IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
(SHERMAN DIVISION)

BELL NORTHERN RESEARCH, LLC, Plaintiff, v. ASUSTEK COMPUTER INC. and ASUS COMPUTER INTERNATIONAL, Defendants.	**Civil Action No. _____** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Bell Northern Research, LLC ("BNR" or "Plaintiff"), for its Complaint against Defendants ASUSTek Computer Inc. and ASUS Computer International (collectively, "ASUS" or "Defendants"), alleges the following:

NATURE OF THE ACTION

1. This is an action for patent infringement arising under the Patent Laws of the United States, 35 U.S.C. § 1 *et seq*.

THE PARTIES

2. Plaintiff BNR is a limited liability company organized under the laws of the State of Delaware with a place of business at 401 North Michigan Avenue, Chicago, Illinois 60611.

3. BNR is informed and believes Defendant ASUSTek Computer Inc. has its principal place of business and headquarters at No. 15, Li-Te Rd., Beitou Dist., Taipei 112, Taiwan. BNR is informed and believes that Defendant ASUSTek Computer Inc. imports, sells for importation, and/or sells after importation into the United States products that practice the accused methods ("Accused Products"), including at least the ASUS PN52 ExpertCenter MiniPC Computer,

which contains a MediaTek MT7922 chip that it uses to communicate over wireless networks in an infringing manner, and the ASUS RT-AX89X AX6000 Dual Band router, which contains a Qualcomm IPQ8074 chip that it uses to communicate over wireless networks in an infringing manner ("ASUS Exemplary Accused Products"), either directly or by directing the co-defendant ASUS entities to do so.

4. BNR is informed and believes Defendant ASUS Computer International has its principal place of business and headquarters at 48720 Kato Rd., Fremont, CA 94538. BNR is informed and believes Defendant ASUS Computer International is a subsidiary of or otherwise controlled by Defendant ASUSTek Computer Inc. as to the sale for importation, importation, and/or sale after importation into the United States of the Accused Products, including the ASUS Exemplary Accused Products. BNR is informed and believes that Defendant ASUS Computer International imports, sells for importation, and/or sells after importation into the United States the Accused Products, including the ASUS Exemplary Accused Products, either directly or on behalf of the other ASUS entities. On information and belief, ASUSTek Computer Inc. also uses ASUS Accused Products within the United States.

JURISDICTION AND VENUE

5. This is an action for patent infringement arising under the Patent Laws of the United States, Title 35 of the United States Code.

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

7. Venue is proper in this judicial district under 28 U.S.C. § 1400(b).

8. Upon information and belief, Defendant ASUSTek Computer Inc. is not a resident in the United States and may be sued in any judicial district. Defendant ASUSTek Computer Inc. has a place of business located at No. 15, Li-Te Rd., Beitou Dist., Taipei 112,

Taiwan. On information and belief, Defendant ASUSTek Computer Inc. has committed acts of infringement in this District.

9. Upon information and belief, Defendant ASUS Computer International has its principal place of business and headquarters at t 48720 Kato Rd., Fremont, CA 94538. On information and belief, Defendant ASUS Computer International has committed acts of infringement within this district.

10. ASUS has previously consented to jurisdiction and venue in this District, for example, in *Genghiscomm Holdings, LLC v. ASUStek Computer, Inc.*, Case No. 2:22-cv-66 (E.D. Tex. 2022).

11. Upon information and belief, Defendants are subject to this Court's general and specific personal jurisdiction, because the Defendants have sufficient minimum contacts within the State of Texas and this District, pursuant to due process and/or the Texas Long Arm Statute, because the Defendants purposefully availed itself of the privileges of conducting business in the State of Texas and in this District, because the Defendants regularly conduct and solicits business within the State of Texas and within this District, and because Plaintiff's causes of action arise directly from the Defendants' business contacts and other activities in the State of Texas and this District.

BACKGROUND

12. The Asserted Patents come from a rich pedigree dating back to the late 19th century. This is when Bell Labs sprang to life from the combined efforts of AT&T and Western Electric. Bell Labs is one of America's greatest technology incubators, and paved the way for many technological advances we know and use today, including the transistor, several kinds of lasers, the UNIX operating system, and computer languages such as C++. In total, Bell Labs received nine Nobel Prizes for its work over the years.

13. Eventually the Bell system broke up and spawned several new companies. They included telecommunications powerhouses Lucent and Agere Systems. Lucent was absorbed by Nokia, while Agere Systems was acquired by LSI, then Avago, and ultimately renamed Broadcom. The Bell system also spun off Northern Electric which led to the creation of a research lab known as BNR. This lab grew to host thousands of engineers in offices around the globe. One of those was an 800,000-square-foot campus in Richardson, Texas.

14. Collectively, these companies spurred a digital revolution in telecommunications, starting with the first digital telephone switch in 1975. They continued to push the industry to new heights in the late-80s, when BNR announced the desire to create a global fiber optic network (called "FiberWorld"). Its goal was to give users easy, reliable, and fast access to a variety of multimedia services. To realize this vision, Bell Labs and subsequent innovators made numerous breakthroughs in laser, integrated circuit, photodetector, amplifier, and waveguide designs. These advancements led to the modern fiber optic systems we use today.

15. This work naturally evolved to include cellular telecommunications as well. On May 6, 1992, BNR VP George Brody—along with executives from Bell Cellular and Northern Electric—made the first Canada-US digital cellular call. It stretched from Toronto, Ontario to Fort Worth, Texas.

16. Eventually, Nortel Networks absorbed BNR. Although Nortel was ultimately unsuccessful in its bid to supply digital telecommunications and networking solutions to the market, some Bell Labs and Nortel alumni decided to reenergize BNR in 2017. Today it is the successor in interest to many of the key telecommunications technologies.

17. The BNR Patent portfolio comprises hundreds of patents that reflect important developments in telecommunications that were invented and refined by leading technology

research companies, including Agere, LSI, and Broadcom. These include U.S. Patent Nos. RE 48,629, 8,416,862, and 7,564,914 (collectively, these patents comprise the "Asserted Patents").

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

19. BNR brings this action to put a stop to the Defendants' unauthorized and unlicensed use of the Asserted Patents.

U.S. PATENT NO. RE 48,629

20. Jason Alexander Trachewsky and Rajendra T. Moorti are the inventors of U.S. Patent No. RE 48,629 (the '629 patent). A true and correct copy of the '629 patent is attached as Exhibit A.

21. On July 6, 2021, the '629 patent was duly and legally reissued by the United States Patent and Trademark Office under the title "Backward-compatible Long Training Sequences for Wireless Communication Networks."

22. BNR is the assignee and owner of the right, title and interest in and to the '629 patent, including the right to assert all causes of action arising under the Patent and the right to any remedies for infringement of it.

23. The '629 patent resulted from the pioneering efforts of Messrs. Trachewsky and Moorti (hereinafter "the Inventors") in the general area of wireless communication systems and more particularly to long training sequences of minimum peak-to-average power ratio which may be used in legacy systems. At the time of these pioneering efforts, conventionally implemented technology did not sufficiently address the problem of different wireless devices compliant with different standards or different versions of the same standard while enabling backward compatibility with legacy devices that avoids collisions. For example, in the 802.11a and 802.11g standards, each data packet starts with a preamble which includes a short training

sequence followed by a long training sequence. The short and long training sequences are used for synchronization between the sender and the receiver. The long training sequence of 802.11a and 802.11g is defined such that each of sub-carriers -26 to +26, except for the subcarrier 0 which is set to 0, has one binary phase shift keying constellation point, either +1 or -1.

24. There existed a need to create a long training sequence of minimum peak-to-average ratio that uses more sub-carriers without interfering with adjacent channels.

25. For example, the Inventors developed a wireless communications device, comprising: a signal generator that generates an extended long training sequence; and an Inverse

Sub-carrier	*−28*	*−27*	*−26*	*−25*	*−24*	*−23*	*−22*
Encoding	*+1*	*+1*	*+1*	*+1*	*−1*	*−1*	*+1*
Sub-carrier	*−14*	*−13*	*−12*	*−11*	*−10*	*−9*	*−8*
Encoding	*+1*	*+1*	*+1*	*−1*	*−1*	*+1*	*+1*
Sub-carrier	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Encoding	*+1*	*−1*	*−1*	*+1*	*+1*	*−1*	*+1*
Sub-carrier	*15*	*16*	*17*	*18*	*19*	*20*	*21*
Encoding	*+1*	*+1*	*−1*	*−1*	*+1*	*−1*	*+1*

Sub-carrier	*−21*	*−20*	*−19*	*−18*	*−17*	*−16*	*−15*
Encoding	*+1*	*−1*	*+1*	*−1*	*+1*	*+1*	*+1*
Sub-carrier	*−7*	*−6*	*−5*	*−4*	*−3*	*−2*	*−1*
Encoding	*−1*	*+1*	*−1*	*+1*	*+1*	*+1*	*+1*
Sub-carrier	*8*	*9*	*10*	*11*	*12*	*13*	*14*
Encoding	*−1*	*+1*	*−1*	*−1*	*−1*	*−1*	*−1*
Sub-carrier	*22*	*23*	*24*	*25*	*26*	*27*	*28*
Encoding	*−1*	*+1*	*+1*	*+1*	*+1*	*−1*	*−1.*

Fourier Transformer operatively coupled to the signal generator, wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme, wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers, and wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28, excluding indexed sub-carrier 0 which is set to zero, as follows:

26. One advantage of the patented invention is that it provides an expanded long training sequence of minimum peak-to-average power ratio thereby decreasing power back-off. (*See* '629 patent at 4:15-17.)

27. Another advantage of the invention is that expanded long training sequence may be used by 802.11a and 802.11g devices for estimating the channel impulse response and by a receiver for estimating the carrier frequency offset between the transmitter clock and receiver clock. (*See* '629 patent at 4:17-21.)

U.S. PATENT NO. 8,416,862

28. Carlos Aldana and Joonsuk Kim are the inventors of U.S. Patent No 8,416,862 ("the '862 patent"). A true and correct copy of the '862 patent is attached as Exhibit B.

29. On April 9, 2013, the '862 patent was duly and legally issued by the United States Patent and Trademark Office under the title "Efficient Feedback of Channel Information in a Closed Loop Beamforming Wireless Communications System."

30. BNR is the assignee and owner of the right, title and interest in and to the '862 patent, including the right to assert all causes of action arising under the patent and the right to any remedies for infringement of it.

31. The '862 patent resulted from the pioneering efforts of Messrs. Aldana and Kim (hereinafter "the Inventors") in the area of wireless communications systems using beamforming. These efforts resulted in the development of a method and system for the efficient feedback of channel information in a closed loop beamforming wireless communication system.

32. At the time of these pioneering efforts, the most widely implemented technology used to address reduced beam forming feedback information for wireless communications was to reduce the size of the feedback. For instance, in a 2x2 MIMO wireless communication, the feedback needs four elements that are all complex Cartesian coordinate values V11 V12;V21

V22. In general, Vik=aik+j*bik, where aik and bik are values between -1, 1. Thus, with 1 bit express per each element for each of the real and imaginary components, aik and bik can be either -1/2 or +1/2, which requires 4x2x1=8 bits per tone. With 4 bit expressions per each element of V(f) in an orthogonal frequency division multiplexing (OFDM) 2x2 MIMO wireless communication, the number of bits required is 1728 per tone (e.g., 42*54*4=1728, 4 elements per tone, 2 bits for real and imaginary components per tone, 54 data tones per frame, and 4 bits per element), which requires overhead for a packet exchange that is too large for practical applications.

33. The Inventors conceived of the invention claimed in the ’862 patent as a way to reduce beam forming feedback information for wireless communications.

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

35. One advantage of the patented invention is a reduction of beamforming feedback information for wireless communications. (*See* ’862 patent at 3:49–51.)

U.S. PATENT NO. 7,564,914

36. Christopher J. Hansen, Carlos H. Aldana, and Joonsuk Kim are the inventors of U.S. Patent No. 7,564,914 ("the '914 patent"). A true and correct copy of the '914 patent is attached as Exhibit C.

37. On July 21, 2009, the '914 patent was duly and legally issued by the United States Patent and Trademark Office under the title "Method and System for Frame Formats for MIMO Channel Measurement Exchange."

38. BNR is the assignee and owner of the right, title and interest in and to the '914 patent, including the right to assert all causes of action arising under the patent and the right to any remedies for infringement of it.

39. The '914 patent resulted from the pioneering efforts of Messrs. Hansen, Aldana, and Kim (hereinafter "the Inventors") in the general area of wireless networking.

40. For example, the Inventors developed a method for communicating information in a communication system, the method comprising: transmitting data via a plurality of radio frequency (RF) channels utilizing a plurality of transmitting antennas; receiving feedback information via at least one of said plurality of RF channels; modifying a transmission mode based on said feedback information; receiving said feedback information comprising channel estimates based on transmission characteristics of said transmitted data via at least one of said plurality of transmitting antennas; and deriving said feedback information from mathematical matrix decomposition of said channel estimates.

41. One advantage of the '914 patent is the more precise estimation of channel characteristics. (*See* '914 patent at 18:12–15.)

42. Another advantage of the patented invention is that it minimizes the quantity of feedback information and in turn reduces overhead. (*See* '914 patent at 18:35–39.)

43. Further advantages include higher information transfer rates, and more effective beamforming on transmitted signals. (*See* '914 patent at 18:40–45.)

DEFENDANTS' ACTIVITIES

44. ASUS makes, uses, sells, imports and/or provides or causes to be used ASUS Accused Products, which are wireless communications devices that communicate over wireless networks and/or operate according to the 802.11ax, 802.11ac, and/or similarly backward-compatible standards, such as the ASUS Exemplary Accused Products: the ASUS PN52 ExpertCenter MiniPC Computer, which contains a MediaTek MT7922 chip that it uses to communicate over wireless networks in an infringing manner, and the ASUS RT-AX89X AX6000 Dual Band router, which contains a Qualcomm IPQ8074 chip that it uses to communicate over wireless networks in an infringing manner. ASUS Accused Products include all ASUS wireless communications products that utilize a chip, chipset, SoC, or other semiconductor device provided by an unlicensed party (including, but not limited to Qualcomm, MediaTek, and/or NXP) that is used to communicate over wireless networks in an infringing manner as set forth below.

COUNT I – INFRINGEMENT OF U.S. PATENT NO. RE 48,629

45. BNR re-alleges and incorporates by reference the allegations of the foregoing paragraphs as if fully set forth herein.

46. Upon information and belief, the Defendants have and continue to directly infringe one or more claims of the '629 patent, including at least claim 1, making, using, selling, importing and/or providing and causing to be used the ASUS Accused Products. A set of charts showing exemplary infringement of the '629 patent by the ASUS Exemplary Accused Products is provided in Exhibit D to this Complaint.

47. The 802.11n standard was introduced on or about October 2009, and provides a definition for a High Throughput Long Training Field ("HT-LTF"). The first part of the HT-LTF "consists of one, two, or four HT-LTFs that are necessary for demodulation of the HT-Data portion of the PPDU" (i.e., Protocol Data Unit). The 802.11n standard provides a specific HT-LTF sequence that is transmitted in the case of 20 MHz operation. (*See* 802.11-2016 at 19.3.9.4.6 or 802.11-2009 at 20.3.9.4.6.)

48. Upon information and belief after a reasonable investigation, the ASUS Accused products, including at least the ASUS Exemplary Accused Products, infringe the '629 patent. The ASUS Accused Products are wireless communication devices that include a signal generator that generates an extended long training sequence. For instance, the ASUS Exemplary Accused Products are 802.11n compliant because they are each 802.11ac compliant, and, therefore, each uses a specific HT-LTF sequence that is transmitted in the case of 20 MHz operation. (*See* 802.11-2016 at 19.3.9.4.6 or 802.11-2009 at 20.3.9.4.6; *see, e.g.*, Ex. D.) This corresponds to the long training sequence with minimum peak-to-average power ratio described in the '629 patent. (*See id.*) Devices operating in accordance with the 802.11n standard (known as "wireless stations" or "STAs"), including the ASUS Exemplary Accused Products, must be able to generate the HT-LTF described.

49. The ASUS Accused Products, including the ASUS Exemplary Accused Products, include an Inverse Fourier Transformer operatively coupled to the signal generator. For instance, the ASUS Exemplary Accused Products are 802.11n compliant and, therefore, each uses an encoding process that requires a reverse Fourier transformer. (*See* 802.11-2016 and 19.3.4(b) or 802.11-2009 at 20.3.4(b); *see, e.g.*, Ex. D.)

50. The ASUS Accused Products, including the ASUS Exemplary Accused Products, include an Inverse Fourier Transformer (as explained above) that processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio. For instance, the ASUS Exemplary Accused Products are 802.11n compliant because they are 802.11ac compliant and, therefore, each processes the HT-LTF training sequence from the signal generator. (*See* 802.11-2016 at Figure 19-9 and 19.3.9.4.6; *see, e.g.*, Ex. D.) The IPQ8074 and MT7922 also provide an optimal HT-LTF training sequence with a minimal peak-to-average ratio. (*See* 802.11-2016 at 19.3.9.4.6 at Equation 19-23; *see, e.g.*, Ex. D.)

51. The ASUS Accused Products, including the ASUS Exemplary Accused Products, also include an optimal extended long training sequence that is carried by a greater number of subcarriers than a standard wireless networking configuration for an OFDM scheme. For instance, the ASUS Exemplary Accused Products are 802.11n compliant because they are 802.11ac compliant, and, therefore, each includes an optimal HT-LTF training sequence that is carried by a greater number of subcarriers than is standard for an OFDM scheme. (*See* 802.11-2016 at 19.3.9.4.6 at Equation 19-23 and additional subcarriers noted therein as compared to L-LT; *see, e.g.*, Ex. D)

52. The ASUS Accused Products also include an optimal extended long training sequence that is carried by exactly 56 active subcarriers. For instance, each ASUS Exemplary Accused Product is 802.11n compliant because it is 802.11ac compliant, and, therefore, includes an optimal HT-LTF training sequence that is carried by 56 active subcarriers. (*See* 802.11-2016 at 19.3.9.4.6; *see, e.g.,* Ex. D.)

53. The ASUS Accused Products also include an optimal extended long training sequence (as explained above) that is represented by encodings for indexed subcarriers -28 to +28, excluding indexed subcarrier 0 which is set to zero, as follows:

Sub-carrier	*−28*	*−27*	*−26*	*−25*	*−24*	*−23*	*−22*
Encoding	*+1*	*+1*	*+1*	*+1*	*−1*	*−1*	*+1*
Sub-carrier	*−14*	*−13*	*−12*	*−11*	*−10*	*−9*	*−8*
Encoding	*+1*	*+1*	*+1*	*−1*	*−1*	*+1*	*+1*
Sub-carrier	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Encoding	*+1*	*−1*	*−1*	*+1*	*+1*	*−1*	*+1*
Sub-carrier	*15*	*16*	*17*	*18*	*19*	*20*	*21*
Encoding	*+1*	*+1*	*−1*	*−1*	*+1*	*−1*	*+1*
Sub-carrier	*−21*	*−20*	*−19*	*−18*	*−17*	*−16*	*−15*
Encoding	*+1*	*−1*	*+1*	*−1*	*+1*	*+1*	*+1*
Sub-carrier	*−7*	*−6*	*−5*	*−4*	*−3*	*−2*	*−1*
Encoding	*−1*	*+1*	*−1*	*+1*	*+1*	*+1*	*+1*
Sub-carrier	*8*	*9*	*10*	*11*	*12*	*13*	*14*
Encoding	*−1*	*+1*	*−1*	*−1*	*−1*	*−1*	*−1*
Sub-carrier	*22*	*23*	*24*	*25*	*26*	*27*	*28*
Encoding	*−1*	*+1*	*+1*	*+1*	*+1*	*−1*	*−1.*

54. For instance, each ASUS Exemplary Accused Product is 802.11n compliant because it is 802.11ac compliant, and therefore includes an optimal HT-LTF training sequence that is represented by encodings for indexed subcarriers -28 to +28, excluding indexed subcarrier 0 according to the chart above. (*See* 19.3.9.4.6 at Equation 19-23; *see, e.g.*, Ex. D.)

55. Defendants have infringed and is infringing, individually and/or jointly, either literally or under the doctrine of equivalents, at least claim one claim of the ’629 patent, *e.g.*, claim 1, in violation of 35 U.S.C. §§ 271, *et seq*., directly or indirectly, by making, using, offering for sale, selling, offering for lease, leasing in the United States, and/or importing into the United States without authority or license, ASUS Accused Products, including the ASUS Exemplary Accused Products.

56. Upon information and belief, ASUS has been aware of the ’629 patent and its infringement thereof at least as early as December 3, 2017, when BNR sent a notice letter to ASUS.

57. Upon information and belief, since the Defendants have had knowledge of the ’629 patent, ASUS has induced and continues to induce others to infringe at least claim 1 of the ’629

patent under 35 U.S.C. § 271(b) by, among other things, and with specific intent or willful blindness, actively aiding and abetting others to infringe, including but not limited to ASUS's partners, clients, customers, and end users whose use of the ASUS Accused Products constitutes direct infringement of at least claim 1 of the '629 patent.

58. In particular, ASUS's actions that aid and abet others such as its partners, customers, clients, and end users to infringe include advertising and distributing the ASUS Accused Products and providing instruction materials, training, and services regarding the ASUS Accused Products. On information and belief, ASUS has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because ASUS has had actual knowledge of the '629 patent and knowledge that its acts were inducing infringement of the '629 patent since at least the date ASUS received notice that such activities infringed the '629 patent.

59. Upon information and belief, the Defendants have engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because the Defendants have had actual knowledge of the '629 patent and that its acts were inducing infringement of the '629 patent since ASUS has had knowledge of the '629 patent.

60. ASUS's infringement of the '629 patent is willful and deliberate, entitling BNR to enhanced damages and attorneys' fees.

61. ASUS's infringement of the '629 patent is exceptional and entitles BNR to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

62. BNR is entitled to recover from ASUS all damages that BNR has sustained as a result of Defendants' infringement of the '629 patent, including without limitation and/or not less than a reasonable royalty.

COUNT II – INFRINGEMENT OF U.S. PATENT NO. 8,416,862

63. BNR re-alleges and incorporates by reference the allegations of the foregoing paragraphs as if fully set forth herein.

64. Upon information and belief, ASUS has and continues to directly or indirectly infringe one or more claims of the '862 patent, *e.g.,* claim 1, by selling, offering to sell, making, using, and/or providing and causing to be used ASUS Accused Products that operate according to the 802.11ac standard, such as the ASUS Exemplary Accused Products. A chart showing exemplary infringement of the '862 patent by the ASUS Exemplary Accused Products is attached as Exhibit E.

65. The 802.11ac standard was introduced on or about December 2013, and provides a definition and standardization for channel sounding for beamforming for Multiple Input Multiple Output ("MIMO") RF radio links, including how a receiving wireless device communicates channel sounding to a base station. Beamforming requires the use of a steering matrix that improves the reception to the beamformee. The 802.11ac standard provides a specific way to compress the beamforming feedback matrix by the beamformee, and how to determine and decompose the estimated transmitter beamforming unitary matrix and compressed into angles for efficient transmission to the beamformer, which generates a next steering matrix. (*See* 802.11-2016 at 19.3.12.1.)

66. Upon information and belief after a reasonable investigation, the ASUS Accused Products, including at least the ASUS Exemplary Accused Products, infringe the '862 patent by providing a method for feeding back transmitter beamforming information from a receiving wireless communication device to a transmitting wireless communication device. For instance, the ASUS Exemplary Accused Products are 802.11ac compliant and therefore each provides a

compressed beamforming feedback matrix to a beamformer. (*See, e.g.*, 802.11-2016 at 19.3.12.1; Ex. E.)

67. The ASUS Accused Products, for example, receive a preamble sequence from a transmitting wireless device. For instance, each of the ASUS Exemplary Accused Products comprises an 802.11ac compliant receiver and, therefore, each receives a PHY preamble with HT-LTFs from a beamformer. (*See, e.g.*, 802.11-2016 at 19.3.13.1; Ex. E.)

68. The ASUS Accused Products include estimating a channel response based upon the preamble sequence. For instance, the ASUS Exemplary Accused Products are each 802.11ac compliant wireless devices and, therefore, each estimates a channel response as a result of receiving the HT-LTF's which are part of the PHY preamble. (*See, e.g.*, 802.11-2016 at 19.3.13.1; Ex. E.)

69. The ASUS Accused Products include determining an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U). For instance, the ASUS Exemplary Accused Products are 802.11ac compliant wireless devices, and therefore each calculates a beamforming unitary matrix V based on a singular value decomposition of the channel response H=UDV*, where D is a diagonal matrix and U is a receiver unitary matrix. (*See, e.g.*, 802.11-2016 at 19.3.12.3.6; Ex. E.)

70. The ASUS Accused Products include decomposing the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information. For instance, each ASUS Exemplary Accused Product is an 802.11ac compliant wireless device and, therefore, determines beamforming feedback matrices and compresses those into the form of angles. (*See, e.g.*, 802.11-2016 at 19.3.12.3.6; Ex. E.)

71. The ASUS Accused Products include wirelessly sending the transmitter beamforming information to the transmitting wireless device. For instance, each ASUS Exemplary Accused Product is an 802.11ac compliant wireless device and, therefore, wirelessly sends the compressed beamformed matrices to the beamformer. (*See, e.g.*, 802.11-2016 at 19.3.12.3.6; Ex. E.)

72. ASUS has infringed and is infringing, individually and/or jointly, either literally or under the doctrine of equivalents, at least one claim of the '862 patent, e.g. claim 1, in violation of 35 U.S.C. §§ 271, *et seq.*, directly and/or indirectly, by making, using, offering for sale, selling, offering for lease, leasing in the United States, and/or importing into the United States without authority or license, ASUS Accused Products, including the ASUS Exemplary Accused Products.

73. Upon information and belief ASUS has been aware of the '862 patent and its infringement thereof at least as early as December 3, 2017, upon the receipt of a notice letter from BNR.

74. Upon information and belief, since ASUS has had knowledge of the '862 patent, ASUS has induced and continues to induce others to infringe at least claim 1 of the '862 patent under 35 U.S.C. § 271(b) by, among other things, and with specific intent or willful blindness, actively aiding and abetting others to infringe, including but not limited to ASUS's partners, clients, customers, and end users across the country and in this District, whose use of the ASUS Accused Products constitutes direct infringement of at least one claim of the '862 patent.

75. In particular, ASUS's actions that aid and abet others such as its partners, customers, clients, and end users to infringe include advertising and distributing the ASUS Accused Products and providing instruction materials, training, and services regarding the ASUS Accused

Products. On information and belief, ASUS has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because ASUS has had actual knowledge of the '862 patent and knowledge that its acts were inducing infringement of the '862 patent since at least the date ASUS received notice that such activities infringed the '862 patent.

76. Upon information and belief, ASUS has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because ASUS has had actual knowledge of the '862 patent and that its acts were inducing infringement of the '862 patent since ASUS has had knowledge of the '862 patent.

77. ASUS's infringement of the '862 patent is willful and deliberate, entitling BNR to enhanced damages and attorneys' fees.

78. ASUS's infringement of the '862 patent is exceptional and entitles BNR to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

79. BNR is entitled to recover from ASUS all damages that BNR has sustained as a result of ASUS's infringement of the '862 patent, including without limitation and/or not less than a reasonable royalty.

80. Plaintiff has been harmed by ASUS's infringing activities.

COUNT III – INFRINGEMENT OF U.S. PATENT NO. 7,564,914

81. BNR re-alleges and incorporates by reference the allegations of the foregoing paragraphs as if fully set forth herein.

82. Upon information and belief, the Defendants have and continue to directly infringe one or more claims of the '914 patent, including at least claim 13, by selling, offering to sell, making, using, and/or providing and causing to be used instrumentalities that operate according to the 802.11ac standard, including the ASUS Accused Products. A chart showing exemplary

infringement of the '914 patent by the ASUS Exemplary Accused Products is attached as Exhibit F.

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

84. On information and belief after a reasonable investigation, the ASUS Accused Products infringe the '914 patent that provide a method for receiving data via a plurality of radio frequency (RF) channels utilizing a plurality of receiving antennas. For instance, each of the ASUS Exemplary Accused Products is an 802.11ac compliant wireless device that transmits data via a plurality of radio frequency (RF) channels utilizing a plurality of transmitting antennas. *See* Ex. F.

85. The ASUS Accused Products transmit feedback information via at least one of the plurality of RF channels. For instance, each of the ASUS Exemplary Accused Products is an 802.11ac compliant wireless device that transmits feedback information via at least one of the plurality of RF channels. *See* Ex. F.

86. The ASUS Accused Products request modification of a transmission mode based on the feedback information in transmitted response messages. For instance, each of the ASUS

Exemplary Accused Products is an 802.11ac compliant wireless device that modifies a transmission mode based on the feedback information. *See* Ex. F.

87. The ASUS Accused Products transmit, via at least one of the plurality of receiving antennas, the feedback information comprising channel estimates based on transmission characteristics of the received data. For instance, each of the ASUS Exemplary Accused Products is an 802.11ac compliant wireless device that transmits, via at least one of the plurality of receiving antennas, the feedback information comprising channel estimates based on transmission characteristics of the received data *See* Ex. F.

88. The ASUS Accused Products derive the feedback information from mathematical matrix decomposition of channel estimates. For instance, each of the ASUS Exemplary Accused Products is an 802.11ac compliant wireless device that derives the feedback information from mathematical matrix decomposition of channel estimates. *See* Ex. F.

89. ASUS has infringed and is infringing, individually and/or jointly, either literally or under the doctrine of equivalents, at least one claim of the ’914 patent, *e.g.*, claim 13, in violation of 35 U.S.C. §§ 271, *et seq.*, directly or indirectly, by making, using, offering for sale, selling, offering for lease, leasing in the United States, and/or importing into the United States without authority or license, the ASUS Accused Products.

90. On information and belief, these ASUS Accused Products are used, marketed, provided to, and/or used by or for ASUS’s partners, clients, customers and end users across the country and in this District.

91. Upon information and belief, ASUS has been aware of the ’914 patent and its infringement thereof at least as early as December 3, 2017, when BNR sent a notice letter to ASUS.

92. Upon information and belief, since ASUS has had knowledge of the '914 patent, ASUS has induced and continues to induce others to infringe at least claim 13 of the '914 patent under 35 U.S.C. § 271(b) by, among other things, and with specific intent or willful blindness, actively aiding and abetting others to infringe, including but not limited to ASUS's partners, customers, clients, and end users, whose use of the ASUS Accused Products constitutes direct infringement of at least claim 13 of the '914 patent.

93. In particular, ASUS's actions that aid and abet others such as its partners, customers, clients, and end users to infringe include advertising and distributing the ASUS Accused Products and providing instruction materials, training, and services regarding the ASUS Accused Products. On information and belief, ASUS has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because ASUS has had actual knowledge of the '914 patent and knowledge that its acts were inducing infringement of the '914 patent since at least the date ASUS received notice that such activities infringed the '914 patent.

94. Upon information and belief, ASUS has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because ASUS has had actual knowledge of the '914 patent and that its acts were inducing infringement of the '914 patent since ASUS has had knowledge of the '914 patent.

95. ASUS's infringement of the '914 patent is exceptional and entitles BNR to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

96. BNR is entitled to recover from ASUS all damages that BNR has sustained as a result of ASUS's infringement of the '914 patent, including without limitation and/or not less than a reasonable royalty.

97. Plaintiff has been harmed by ASUS's infringing activities.

JURY DEMAND

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, BNR demands a trial by jury on all issues triable as such.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff BNR demands judgment for itself and against the Defendant as follows:

A. An adjudication that each Defendant has infringed each of U.S. Patent Nos. RE 48,629, 8,416,862, and 7,564,914;

B. An award of damages to be paid by Defendants adequate to compensate BNR for Defendants' past infringement of each of U.S. Patent Nos. RE 48,629, 8,416,862, and 7,564,914, and any continuing or future infringement through the date such judgment is entered, including interest, costs, expenses, and an accounting of all infringing acts including, but not limited to, those acts not presented at trial;

C. Enhanced damages for willful infringement;

D. A declaration that this case is exceptional under 35 U.S.C. § 285, and an award of BNR's reasonable attorneys' fees; and

E. An award to BNR of such further relief at law or in equity as the Court deems just and proper.

Dated: June 20, 2023

/s/ Clifford Chad Henson

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