods and systems. Claim 1 reads:

6 A method for communication, the method comprising:

7 computing a plurality of channel estimate matrices based on signals received by
8 a mobile terminal from a base station, via one or more downlink RF channels,
9 wherein said plurality of channel estimate matrices comprise coefficients
10 derived from performing a singular value matrix decomposition (SVD) on said
11 received signals; and

12 transmitting said coefficients as feedback information to said base station, via
13 one or more uplink RF channels.

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

16 83. The publicly available prosecution history for the ’450 Patent indicates that a
17 single patent examiner was involved in examining the application that matured into the
18 ’450 Patent, namely, Examiner Khai Tran.

19 84. Between any prior art references located by the Patent Examiner, and the
20 references submitted by the applicants and considered by the Patent Examiner during
21 the prosecution of the ’450 Patent, at least two patent references were formally
22 considered by the Patent Examiner, as indicated on the front page of the issued ’450
23 Patent. Furthermore, Patent Office procedure dictate that for continuations, such as the
24 ’450 Patent, the prior art of record from the examination of the parent patent is part of
25 the record in a continuation application. *See* Manual of Patent Examining Procedure
26 (“MPEP”) at §609.02 (8th ed., Rev. 7, July 2008) (“The examiner of the continuing
27 application will consider information which has been considered by the Office in the
28 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.

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

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

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

12 88. The references cited during the examination of the '450 Patent all represent
13 patentably distinct and in some instances may constitute prior art means or methods for
14 communicating information in wireless systems and devices. By allowing the claims of
15 the '450 Patent, each of the claims in the '450 Patent, as a whole, was shown to be
16 inventive, novel, and innovative over at least the formally identified references.

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

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

25 91. The '450 patent claims priority to at least once provisional application filed
26 on December 14, 2004.

27 92. The technology disclosed and claimed in the '450 Patent was not then well-
28 understood, routine or conventional. The invention allows for improved beamforming

1 in wireless communication devices, which translates to improved device performance
2 and information transfer for end users.

3 **B. The Wireless Switching Patent**

4 93. BNR is the owner by assignment of U.S. Patent No. 6,941,156 (the “’156
5 Patent”). The ’156 Patent is entitled “Automatic Handoff for Wireless Piconet
6 Multimode Cell Phone.” The ’156 Patent issued on September 6, 2005. A true and
7 correct copy of the ’156 Patent is attached as **Exhibit F**.

8 94. The inventor of the ’156 patent is Philip D. Mooney.

9 95. The ’156 Patent is generally related to the use of multimode cellular phones
10 and the ability to smoothly switch between two different modes of communication
11 operable on the cellular phone. *See* ’156 Patent at Col. 1:5–61.

12 96. The description of related art section of the patent identifies that prior art
13 multimode cellphones required manual switching and interruption in the signal when
14 attempting to switch between the modes of the cellphone. *See* ’156 Patent at Col. 1:32–
15 48.

16 97. Thus, the ’156 patent identifies a need for a cellular phone “which provides
17 smooth switchover and interaction between separate modes of operation.” *See* ’156
18 Patent at Col. 1:46–48.

19 98. The claimed inventions in the ’156 Patent are directed to improved methods
20 of switching between modes of operation in multimode cellular phones. *See* ’156
21 Patent at Col. 1:46–48. One of the important technical advantages and improvements
22 offered by the inventive, improved switching is the automatic switching, including
23 establishing a second communications link while the first communications link is still
24 active whereas the prior art required the call to disconnect before switching modes. *See*
25 ’156 Patent at Col. 1:50–2:5.

26 99. The ’156 Patent contains three independent claims and nineteen total claims,
27 covering various methods and systems. Claim 1 reads:

28 A multimode cell phone, comprising:

1 a cell phone functionality; and

2 an RF communication functionality separate from said cell phone functionality;
3 a module to establish simultaneous communication paths from said multimode
4 cell phone using both said cell phone functionality and said RF communication
5 functionality; and

6 an automatic switch over module, in communication with both said cell phone
7 functionality and said RF communication functionality, operable to switch a
8 communication path established on one of said cell phone functionality and said
9 RF communication functionality, with another communication path later
10 established on the other of said cell phone functionality and said RF
11 communication functionality.

12 100. The above-disclosed claim limitations from the '156 Patent comprise various
13 elements, including, e.g., a multimode cellphone with cell phone and RF
14 communication functionality; a module to establish simultaneous communication paths
15 with both modes, and an automatic switchover module in communication with both
16 modes of communication functionality that can switch between the first established
17 communication path to the other communication path that exists in parallel with the
18 first. This claim, as a whole, provides significant benefits and improvements discussed
19 previously that directly impact the ability to switch between two distinct RF
20 communication paths of a cellphone device seamlessly and automatically, relative to
21 the prior art.

22 101. The examination of the '156 Patent required over four years, from the date of
23 the filing of the patent application on June 26, 2001, through the issue date of
24 September 6, 2005.

25 102. The Patent Examiner involved in examining the application that matured into
26 the '156 Patent was Examiner Bing Q. Bui.

27 103. Although the publicly available prosecution history of the '156 Patent does
28 not contain a complete summary of various patent examiner searches, it indicates that
Examiner Bui conducted prior art and/or other searches using at least the patent
examiner system Examiner Automated Search Tool ("EAST"), and performed

1 searches on at least December 6, 2004. The Patent Examiner formally cited at least 9
2 separate references during the prosecution of the '156 Patent.

3 104. Between the prior art references located by and cited by the Patent Examiner,
4 and the references submitted by the applicants and considered by the Patent Examiners
5 during the prosecution of the '156 Patent, at least 9 were formally considered by the
6 Patent Examiner, as indicated on the front page of the issued '156 Patent.

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

13 106. On April 26, 2005, the USPTO issued a Notice of Allowance as to all of
14 claims 1-19 presently in the '156 Patent.

15 107. The issued claims from the '156 Patent are patentably distinct from the at
16 least 9 references identified and/or discussed during prosecution. That is, each of the
17 19 claims, as a whole—which include, e.g., a multimode cellphone with cell phone and
18 RF communication functionality; a module to establish simultaneous communication
19 paths with both modes, and an automatic switchover module in communication with
20 both modes of communication functionality that can switch between the first
21 established communication path to the other communication path that exists in parallel
22 with the first—were found to be patentably distinct from at least the 9 formally
23 identified references.

24 108. The references cited during the examination of the '156 Patent all represent
25 patentably distinct and in some instances prior art means or methods to manually
26 switching communication between two modes of a phone. *See* '156 Patent, Col. 1:13–
27 45. By allowing the claims of the '156 Patent, each of the claims in the '156 Patent, as
28

1 a whole was shown to be inventive, novel, and innovative over at least the 9 formally
2 identified references.

3 109. As each claim as a whole from the '156 Patent is inventive, novel, and
4 innovative as compared to several specific patents and other publications, each claim
5 as a whole, constitutes more than the application of well-understood, routine, and
6 conventional activities.

7 110. As of July 18, 2018, the '156 Patent or one of its family members has been
8 cited as pertinent prior art by a USPTO examiner or an applicant during the
9 prosecution of at least 25 issued patents and published applications—including during
10 the prosecution of patent applications filed by leading technology companies such as
11 Motorola, AT&T, Nokia, Sprint, and Garmin.

12 111. The '156 patent claims priority to no later than June 26, 2001. The
13 technology disclosed and claimed in the '156 Patent was not then well-understood,
14 routine or conventional. To the contrary, the technology claimed in the '156 Patent—
15 namely, the automatic handoff of a call from one type of RF communication link to a
16 different type of RF communication link without dropping the call —was well ahead
17 of the state of the art at the time of the invention.

18 **C. The RACH Message Prioritization Patent**

19 112. BNR is the owner by assignment of U.S. Patent No. 8,792,432 (the "'432
20 Patent"). The '432 Patent is entitled "Prioritizing RACH Message Contents." The '432
21 Patent issued on July 29, 2014. A true and correct copy of the '432 Patent is attached
22 as **Exhibit G**.

23 113. The inventors of the '432 patent are Brian Martin and Keiichi Kubota.

24 114. The '432 Patent is generally related to wireless communication systems. In
25 particular, the '432 Patent is concerned with the portion of the 3GPP standard that
26 addresses Random Access Channel ("RACH") procedures. RACH procedures are used
27 by various radio technologies for User Equipment ("UE")—e.g., a mobile device—to
28 gain contention-based access to a network. *See* '432 Patent at Col. 1:5–9, 31-44.

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

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

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

20 118. The claimed inventions in the '432 Patent are directed to prioritization of
21 information transmitted from a user device to a base station in a RACH RRC
22 connection message, within the space constraints of that message. *See* '432 Patent at
23 Col. 1:58–2:44. One of the important technical advantages and improvements offered
24 by the inventive, improved prioritization is that the mobile device is enabled to
25 prioritize the content of the RRC connection request message more efficiently. The
26 invention also avoids network features being redundant, unusable, or unreliable, and
27 permits the RRC connection request to be used in future implementations of the 3GPP
28 standards. *See* '432 Patent at Col. 1:50–2:5.

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

3 A method comprising:

4 receiving, by a user equipment, a broadcast indication indicating whether to
5 prioritize inter-frequency or intra-frequency neighbor cell measurements for
6 inclusion in an uplink connection request message to be sent on a random
7 access channel; and

8 constructing the uplink connection request message which includes
9 measurements that are prioritized in accordance with the broadcast indication
10 so as not to exceed a maximum size of the uplink connection request message;

11 in which one value of the indication directs that the inter-frequency neighbor
12 cell measurements are prioritized over the intra-frequency neighbor cell
13 measurement results for inclusion in the uplink connection request message;
14 and a different value of the indication or omission of the indication directs
15 that the intra-frequency neighbor cell measurements are prioritized over the
16 inter-frequency neighbor cell measurements for inclusion in the uplink
17 connection request message, and

18 in which the indication is within an information element of system
19 information received on a broadcast channel from an access node of a
20 UTRAN or an E-UTRAN wireless system, and the uplink connection request
21 message is a Radio Resource Control Connection Request message.

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

121. 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.

1 122. Two Patent Examiners were involved in examining the application that
2 matured into the '432 Patent, namely, Examiner Andrew Lai and Assistant Examiner
3 Sumitra Ganguly.

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

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

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

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

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

26 128. The issued claims from the '432 Patent are patentably distinct from the at
27 least 13 references identified and/or discussed during prosecution. That is, each of the
28 14 claims, as a whole—which include, e.g., receiving on a mobile device a broadcast

1 indication indicating prioritization of neighbor cell measurements to be sent on a
2 RACH uplink message, and constructing the uplink connection message in accordance
3 with that prioritization—were found to be patentably distinct from at least the 13
4 formally identified references.

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

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

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

19 132. The '432 patent claims priority to no later than February 14, 2011. The
20 technology disclosed and claimed in the '432 Patent was not then well-understood,
21 routine or conventional. To the contrary, the technology claimed in the '432 Patent was
22 well ahead of the state of the art at the time of the invention. As described above, the
23 prior technology regarding sharing of neighboring cell information prioritized inter-
24 frequency information above intra-frequency information in all cases, and did not
25 allow for prioritizing intra-frequency or other RACH message information if the RRC
26 connection request message were space-constrained. The '432 Patent resolves that
27 problem.
28

1 **D. The Proximity-Based Power Regulation Patent**

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

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

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

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

12 To address the [] deficiencies of the prior art, the present invention provides a
13 proximity regulation system for use with a portable cell phone. In one
14 embodiment, the proximity regulation system includes a location sensing
15 subsystem that is configured to determine a location of the portable cell phone
16 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.

17 ’435 Patent at Col. 2:1-11.

18 137. The background section of the ’435 Patent describes the shortcomings of the
19 prior art:

20 Typically, the quality of service of a cell phone is proportional to the transmit
21 power level of the cell phone. Though no definite proof has been determined,
22 health concerns have arisen due to the power used to transmit the radio
23 frequency of cell phones when operated close to the body of a cell phone user.
24 ...Cell phone users still want the best possible quality of service from their cell
25 phone. However, health concerns regarding the transmit power of cell phones
26 are now beginning to affect some users. Manufacturers have tried several
27 options to relieve the fears of consumers. One such option involves permanently
28 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

1 level of up to three watts....These type of cell phones, however, do not allow the
2 flexibility demanded by consumers that is found in the use of a portable cell
phone.

3 '435 Patent at Col. 1:33-62.

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

8 139. The '435 Patent addresses that need by allowing for adjustment of a power
9 governing subsystem based on a location sensing subsystem, to determine a proximity
10 transmit power level of a cell phone based on location. *See, e.g.*, '435 Patent at Col.
11 2:1-39.

12 140. The '435 Patent contains one independent claim and nine total claims,
13 covering portable cell phone apparatuses. Claim 1 reads:

14 A portable cell phone, comprising:

15 a power circuit that provides a network adjusted transmit power level as a
16 function of a position to a communications tower, and

17 a proximity regulation system, including:

18 a location sensing subsystem that determines a location of said portable
19 cell phone proximate a user; and

20 a power governing subsystem, coupled to said location sensing
21 subsystem, that determines a proximity transmit power level of said
22 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.

23 141. The above-disclosed claim limitations from the '435 Patent comprise various
24 elements, including, e.g., a proximity regulation system that contains both a location
25 sensing subsystem to determine location proximate a user and a power governing
26 subsystem that adjusts transmit power level of a cell phone based on location. This
27 claim, as a whole, provides significant benefits and improvements discussed
28

1 previously that directly adjusts power levels to address certain health concerns based
2 on cell phone usage.

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

5 143. The publicly available prosecution history for the '435 Patent indicates that a
6 single patent examiner was involved in examining the application that matured into the
7 '435 Patent, namely, Examiner Sonny Trinh.

8 144. Between any prior art references located by the Patent Examiner, and the
9 references submitted by the applicants and considered by the Patent Examiner during
10 the prosecution of the '435 Patent, at least 16 U.S. and foreign patent references were
11 formally considered by the Examiner, as indicated on the front page of the issued '435
12 Patent.

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

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

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

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

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

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

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

15 **E. The Accelerometer-Influenced Communication Device Patent**

16 152. BNR is the owner by assignment of U.S. Patent No. 6,549,792 (the "'792
17 Patent"). The '792 Patent is entitled "Accelerometer Influenced Communication
18 Device." The '792 patent issued on April 15, 2003. A true and correct copy of the
19 '792 Patent is attached as **Exhibit I**.

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

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

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

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

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

7 158. The specification discloses “an operational aspect of a communication device
8 [] adapted to be influenced by an output of the accelerometer.” Col. 1:66 -2:2. In one
9 embodiment, the controller of a wireless telephone “is adapted to receive an output
10 from the accelerometer to affect a state of the wireless transceiver” (Col. 2:7-11) and in
11 another embodiment, a method of operating a communication device “includes the
12 steps of determining a motion characteristic of the communication device, and
13 affecting an operational aspect of the [device] based on the motion characteristics.”
14 Col. 2:12-16.

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

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

28 A wireless telephone handset, comprising:

1 a wireless transceiver;

2 a controller; and

3 an accelerometer,

4 wherein the controller is adapted to receive an output from the accelerometer
5 showing an active movement of said wireless telephone and affect a state of said
6 wireless transceiver based on a change in motion history.

7 161. The above-disclosed claim limitations from the '792 Patent comprise various
8 elements, including, e.g., an accelerometer and a controller, wherein the controller is
9 adapted to receive an output from the accelerometer showing movement of the
10 wireless telephone and thus affecting a state of the wireless telephone. This claim
11 provides benefits and improvements that directly impact and improve operability of
12 wireless telephones, relative to the prior art.

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

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

18 164. At least 8 patent references were formally considered by during the
19 prosecution of the '792 Patent, as indicated on the front page of the issued '792 Patent.

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

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

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

5 168. The references cited during the examination of the '792 Patent all represent
6 patentably distinct and in some instances may constitute prior art means or methods of
7 utilizing accelerometers to aid in the operation of communication devices. By allowing
8 the claims of the '792 Patent, each of the claims in the '792 Patent, as a whole, was
9 shown to be inventive, novel, and innovative over at least the 8 formally identified
10 references.

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

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

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

26 **F. The Telephone Handset with Bit Stream Player Patent**

27 172. BNR is the owner by assignment of U.S. Patent No. 7,945,285 (the "'285
28 Patent"). The '285 Patent is entitled "Integrating a Digital Encoded-Audio Bit Stream

1 Player in a Radio-Frequency Telephone Handset.” The ’285 patent issued on May 17,
2 2011. A true and correct copy of the ’285 Patent is attached as **Exhibit J**.

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

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

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

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

19 177. The specification discloses methods and apparatuses for “integrating a digital
20 encoded-audio bit stream player in a radio frequency (RF) telephone handset.” Col.
21 2:3-5, 2:38-40. In one embodiment:

22 An RF connection is established between the RF telephone handset and an RF
23 unit connected to a network, wherein communications between the RF telephone
24 handset and the network pass through the RF unit. The RF telephone handset is
25 switched from performing as a telephony device to performing as a digital
26 encoded audio bit stream player. Digital encoded-audio bit stream music is
27 played from the RF telephone handset. The digital encoded-audio bit stream
28 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.

1 Col. 2:5-18.

2 178. The '285 Patent specification describes the benefits of this invention in view
3 of the challenges presented by the prior art. For example, it describes that, in the prior
4 art, a person wanting to listen to music and still be accessible by telephone while
5 walking, jogging, or biking in his or her neighborhood would need to carry a remote
6 handset *and* a music player, and listening to the music player “makes it difficult at best
7 to hear the audible ringing of the cordless telephone.” Col. 4:58-67. An embodiment of
8 the invention, on the other hand, “allows the user to make and receive telephone calls
9 using a cordless telephone portion of the MP3 cordless telephone, and to listen to audio
10 bit stream music using an audio bit stream (e.g., MP3) player portion of the same MP3
11 cordless telephone without the risk of missing a telephone call because they did not
12 hear a separate telephone ringing.” Col. 4:4-11.

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

15 A method of integrating a digital encoded-audio bit stream player in a radio-
16 frequency (RF) telephone handset, comprising:

17 establishing an RF connection between the RF telephone handset and an RF unit
18 connected to a network, wherein communications between the RF telephone
19 handset and the network pass through the RF unit;

20 switching the RF telephone handset from performing as a telephony device to
21 performing as a digital encoded audio bit stream player;

22 playing digital encoded-audio bit stream music from the RF telephone handset;

23 muting the digital encoded-audio bit stream music playing from the digital
24 encoded-audio bit stream player when the RF telephone handset receives a
25 telephone call; and

26 switching the RF telephone handset from performing as a digital encoded-audio
27 bit stream player to performing as a telephony device while the telephone call is
28 active, wherein:

(i) the RF telephone handset comprises:

a digital signal processor, and

1 a digital-to-analog converter connected to the digital signal
2 processor,

3 (ii) the step of playing digital encoded-audio bit stream music from the RF
4 telephone handset comprises the steps of:

5 the digital signal processor decoding a digital encoded audio bit
6 stream to produce a digital reconstructed audio signal,

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

9 outputting the analog audio signal to the user;

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

14 (iv) the method further comprises:

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

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

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

21 outputting the analog audio signal to the user.

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

28 181. 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.

1 182. The publicly available prosecution history for the '285 Patent indicates that
2 one Examiner was involved in examining the application that matured into the '285
3 Patent, namely Examiner Nghi H. Ly.

4 183. At least 57 patent references and 29 other references were formally
5 considered by during the prosecution of the '285 Patent, as indicated on the front two
6 pages of the issued '285 Patent.

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

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

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

19 187. The references cited during the examination of the '285 Patent all represent
20 patentably distinct and in some instances may constitute prior art means or methods of
21 integrating a digital encoded-audio bit stream player in a radio-frequency (RF)
22 telephone handset. By allowing the claims of the '285 Patent, each of the claims in the
23 '285 Patent, as a whole, was shown to be inventive, novel, and innovative over at least
24 the formally identified references.

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

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

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

13 **OVERVIEW OF ACCUSED TECHNOLOGY**

14 **A. LG'S CELLULAR PHONE PRODUCTS**

15 191. LG makes, imports, and sells cellular phones in the United States. These
16 offerings include LG's G-series, K-series, V-series, and Stylo series, among many
17 others. LG markets these phones as compliant with the 3GPP standards promulgated
18 by standard setting body the European Telecommunications Standards Institute
19 ("ETSI"), and markets some as compliant with either or both the 802.11n and 802.11ac
20 standards promulgated by standard setting body the Institute of Electronics and
21 Electrical Engineers ("IEEE"). These phones also include features that offer service
22 and device-related benefits to users, such as seamlessly switching from a cellular
23 network call to a WiFi network call, proximity sensing systems to regulate transmit
24 power levels, accelerometers to aid in the operation of communication devices, and
25 improved use of combination phone and music players.

26 **B. LG'S TABLET PRODUCTS**

27 192. LG makes, imports, and sells tablet devices in the United States. These
28 offerings include multiple versions of the G Pad series. LG markets each of these

1 tablets as compliant with either or both the 802.11ac and 802.11n standards
2 promulgated by IEEE; it markets some as compliant with the 3GPP standards
3 promulgated by ETSI.

4 **C. LG'S HOME OR OFFICE ELECTRONICS PRODUCTS**

5 193. LG makes, imports, and sells home electronics, such as laptop computers,
6 televisions, home theater equipment, and Blu-Ray or DVD players, in the United
7 States. LG markets certain of these products as compliant with either or both the
8 802.11ac and 802.11n standards promulgated by IEEE.

9 **D. LG'S HOME APPLIANCE PRODUCTS**

10 194. LG makes, imports, and sells home electronics, such as refrigerators,
11 washers, and dryers, in the United States. LG markets certain of these products as
12 compliant with the 802.11ac standard promulgated by IEEE.

13 **COUNT 1**

14 **(Infringement of U.S. Patent No. 7,990,842)**

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

17 196. Plaintiff is informed and believes, and on that basis alleges, that Defendant
18 has infringed and is currently infringing one or more claims (*e.g.*, claim 1) of the '842
19 Patent, in violation of 35 U.S.C. § 271(a).

20 197. Defendant has infringed and is currently infringing literally and/or under the
21 doctrine of equivalents, by, among other things, making, using, offering for sale,
22 selling, and/or importing within this judicial district and elsewhere in the United
23 States, without license or authority, infringing products and related products and/or
24 processes falling within the scope of one or more claims of the '842 Patent, including
25 claim 1 (collectively, the "'842 Accused Products").

26 198. The '842 Accused Products, including but not limited to those identified in
27 the preceding paragraph, comply with the 802.11n Standard per Defendant's product
28 literature and/or publicly available information.

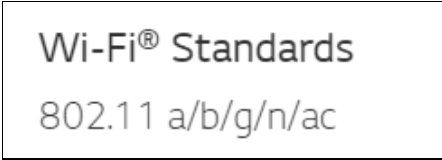
1 199. The 802.11n Standard was introduced on or about October 2009.

2 200. The 802.11n Standard provides a definition for a High Throughput Long
3 Training Field (“HT-LTF”). The first part of the HT-LTF “consists of one, two, or four
4 HT-LTFs that are necessary for demodulation of the HT-Data portion of the PPDU”
5 (*i.e.*, Protocol Data Unit). The 802.11n Standard provides a specific HT-LTF sequence
6 that is transmitted in the case of 20 MHz operation, which corresponds to the long
7 training sequence with minimum peak-to-average power ratio described in the ‘842
8 Patent. *See* 802.11-2016 at 19.3.9.4.6 or 802.11-2009 at 20.3.9.4.6.

9 201. Devices operating in accordance with the 802.11n Standard (known as
10 “wireless stations” or “STAs”) must be able to generate the HT-LTF described. Thus,
11 all 802.11n compliant devices include a signal generator that generates the HT-LTF
12 described above.

13 202. When data is transmitted by an STA, it is encoded in a PPDU. The encoding
14 process set forth in the 802.11n Standard requires a reverse Fourier transformer. *See*
15 802.11-2016 at 19.3.4(b) or 802.11-2009 at 20.3.4(b). Thus, all 802.11n Standard
16 compliant devices, including the ‘842 Accused Products, include an Inverse Fourier
17 Transformer.

18 203. By way of example only, the LG G7 ThinQ product is a mobile station
19 (cellular phone) that is advertised as complying with the 802.11n Standard.

20 The image is a rectangular box with a thin black border. Inside the box, the text "Wi-Fi® Standards" is written in a bold, sans-serif font. Below it, "802.11 a/b/g/n/ac" is written in a smaller, regular sans-serif font.

21
22 LG G7 ThinQ Specifications.¹

23 204. Because of its compliance with 802.11n, Defendant’s G7 contains a signal
24 generator capable of generating training sequences and an inverse Fourier transformer
25
26

27

¹ Available at [<https://www.lg.com/us/cell-phones/lg-G710ULM-Google-Fi-g7-thinq>]
28 (last accessed December 17, 2018).

1 that are capable of providing an extended long training sequence with a minimal peak-
2 to-power ratio which is capable of being transmitted on subcarriers in using the
3 Orthogonal Frequency Division Multiplexing scheme.

4 205. The remainder of the '842 Accused Products include each of the limitations
5 described in the previous paragraph with respect to the Defendant's G7 product. For
6 example, each of those products complies with the 802.11n standard.

7 206. Defendant's acts of making, using, offering for sale, selling, and/or importing
8 infringing products, including but not limited to the '842 Accused Products, and
9 related products and/or processes satisfy, literally or under the doctrine of equivalents,
10 each and every claim limitation, including but not limited to limitations of claim 1.²

11 207. Defendant's infringement is knowing, egregious, consciously wrongful, and
12 willful. Defendant learned of its infringement of the '842 Patent no later than
13 December 1, 2017 in a letter from Mr. Dean, President of Bell Northern Research, to
14 Mr. Jo, Representative Director and CEO and Vice Chairman of LG Electronics, Inc.
15 Mr. Dean's letter identified the '842 Patent and notified Defendant that Defendant's
16 products infringe the patent. Mr. Dean identified exemplary products by name. BNR
17 offered to meet and present a detailed presentation to Defendant, describing the
18 infringement. On January 19, 2018, BNR followed up by sending an additional letter.
19 Subsequently, LG executives met with BNR executives in person and discussed, *inter*
20 *alia*, LG's infringement of the '842 Patent on at least three occasions: on March 14,
21 2018; on June 18, 2018; and on November 30, 2018. Each of these meetings was held
22 in Seoul, Korea; lasted at least a couple of hours; and was attended by at least Mr. Kun
23 Park and Mr. Hojun Suh from the management of Defendant's Intellectual Property
24 Center division. Despite these efforts, and knowing that it was infringing the '842

25 _____
26 ² Plaintiff expressly reserves the right to identify additional asserted claims and
27 products in its infringement contentions in accordance with the local patent rules.
28 Claim 1 is provided for notice pleading only and is not presented as an "exemplary"
claim of all other claims in the '842 patent.

1 Patent, Defendant continued to infringe the '842 Patent by continuing to make, use,
2 sell, and/or offer to sell the '842 Accused Products in the United States.

3 208. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been
4 met with respect to the '842 Patent.

5 209. As a result of Defendant's infringement of the '842 Patent, Plaintiff has been
6 injured by Defendant's unauthorized use of Plaintiff's intellectual property. Plaintiff
7 seeks monetary damages in an amount adequate to compensate for Defendant's
8 infringement, but in no event less than a reasonable royalty for the use made of the
9 invention by Defendant, together with interest and costs as fixed by the Court, and
10 Plaintiff will continue to suffer damages in the future unless Defendant's infringing
11 activities are enjoined by this Court. BNR is willing to abide by any applicable
12 FRAND obligations.

13 210. Unless a permanent injunction is issued enjoining Defendant and its agents,
14 servants, employees, representatives, affiliates, and all others acting or in active
15 concert therewith from infringing the '842 Patent, Plaintiff and its licensees will be
16 greatly and irreparably harmed.

17 **COUNT 2**

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

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

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

24 213. Defendant has infringed and is currently infringing literally and/or under the
25 doctrine of equivalents, by, among other things, making, using, offering for sale,
26 selling, and/or importing within this judicial district and elsewhere in the United
27 States, without license or authority, infringing products and related products and/or
28

1 processes falling within the scope of one or more claims of the '862 Patent, including
2 claim 9 (collectively, the "'862 Accused Products").

3 214. The '862 Accused Products, including but not limited to those identified in
4 the preceding paragraph, comply with the 802.11ac Standard.

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

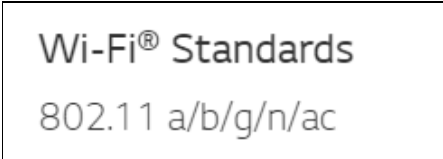
6 216. The 802.11ac Standard provides a definition and standardization for channel
7 sounding for beamforming for Multiple Input Multiple Output ("MIMO") RF radio
8 links, including how a receiving wireless device communicates channel sounding to a
9 base station. Beamforming requires the use of a steering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

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

25 218. The beamformee calculates a beamforming unitary matrix based upon the
26 channel response and a receiver beamforming unitary matrix. *See* 802.11-2016 at
27 19.3.12.3.6. Thus, all 802.11ac Standard compliant devices, including the '862
28 Accused Products are operable to feedback channel information to a beamformer based

1 on information in a preamble sequence from the transmitting wireless device, to
2 calculate transmitter beamforming information and compressing that information in the
3 form of angles and sending this information to the beamforming transmitting wireless
4 device.

5 219. By way of example only, the LG G7 ThinQ product is a receiving wireless
6 device (cellular phone) that is advertised as complying with the 802.11ac Standard.

7 A rectangular box containing the text "Wi-Fi® Standards" on the top line and "802.11 a/b/g/n/ac" on the bottom line.

9
10 LG G7 ThinQ Specifications.³ In addition, the device includes 2 x 2 MU-MIMO
11 capability,⁴ which indicates that it performs beamforming and complies with the
12 beamforming portions of the 802.11ac standard.

13 220. Because of its compliance with the beamforming portions of 802.11ac,
14 Defendant's G7 contains modules operable to feedback channel information to a
15 beamformer based on information in a preamble sequence from the transmitting
16 wireless device, to calculate transmitter beamforming information and compressing
17 that information in the form of angles and sending this information to the beamforming
18 transmitting wireless device.

19 221. The remainder of the '862 Accused Products include each of the limitations
20 described in the previous paragraph with respect to the Defendant's G7 product. For
21
22

23 ³ Available at [<https://www.lg.com/us/cell-phones/lg-G710ULM-Google-Fi-g7-thinq>]
24 (last accessed December 17, 2018).

25 ⁴ "LG Announces the G7 ThinQ," AnandTech (May 2, 2018), available at
26 [<https://www.anandtech.com/show/12680/lg-announces-the-g7-thinq>] (last accessed
27 December 17, 2018).
28

1 example, each of those products complies with the beamforming portions of the
2 802.11ac standard.

3 222. Defendant's acts of making, using, offering for sale, selling, and/or importing
4 infringing products, including but not limited to the '862 Accused Products, and
5 related products and/or processes satisfy, literally or under the doctrine of equivalents,
6 each and every claim limitation, including but not limited to limitations of claim 9.⁵

7 223. Defendant's infringement is knowing, egregious, consciously wrongful, and
8 willful. Defendant learned of its infringement of the '862 Patent no later than
9 December 1, 2017 in a letter from Mr. Dean, President of Bell Northern Research, to
10 Mr. Jo, Representative Director and CEO and Vice Chairman of LG Electronics, Inc.
11 Mr. Dean's letter identified the '862 Patent and notified Defendant that Defendant's
12 products infringe the patent. Mr. Dean identified exemplary products by name. BNR
13 offered to meet and present a detailed presentation to Defendant, describing the
14 infringement. On January 19, 2018, BNR followed up by sending an additional letter.
15 Subsequently, LG executives met with BNR executives in person and discussed, *inter*
16 *alia*, LG's infringement of the '862 Patent on at least three occasions: on March 14,
17 2018; on June 18, 2018; and on November 30, 2018. Each of these meetings was held
18 in Seoul, Korea; lasted at least a couple of hours; and was attended by at least Mr. Kun
19 Park and Mr. Hojun Suh from the management of Defendant's Intellectual Property
20 Center division. Despite these efforts, and knowing that it was infringing the '862
21 Patent, Defendant continued to infringe the '862 Patent by continuing to make, use,
22 sell, and/or offer to sell the '862 Accused Products in the United States.

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

25 _____
26 ⁵ Plaintiff expressly reserves the right to identify additional asserted claims and
27 products in its infringement contentions in accordance with the local patent rules.
28 Claim 9 is provided for notice pleading only and is not presented as an "exemplary"
claim of all other claims in the '862 patent.

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

9 226. Unless a permanent injunction is issued enjoining Defendant and its agents,
10 servants, employees, representatives, affiliates, and all others acting or in active
11 concert therewith from infringing the '862 Patent, Plaintiff and its licensees will be
12 greatly and irreparably harmed.

13 **COUNT 3**

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

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

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

20 229. Defendant has infringed and is currently infringing literally and/or under the
21 doctrine of equivalents, by, among other things, making, using, offering for sale,
22 selling, and/or importing within this judicial district and elsewhere in the United
23 States, without license or authority, infringing products and related products and/or
24 processes falling within the scope of one or more claims of the '450 Patent, including
25 claim 1 (collectively, the "'450 Accused Products").

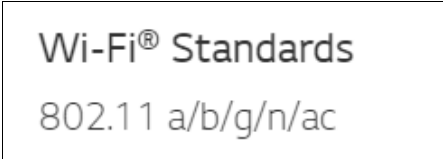
26 230. The '450 Accused Products, including but not limited to those identified in
27 the preceding paragraph, comply with the 802.11ac Standard per Defendant's product
28 literature and/or publicly available information.

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

2 232. The 802.11ac Standard provides for a “compressed beamforming feedback
3 matrix” and specifies that “[i]n compressed beamforming feedback matrix, the
4 beamformee shall remove the specie-time stream CSD in Table 19-10 from the
5 measured channel before computing a set of matrices for feedback to the beamformer.”
6 See 802.11-2016 at 19.3.12.3.6. Furthermore, “[t]he beamforming feedback matrices,
7 $V(k)$, found by the beamformee are compressed in the form of angles, which are sent to
8 the beamformer.” See 802.11-2016 at 19.3.12.3.6. Devices implementing the
9 beamforming standardization according to 802.11ac must be capable of providing
10 compressed beamforming feedback matrices as set forth above.

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

15 234. By way of example only, the LG G7 ThinQ product is a receiving wireless
16 device (cellular phone) that is advertised as complying with the 802.11ac Standard.

17 The image is a rectangular box with a thin black border. Inside the box, the text "Wi-Fi® Standards" is written in a bold, sans-serif font. Below it, "802.11 a/b/g/n/ac" is written in a smaller, regular sans-serif font.

18
19
20 LG G7 ThinQ Specifications.⁶ In addition, the device includes 2 x 2 MU-MIMO
21 capability,⁷ which indicates that it performs beamforming and complies with the
22 beamforming portions of the 802.11ac standard.

23
24
25 _____
26 ⁶ Available at [<https://www.lg.com/us/cell-phones/lg-G710ULM-Google-Fi-g7-thinq>]
(last accessed December 17, 2018).

27 ⁷ “LG Announces the G7 ThinQ,” AnandTech (May 2, 2018), available at
28 [<https://www.anandtech.com/show/12680/lg-announces-the-g7-thinq>] (last accessed
December 17, 2018).

1 235. Because of its compliance with the beamforming portions of 802.11ac,
2 Defendant's G7 contains modules operable to compute one or more channel estimate
3 matrices from signals received from a base station, wherein the channel estimate
4 matrices contain coefficients derived from performing singular value matrix
5 decomposition operations on the signals received from the base station.

6 236. The remainder of the '450 Accused Products include each of the limitations
7 described in the previous paragraph with respect to the Defendant's G7 product. For
8 example, each of those products complies with the beamforming portions of the
9 802.11ac standard.

10 237. Defendant's acts of making, using, offering for sale, selling, and/or importing
11 infringing products, including but not limited to the '450 Accused Products, and
12 related products and/or processes satisfy, literally or under the doctrine of equivalents,
13 each and every claim limitation, including but not limited to limitations of claim 1.⁸

14 238. Defendant's infringement is knowing, egregious, consciously wrongful, and
15 willful. Defendant became aware of its infringement of the '450 Patent no later than
16 the filing of this Complaint; yet it continues to infringe the '450 Patent by continuing
17 to make, use, sell, and/or offer to sell the '450 Accused Products in the United States.

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

20 240. As a result of Defendant's infringement of the '450 Patent, Plaintiff has been
21 injured by Defendant's unauthorized use of Plaintiff's intellectual property. Plaintiff
22 seeks monetary damages in an amount adequate to compensate for Defendant's
23 infringement, but in no event less than a reasonable royalty for the use made of the
24 invention by Defendant, together with interest and costs as fixed by the Court, and
25

26 ⁸ Plaintiff expressly reserves the right to identify additional asserted claims and
27 products in its infringement contentions in accordance with the local patent rules.
28 Claim 1 is provided for notice pleading only and is not presented as an "exemplary"
claim of all other claims in the '450 patent.

1 Plaintiff will continue to suffer damages in the future unless Defendant's infringing
2 activities are enjoined by this Court. BNR is willing to abide by any applicable
3 FRAND obligations.

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

8 **COUNT 4**

9 **(Infringement of U.S. Patent No. 6,941,156)**

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

12 243. Plaintiff is informed and believes, and on that basis alleges, that Defendant
13 has infringed and is currently infringing one or more claims (*e.g.*, claim 1) of the '156
14 Patent, in violation of 35 U.S.C. § 271(a).

15 244. Defendant has infringed and is currently infringing literally and/or under the
16 doctrine of equivalents, by, among other things, making, using, offering for sale,
17 selling, and/or importing within this judicial district and elsewhere in the United
18 States, without license or authority, infringing products and related products and/or
19 processes falling within the scope of one or more claims of the '156 Patent, including
20 claim 1 (collectively, the "'156 Accused Products").

21 245. The '156 Accused Products, including but not limited to those identified in
22 the preceding paragraph, include both an RF radio for cellular communications and a
23 separate RF radio for connection to WiFi networks. Further, those radios are designed
24 and able to operate simultaneous communication paths at different frequencies and
25 automatically switch over communication from either the cellular communication or
26 the WiFi functionality to the other.

27 246. By way of example only, the LG G7 ThinQ product is a multimode cellular
28 phone that includes cellular RF communication functionality, and RF communication

1 functionality separate and different from the cellular RF phone functionality (namely
2 WiFi), a module operable to establish simultaneous communication paths from the
3 multimode cellular phone using both the cellular functionality and the WiFi
4 functionality, and an automatic switchover module, as shown by the device's
5 capability to maintain a voice call while switching between a cellular connection and a
6 WiFi connection.

7 247. More specifically, when a user of a G7 is in an existing call on a first RF
8 connection type, either a WiFi or cellular connection, and then moves to an area where
9 a different and distinct second RF connection type is available, either cellular or WiFi
10 connection, the G7 then switches modes from the first RF connection type to the
11 second, different RF connection type automatically and without dropping the call and
12 having to reconnect.

13 248. By way of example only, the remainder of the '156 Accused Products
14 include each of the limitations described in the previous paragraph with respect to the
15 Defendant's G7 product. For example, those products operate to maintain a call that is
16 first on a first RF connection and then switched to a second, different RF connection
17 without dropping the call or having to reconnect.

18 249. Defendant's acts of making, using, offering for sale, selling, and/or importing
19 infringing products, including but not limited to the '156 Accused Products, and
20 related products and/or processes satisfy, literally or under the doctrine of equivalents,
21 each and every claim limitation, including but not limited to limitations of claim 1.⁹

22 250. Defendant's infringement is knowing, egregious, consciously wrongful, and
23 willful. Defendant learned of its infringement of the '156 Patent no later than
24 December 1, 2017 in a letter from Mr. Dean, President of Bell Northern Research, to
25

26 ⁹ Plaintiff expressly reserves the right to identify additional asserted claims and
27 products in its infringement contentions in accordance with the local patent rules.
28 Claim 1 is provided for notice pleading only and is not presented as an "exemplary"
claim of all other claims in the '156 patent.

1 Mr. Jo, Representative Director and CEO and Vice Chairman of LG Electronics, Inc.
2 Mr. Dean's letter identified the '156 Patent and notified Defendant that Defendant's
3 products infringe the patent. Mr. Dean identified exemplary products by name. BNR
4 offered to meet and present a detailed presentation to Defendant, describing the
5 infringement. On January 19, 2018, BNR followed up by sending an additional letter.
6 Subsequently, LG executives met with BNR executives in person and discussed, *inter*
7 *alia*, LG's infringement of the '156 Patent on at least three occasions: on March 14,
8 2018; on June 18, 2018; and on November 30, 2018. Each of these meetings was held
9 in Seoul, Korea; lasted at least a couple of hours; and was attended by at least Mr. Kun
10 Park and Mr. Hojun Suh from the management of Defendant's Intellectual Property
11 Center division. Despite these efforts, and knowing that it was infringing the '156
12 Patent, Defendant continued to infringe the '156 Patent by continuing to make, use,
13 sell, and/or offer to sell the '156 Accused Products in the United States.

14 251. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been
15 met with respect to the '156 Patent.

16 252. As a result of Defendant's infringement of the '156 Patent, Plaintiff has been
17 injured by Defendant's unauthorized use of Plaintiff's intellectual property. Plaintiff
18 seeks monetary damages in an amount adequate to compensate for Defendant's
19 infringement, but in no event less than a reasonable royalty for the use made of the
20 invention by Defendant, together with interest and costs as fixed by the Court, and
21 Plaintiff will continue to suffer damages in the future unless Defendant's infringing
22 activities are enjoined by this Court.

23 253. Unless a permanent injunction is issued enjoining Defendant and its agents,
24 servants, employees, representatives, affiliates, and all others acting or in active
25 concert therewith from infringing the '156 Patent, Plaintiff and its licensees will be
26 greatly and irreparably harmed.

COUNT 5

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

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

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

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

14 257. The '432 Accused Products, including but not limited to those identified in
15 the preceding paragraph, comply with the 3GPP TS 25.331 standard, Version 11.4.0
16 Release 11 (the "TS 25.331 v.11.4.0 Standard") or later, per Defendant's product
17 literature.

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

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

23 260. The TS 25.331 v.11.4.0 Standard requires that compliant devices be capable
24 of receiving the network's RACH reporting priority, indicating the order of limiting
25 intra/inter neighbor cell measurements and other information. *See* TS 25.331 v.11.4.0
26 at 10.3.7.136. This means that compliant devices, including the '432 Accused
27 Products, can receive a broadcast indication indicating whether to prioritize inter-
28

1 frequency or intra-frequency neighbor cell measurements for inclusion in an uplink
2 connection request message to be sent on a random-access channel.

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

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

23 263. The TS 25.331 v.11.4.0 Standard requires the broadcast indication discussed
24 above to be an information element of system information received on a broadcast
25 channel from an access node of a Universal Terrestrial Radio Access Network or an
26 Evolved Universal Terrestrial Radio Access Network (e.g., a cell network), and, as
27 discussed above, the uplink connection request message is a Radio Resource Control
28

1 Connection Request Message. *See* TS 25.331 v.11.4.0 at 8.5.23, 10.2.39, 10.2.48,
2 10.2.48.8.22.

3 264. By way of example only, the LG G7 ThinQ product is a receiving wireless
4 device (cellular phone) that is advertised as containing features that comply with the
5 TS 25.331 v.11.4.0 Standard or later, including an LTE Category that complies with
6 that version of the standard or later.

7 265. For example, Defendant’s G7 is advertised as containing the Qualcomm
8 Snapdragon 845 processor:



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11 LG G7 ThinQ Specifications.¹⁰

12 266. Qualcomm, in turn, advertises the Snapdragon 845 processor as LTE
13 Category 18 (downlink) / Category 13 (uplink):



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15
16 Qualcomm Snapdragon 845 Specifications.¹¹

17 267. LTE Category 12 was added in TS 25.331 Release 11; therefore,
18 Defendant’s G7 supports TS 25.331 v.11.4.0 or later.

19 268. Because Defendant’s G7 complies with the TS 25.331 v.11.4.0 Standard or
20 later, it therefore implements the mandatory portions of that standard described above.

21 269. Because of its compliance with the TS 25.331 v.11.4.0 Standard or later,
22 Defendant’s G7 receives a broadcast indication indicating whether to prioritize inter-
23 frequency or intra-frequency neighbor cell measurements for inclusion in an uplink
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26 ¹⁰ Available at [<https://www.lg.com/us/cell-phones/lg-G710ULM-Google-Fi-g7-thinq>]
27 (last accessed December 19, 2018).

28 ¹¹ Available at [<https://www.qualcomm.com/products/snapdragon-845-mobile-platform>] (last accessed December 19, 2018).

1 connection request message to be sent on a random access channel, and constructs the
2 uplink connection request message which includes measurements that are prioritized in
3 accordance with the broadcast indication so as not to exceed a maximum size of the
4 uplink connection request message, in which one value of the indication directs that
5 the inter-frequency neighbor cell measurements are prioritized over the intra-frequency
6 neighbor cell measurement results for inclusion in the uplink connection request
7 message, and a different value of the indication or omission of the indication directs
8 that the intra-frequency neighbor cell measurements are prioritized over the inter-
9 frequency neighbor cell measurements for inclusion in the uplink connection request
10 message, and in which the indication is within an information element of system
11 information received on a broadcast channel from an access node of a UTRAN or an
12 E-UTRAN wireless system, and the uplink connection request message is a Radio
13 Resource Control Connection Request message.

14 270. By way of example only, the remainder of the '432 Accused Products
15 include each of the limitations described in the previous paragraph with respect to the
16 Defendant's G7 product. For example, those products comply with the TS 25.331
17 v.11.4.0 Standard or later.

18 271. Defendant's acts of making, using, offering for sale, selling, and/or importing
19 infringing products, including but not limited to the '432 Accused Products, and
20 related products and/or processes satisfy, literally or under the doctrine of equivalents,
21 each and every claim limitation, including but not limited to limitations of claim 12.¹²

22 272. Defendant's infringement is knowing, egregious, consciously wrongful, and
23 willful. Defendant learned of its infringement of the '432 Patent no later than
24 December 1, 2017 in a letter from Mr. Dean, President of Bell Northern Research, to
25

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

1 Mr. Jo, Representative Director and CEO and Vice Chairman of LG Electronics, Inc.
2 Mr. Dean's letter identified the '432 Patent and notified Defendant that Defendant's
3 products infringe the patent. Mr. Dean identified exemplary products by name. BNR
4 offered to meet and present a detailed presentation to Defendant, describing the
5 infringement. On January 19, 2018, BNR followed up by sending an additional letter.
6 Subsequently, LG executives met with BNR executives in person and discussed, *inter*
7 *alia*, LG's infringement of the '432 Patent on at least three occasions: on March 14,
8 2018; on June 18, 2018; and on November 30, 2018. Each of these meetings was held
9 in Seoul, Korea; lasted at least a couple of hours; and was attended by at least Mr. Kun
10 Park and Mr. Hojun Suh from the management of Defendant's Intellectual Property
11 Center division. Despite these efforts, and knowing that it was infringing the '432
12 Patent, Defendant continued to infringe the '432 Patent by continuing to make, use,
13 sell, and/or offer to sell the '432 Accused Products in the United States.

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

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

24 275. Unless a permanent injunction is issued enjoining Defendant and its agents,
25 servants, employees, representatives, affiliates, and all others acting or in active
26 concert therewith from infringing the '432 Patent, Plaintiff and its licensees will be
27 greatly and irreparably harmed.
28

COUNT 6

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

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

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

8 278. Defendant has infringed and is currently infringing literally and/or under the
9 doctrine of equivalents, by, among other things, making, using, offering for sale,
10 selling, and/or importing within this judicial district and elsewhere in the United
11 States, without license or authority, infringing products and related products and/or
12 processes falling within the scope of one or more claims of the '435 Patent, including
13 claim 1 (the "'435 Accused Products").

14 279. By way of example only, the LG G7 ThinQ product is a portable cell phone
15 with (1) a power circuit that provides a network adjusted transmit power level as a
16 function of a position to a communications tower (e.g., the circuitry coupled to the
17 antenna, pictured below) and (2) a proximity regulation system that includes both a
18 location sensing subsystem and a power governing subsystem, the latter of which
19 determines a transmit power level based on a proximity transmit power level
20 determined by the location of the cell phone proximate a user and the network adjusted
21 transmit power level.
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8 G7 Internal Photos (submitted to the FCC on behalf of LG), PCTEST ENGINEERING
9 LABORATORY INC.¹³

10 280. Specifically, as part of its submissions to the Federal Communications
11 Commission (“FCC”), Defendant or one of its agents discloses test results from
12 Specific Absorption Rate (“SAR”) Testing that shows power regulation based on
13 information received from the device’s proximity sensor, whereby transmit power
14 levels are adjusted based on proximity data. For instance, the test report submitted to
15 the FCC for the G7 product includes these tables showing adjusted power based on
16 proximity:
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28 ¹³ Available at [<https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm>], Grantee
Code: ZNF; Product Code: G710VM (last accessed December 17, 2018).

1.3 Main Antenna Verification Summary

Table G-1
Power Measurement Verification for Main Antenna

| Mechanism(s) | Mode/Band | Conducted Power (dBm) | |
|------------------|-----------|-----------------------|------------------------|
| | | Un-triggered (Max) | Mechanism #1 (Reduced) |
| Proximity Sensor | UMTS B4 | 25.18 | 24.12 |
| Proximity Sensor | UMTS B2 | 25.27 | 24.33 |
| Proximity Sensor | CDMA BC1 | 24.75 | 23.78 |
| Proximity Sensor | LTE B4 | 25.12 | 24.13 |
| Proximity Sensor | LTE B66 | 25.19 | 24.16 |
| Proximity Sensor | LTE B2 | 24.86 | 23.75 |
| Proximity Sensor | LTE B25 | 24.93 | 24.01 |

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 | |
| Proximity Sensor | Phablet - Back Side | Mid | 8 | 11 | 6 |
| Proximity Sensor | Phablet - Front Side | Mid | 4 | 6 | 3 |
| Proximity Sensor | Phablet - Bottom Edge | Mid | 8 | 10 | 7 |

*Note: Mid band refers to: CDMA BC1, UMTS B2/4, LTE B2/4/25/66

SAR Compliance Test Report (submitted to the FCC on behalf of LG), PCTEST ENGINEERING LABORATORY INC., Report No. 1M1804030062-01-R2.ZNF, 04/02/18 – 04/15/18.¹⁴

281. 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 Defendant's G7 product. For example, Defendant submits data to the FCC relating to the transmit power level variations on many of those other products.

282. Defendant'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 1.¹⁵

¹⁴ Available at [<https://apps.fcc.gov/oetcf/eas/reports/GenericSearch.cfm>], Grantee Code: ZNF; Product Code: G710VM (last accessed December 17, 2018).

¹⁵ 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.

1 283. Defendant's infringement is knowing, egregious, consciously wrongful, and
2 willful. Defendant learned of its infringement of the '435 Patent no later than
3 November 30, 2018, the date on which Defendant's executives met with BNR
4 executives in person and discussed, *inter alia*, Defendant's infringement of the '435
5 Patent. The meeting was held in Seoul, Korea; lasted a couple of hours; and was
6 attended by Mr. Kun Park and Mr. Hojun Suh from the management of Defendant's
7 Intellectual Property Center division, among others. Despite these efforts, and knowing
8 that it was infringing the '435 Patent, Defendant continued to infringe the '435 Patent
9 by continuing to make, use, sell, and/or offer to sell the '435 Accused Products in the
10 United States.

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

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

20 286. Unless a permanent injunction is issued enjoining Defendant and its agents,
21 servants, employees, representatives, affiliates, and all others acting or in active
22 concert therewith from infringing the '435 Patent, Plaintiff and its licensees will be
23 greatly and irreparably harmed.

24 **COUNT 7**

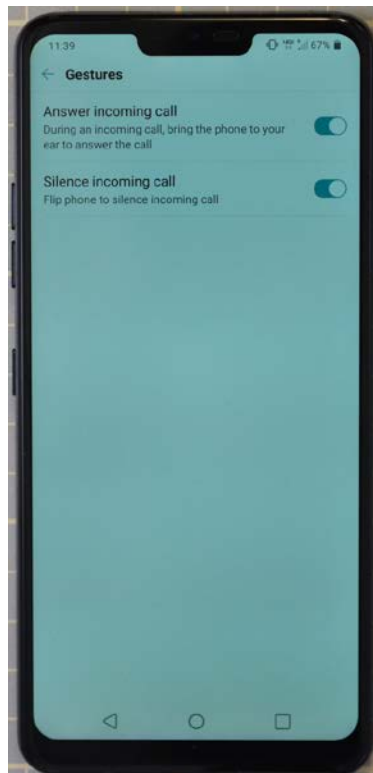
25 **(Infringement of U.S. Patent No. 6,549,792)**

26 287. Plaintiff re-alleges and incorporates by reference the allegations in the
27 foregoing paragraphs as if fully set forth herein.
28

1 288. Plaintiff is informed and believes, and on that basis alleges, that Defendant
2 has infringed and is currently infringing one or more claims (e.g., claim 9) of the '792
3 Patent, in violation of 35 U.S.C. § 271(a).

4 289. Defendant has infringed and is currently infringing literally and/or under the
5 doctrine of equivalents, by, among other things, making, using, offering for sale,
6 selling, and/or importing within this judicial district and elsewhere in the United
7 States, without license or authority, infringing products and related products and/or
8 processes falling within the scope of one or more claims of the '792 Patent, including
9 claim 9 (the "'792 Accused Products").

10 290. By way of example only, the LG G7 ThinQ product is a wireless handset,
11 including a wireless transceiver, a controller, and an accelerometer. Accordingly, the
12 controller in Defendant's G7 product is adapted to receive an output from the
13 accelerometer showing an active movement of the G7 product and affect a state of the
14 wireless transceiver, including transitioning to an answered call, based on a change in a
15 motion history. This function is shown in the G7 Settings:



1 291. More specifically, when a user of the G7 product receives an incoming call,
2 the call is answered by bringing it to the ear. The controller in the G7 product is
3 adapted to receive an output from the accelerometer showing an active movement of
4 said wireless transceiver based on a change in motion history.

5 292. By way of example only, the remainder of the '792 Accused Products
6 include each of the limitations described in the previous paragraphs with respect to the
7 Defendant's G7 product. For example, in each of those products, a user can answer a
8 call by lifting the phone to the user's ear, and such functionality is influenced by the
9 device's accelerometer.

10 293. Defendant's acts of making, using, offering for sale, selling, and/or importing
11 infringing products, including but not limited to the '792 Accused Products, and
12 related products and/or processes satisfy, literally or under the doctrine of equivalents,
13 each and every claim limitation, including but not limited to limitations of claim 1.¹⁶

14 294. Defendant's infringement is knowing, egregious, consciously wrongful, and
15 willful. Defendant became aware of its infringement of the '792 Patent no later than
16 December 18, 2018 in an email from Mr. Dean, President of Bell Northern Research,
17 to Mr. Kun Park from the management of Defendant's Intellectual Property Center
18 division. Mr. Dean's email identified the '792 Patent and notified Defendant that
19 Defendant's products infringe the patent. Despite these efforts, and knowing that it was
20 infringing the '792 Patent, Defendant continued to infringe the '792 Patent by
21 continuing to make, use, sell, and/or offer to sell the '792 Accused Products in the
22 United States.

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

25
26 ¹⁶ Plaintiff expressly reserves the right to identify additional asserted claims and
27 products in its infringement contentions in accordance with the local patent rules.
28 Claim 9 is provided for notice pleading only and is not presented as an "exemplary"
claim of all other claims in the '792 Patent.

1 296. As a result of Defendant's infringement of the '792 Patent, Plaintiff has been
2 injured by Defendant's unauthorized use of Plaintiff's intellectual property. Plaintiff
3 seeks monetary damages in an amount adequate to compensate for Defendant's
4 infringement, but in no event less than a reasonable royalty for the use made of the
5 invention by Defendant, together with interest and costs as fixed by the Court, and
6 Plaintiff will continue to suffer damages in the future unless Defendant's infringing
7 activities are enjoined by this Court.

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

12 **COUNT 8**

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

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

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

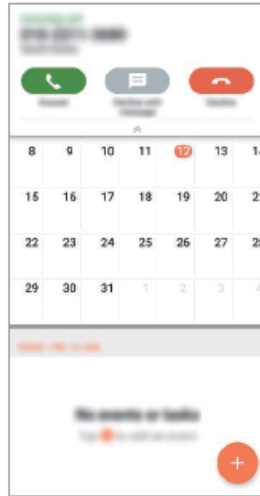
19 300. Defendant has infringed and is currently infringing literally and/or under the
20 doctrine of equivalents, by, among other things, making, using, offering for sale,
21 selling, and/or importing within this judicial district and elsewhere in the United
22 States, without license or authority,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

25 301. By way of example only, the LG G7 ThinQ product is a radio-frequency
26 (RF) telephone handset that plays digital encoded-audio bit stream music, wherein a
27 digital signal processor decodes the audio bit stream to a digital audio signal, and then
28 a digital-to-analog converter converts the decoded digital signal to an analog audio

1 signal and outputs it to a user. The G7 User Guide describes both its telephony and its
 2 music-playing capabilities:

3 **Checking an incoming call while using an app**

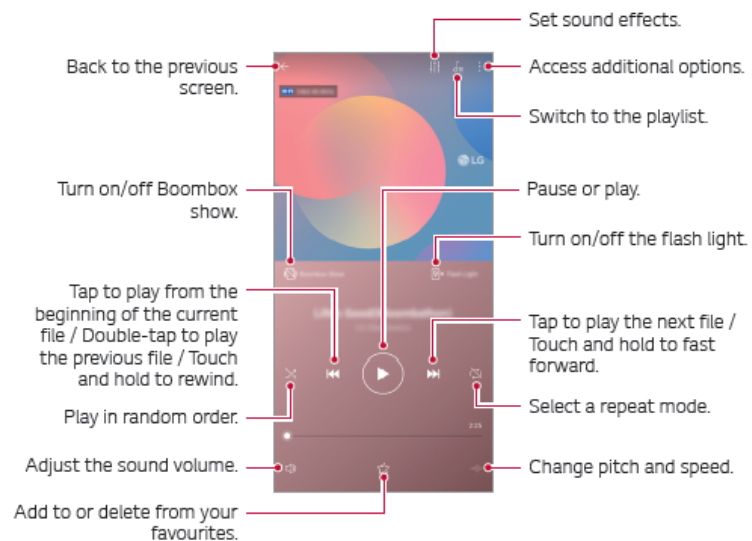
4 When a call comes in while using an app, a pop-up notification can be
 5 displayed at the top of the screen. You can receive the call, reject the call,
 6 or send message from the pop-up screen.



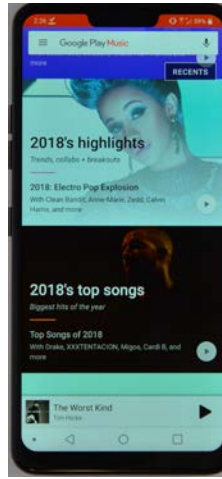
14 **Music**

15 You can play and manage songs or music albums.

- 16 1 Tap > **Essentials** > **Music**.
- 17 2 Select a category.
- 18 3 Select a music file.



1 LG G7 ThinQ User Guide.¹⁷ By way of further example only, the G7 is pre-loaded
2 with Google Play Music:



12 302. The G7, by way of example only, receives telephone signals from an RF unit
13 (for example a cell phone tower, in the case of a cellular network, or a WiFi router in
14 the case of a local area network), and the RF unit is connected to a network.

15 303. The G7, by way of example only, can switch between its bit-stream music
16 playing and telephone functionalities, and when playing music, for example, will mute
17 the music when receiving a telephone call and continue playing the music after the call
18 is completed or stops ringing.

19 304. In addition, by way of example only, the G7 outputs analog audio signals to
20 the user for both telephone calls and music via a digital signal processor and a digital
21 to analog converter.

22 305. By way of example only, the remainder of the '285 Accused Products
23 include each of the limitations described in the previous paragraph with respect to the
24 Defendant's LG G7 ThinQ product. For example, each product contains similar
25
26

27
28 ¹⁷ Available at [<https://www.lg.com/us/support/manuals-documents>] (last accessed December 20, 2018).

1 telephony and music playing capabilities that allow switching from playing music to
2 telephony and back to music when the call is terminated.

3 306. Defendant's acts of making, using, offering for sale, selling, and/or importing
4 infringing products, including but not limited to the '285 Accused Products, and
5 related products and/or processes satisfy, literally or under the doctrine of equivalents,
6 each and every claim limitation, including but not limited to limitations of claim 1.¹⁸

7 307. Defendant's infringement is knowing, egregious, consciously wrongful, and
8 willful. Defendant became aware of its infringement of the '285 Patent no later than
9 December 18, 2018 in an email from Mr. Dean, President of Bell Northern Research,
10 to Mr. Kun Park from the management of Defendant's Intellectual Property Center
11 division. Mr. Dean's email identified the '285 Patent and notified Defendant that
12 Defendant's products infringe the patent. Despite these efforts, and knowing that it was
13 infringing the '285 Patent, Defendant continued to infringe the '285 Patent by
14 continuing to make, use, sell, and/or offer to sell the '285 Accused Products in the
15 United States.

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

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

25
26 _____
27 ¹⁸ Plaintiff expressly reserves the right to identify additional asserted claims and
28 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.

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

5 **PRAYER FOR RELIEF**

6 Plaintiff prays for the following relief:

7 A. A judgment that Defendant has infringed one or more claims of the
8 Asserted Patents;

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

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

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

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

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

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

24 **JURY TRIAL DEMANDED**

25 Plaintiff hereby demands a trial by jury of all issues so triable.
26
27
28

1 Dated: December 20, 2018

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