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

GENERAL ACCESS SOLUTIONS, LTD., Plaintiff, v. SPRINT CORPORATION, VIRGIN MOBILE USA, L.P. and BOOST MOBILE LLC., Defendants.	**Civil Action No. _____** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff General Access Solutions, LTD ("GAS" or "Plaintiff"), for its Complaint against Defendants Sprint Communications, Inc., ("Sprint"), Boost Mobile LLC ("Boost"), and Virgin Mobile USA L.P. ("Virgin Mobile"), 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 GAS is a domestic limited partnership organized under the laws of the State of Texas with a place of business in Dallas, TX 75219. GAS (formerly known as "Access Solutions, Ltd.") was previously associated with Raze Technologies, Inc. (see below), which had an office at 2540 Plano Pkwy Suite 188 Plano TX 75074. Further, GAS maintained and

maintains storage facilities for documents and equipment at 2560 Kathryn Lane Plano TX, 75025.

3. Upon information and belief, Sprint is a Delaware corporation with its principal place of business at 6200 Sprint Parkway, Overland Park, KS 66251. Sprint can be served with process through its registered agent, Corporation Service Company, 2711 Centerville Road, Suite 400, Wilmington, DE 19808.

4. Upon information and belief, Virgin Mobile is a New Jersey corporation with its principal place of business at 10 Independence Boulevard Warren, NJ 07059, United States. Virgin Mobile can be served with process through its registered agent, Corporation Service Company, 2711 Centerville, Rd., Suite 400, Wilmington, Delaware 19808. On information and belief, Virgin Mobile is a wholly owned subsidiary of Sprint.

5. Upon information and belief, Boost Mobile LLC ("Boost") is a California corporation with its principal place of business at 9060 Irvine Center Dr. Irvine, CA 92618. On information and belief, Boost is a wholly owned subsidiary of Sprint. Boost can be served with process through its registered agent, Corporation Service Company, 2711 Centerville, Rd., Suite 400, Wilmington, Delaware 19808. Sprint, Virgin Mobile, and Boost are each individually referred to herein as a "Defendant," and collectively as "Defendants."

6. Upon information and belief, each of Defendants sells and offers to sell products and services throughout the United States, including in this judicial district, and introduces products and services into the stream of commerce and that incorporate infringing technology knowing that they would be sold in this judicial district and elsewhere in the United States.

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

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

9. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b), (c), (d) and/or 1400(b). On information and belief, each of Defendants conducts business in this district, the claims alleged in this Complaint arise in this District, and acts of infringement have taken place and are continuing to take place in this District.

10. On information and belief, each Defendant is subject to this Court's general and specific personal jurisdiction because each Defendant has sufficient minimum contacts within the State of Texas and this District (including via sales of each Defendant's services to investors), pursuant to due process and/or the Texas Long Arm Statute, because each Defendant purposefully availed itself of the privileges of conducting business in the State of Texas and in this District, because each Defendant regularly conducts and solicits business within the State of Texas and within this District, and because GAS's causes of action arise directly from each of Defendants' business contacts and other activities in the State of Texas and this District.

BACKGROUND

11. Around the year 2000, several major wireless carriers, including Sprint, implemented "3G" (third-generation wireless technology) wireless networks that were primarily designed around voice services. Around that time, anticipating the future increasing demand for wireless data services (e.g., email, internet browsing, application downloads, and video services) in the wireless industry, WestEnd Broadband worked in earnest on research and development of next generation wireless communications networks.

12. In 2000-2001, WestEnd Broadband, Inc., a Texas corporation, changed its name to Raze Technologies, Inc. In or around December 2001, Access Solutions, Ltd. assisted with the restructuring of the business of Raze Technologies, Inc. into a Delaware entity of the same

name. Access Solutions, Ltd. subsequently underwent a name change in 2011 to General Access Solutions, Ltd., ("GAS").

13. Continuing the work of WestEnd Broadband, Inc., the Texas and Delaware Raze entities (collectively "RAZE") continued to pioneer the development of wireless telecommunications equipment, sometimes referred to as "4G" networks, which would accommodate voice and broadband data services as well as provide heightened reliability and Quality of Service (QOS). In the years 2000-2002, RAZE successfully designed, developed, built and tested 4G wireless networks in Texas.

14. As part of that effort, on April 20, 2001 and September 5, 2001, a number of patent applications were filed of behalf of inventors including Paul Struhsaker, Robert R. Nelson, and Russell C. McKown, among others. Three of those applications, 09/839,456, 09/839,458, and 09/948,050 lead to U.S. Patent Nos. 6,891,810, 7,173,916, and 7,230,931 respectively.

15. On information and belief, 4G networks provide increased bandwidth and throughput and are noticeably faster with respect to data services than 3G networks. At the time RAZE was developing its 4G technology, however, the available spectrum necessary to implement 4G networks was limited and owned by entities that were not positioned to invest and deploy this technology. For instance, Sprint and Clearwire Corporation owned licenses for spectrums in the 2500-2700 MHz range, which is suitable for 4G networking. Clearwire was ultimately acquired by Sprint in 2013. (*See* http://newsroom.sprint.com/news-releases/sprint-completes-acquisition-of-clearwire.htm.)

16. On information and belief, at the time RAZE was developing its 4G technology, Sprint and Clearwire were heavily invested in 3G technologies, and therefore did not utilize (or substantially utilize) their spectrum for 4G wireless networking. Similarly, the other major

wireless carriers were reluctant to invest in 4G technology before realizing a return on their investments in 3G technology and infrastructure. Transitioning to 4G technology required significant infrastructure improvements relative to earlier technologies. Additionally, the public's demand for both data and voice services was not evident to the major wireless carriers because "smartphones," such as the immensely popular iPhone and later Android phones, which have both high-speed data and voice functionality, had yet to be introduced to the public.

17. During 2001-2002, Sprint and Clearwire each engaged RAZE about conducting a "field trial" of RAZE's 4G technology for a six-month period. In addition to executing Confidentiality Agreements with Sprint and Clearwire, RAZE produced data sheets and other confidential information relating to its technology to Sprint and Clearwire. Because the field test was prohibitively expensive for RAZE, the field test was never conducted. Further, on information and belief, Sprint had knowledge of the '810, '916, and '931 patents and/or the applications leading to those patents, the technologies of which were implemented in the IEEE 802.16 specification (commonly referred to as "WiMAX" (see below)).

THE INFRINGING INSTRUMENTALITIES

On information and belief, Defendants' products and services currently operate and/or have operated utilizing "WiMAX" (Worldwide Interoperability for Microwave Access) and/or "LTE" (Long-Term Evolution) networks, both of which are 4G technologies. Both technologies are built to support Internet Protocol (IP) communications and are capable of high speed data transmission.

18. On information and belief, WiMAX is a wireless industry trade name for the IEEE 802.16 standards for broadband wireless access (BWA) networks. According to the

WiMAX Forum (a wireless industry coalition supporting the advancement of WiMAX technologies), the group's aim is to promote and certify compatibility and interoperability of devices based on a standard (the "802.16 specification," or "WiMAX Standards"), and to develop such devices, or support their development, for the marketplace.

19. On information and belief, three employees of RAZE, Robert R. Nelson, Russell C. McKown, and Paul Struhsaker, were voting members of the working group that formulated the WiMAX Standards. Because the applications leading to the '916, '810, and '931 patents were essential for the use of the WiMAX Standards under development, on information and belief, RAZE disclosed those patent applications to the WiMAX Standards committee.

20. Pursuant to relevant policies governing the standards organization, RAZE thus agreed to license users of WiMAX technology on fair, reasonable, and non-discriminatory (FRAND) terms. Plaintiff intends to abide by such terms by furnishing a courtesy copy of this Complaint upon filing, in advance of service, so that the Parties may amicably determine such a FRAND royalty. GAS intends to negotiate such FRAND terms in good faith, and will be amenable to a continued delay of service and/or an immediate stay of the matter if Defendant also negotiates in good faith, so that no party need bear any unnecessary cost or expense. If Defendants contests the obligation to abide by such terms, through action or inaction, then Plaintiff shall proceed against Defendant as an unwilling licensee and pursue the highest damages and/or other relief available under the law. (To the extent any of U.S. Patent Nos. 6,891,810, 7,173,916, and 7,230,931 are subject to a FRAND obligation related to LTE technology, as described below, Plaintiff intends to abide by such terms in the same manner.)

21. On information and belief, Sprint participated in meetings held by the working group during the development of the WiMAX Standards. Sprint is also currently listed as a

"WiMAX Forum member." (*See e.g.* http://resources.WiMAXforum.org/about/members/sprint-nextel; *See e.g.* Nuaymi, *WiMAX: Technology for Broadband Access* at 15.) The WiMAX Forum's goal is to accelerate the adoption, deployment and expansion of WiMAX technologies across the globe while facilitating roaming agreements, sharing best practices within the forum and certifying products. (*See e.g.* http://www.WiMAXforum.org/about.)

22. On information and belief, as a member of the WiMAX Forum, Sprint would have been involved in the development of the WiMAX Standards in some capacity. For instance, some of the benefits of being a WiMAX Forum member include "[i]nfluenc[ing] the development of WiMAX™ technology through involvement in Working Groups." (*See e.g.* http://www.WiMAXforum.org/membership/membership-benefits.) Accordingly, on information and belief, Sprint would have known about the existence of the '810, '916, and '931 patents, and/or the applications leading thereto, which are embodied in the WiMAX Standards, and which were disclosed to the WiMAX working group in accordance with applicable policies. As noted above, Sprint and Clearwire also had knowledge of the applications and/or then-confidential technologies leading to the '810, '916, and '931 patents in their previous communications with RAZE during 2001-2002 with respect to the proposed field tests.

23. On information and belief, LTE technology is managed by an organization of interested parties called the 3rd Generation Partnership Project (3GPP). 3GPP was originally developed to support the Global System for Mobile Communications (GSM) standard. (*See e.g. White Paper, WiMAX versus Long Term Evolution (LTE) Wireless Air Interface Standards, available at* http://www.utccanada.org/sites/default/files/public/UTC_Public_files/UTC%20-%20LTE%20vs%20WiMAX%202012.pdf..) The specifications of these efforts are formally

known as the "evolved UMTS terrestrial radio access" (E-UTRA) and "evolved UMTS terrestrial radio access network" (E-UTRAN), ("LTE Standards"). (*See e.g.* http://www.kemtold.fei.tuke.sk/predmety/MobilneKomunikacie/_materialy/Podklady/LTE/LTE%2520and%2520WiMAX%2520Overview%5B1%5D.pdf, at 5.)

24. On information and belief, the LTE Standards were significantly influenced by the WiMAX Standards. Unlike the organization governing the development and adoption of the WiMAX Standards, the governing body related to the LTE Standards was relatively exclusive. In particular, it was effectively limited to a small number of major carriers and equipment makers. High participation fees and other barriers limited the ability of smaller entities like RAZE to participate.

25. Nevertheless, on information and belief, with the exception of some minor variations, the LTE Standards adopted the core framework of the WiMAX Standards. This occurred in part because a number of the major carriers and equipment makers, including Sprint, participated in or observed meetings related to the development of the WiMAX Standards. As a result, the two sets of standards include much of the same core technology. For instance, the LTE Standards define a physical layer radio access technology based on Orthogonal Frequency Division Multiple Access (OFDMA) for the downlink, similar in concept to the PHY layer of Mobile WiMAX.

26. Beginning in the mid to late 2000s, the cellular industry changed dramatically with the rising popularity of smartphones, which combine the features of a mobile cell phone with a personal computer operating system capable of wirelessly transmitting data over the carrier's network. The great demand for smartphones with high-speed data functionality prompted the major wireless cellular carriers to invest heavily in 4G networks, such as WiMAX and LTE, and

to use their existing licenses, acquire licenses from other owners, or purchase licenses from the FCC for increased bandwidth capacity in the 700 MHz, 1700-2100 MHz, 1900MHz and 2500-2700 MHz spectrums. (*See e.g.* http://www.tmonews.com/2014/12/fcc-speeds-up-aws-3-auction-as-bids-reach-41-billion/.) Consequently, most of the wireless carriers began to transition from 3G networks to 4G (WiMAX and LTE) networks.

27. On information and belief, each Defendants' systems, equipment, and software used to deliver cellular voice and/or data services to users, as well as the processes and methods for delivering such services (collectively the "Accused Instrumentalities"), currently operate or have operated in compliance with the WiMAX and/or LTE technical standards. Specifically, Sprint's wireless products and services implemented the WiMAX Standards at least from 2008 to the present day. In October of 2011, Sprint announced its intention to transition from 4G WiMAX to 4G LTE beginning in November 2015. (*See e.g.* http://gizmodo.com/5847643/its-official-sprint-is-going-lte.) Accordingly, on information and belief, during periods relevant to this Complaint, Sprint's Accused Instrumentalities operated in compliance with either the WiMAX or LTE Standards, or both.

28. In addition, as of the date of the filing of this complaint, Virgin Mobile, a "pre-paid" wireless service owned by Sprint and operating on Sprint's WiMAX and LTE network, discloses a coverage map showing "4G (WiMAX)" and "4G LTE" capability. (*See e.g.* http://www.virginmobileusa.com/check-cell-phone-coverage.) On information and belief, Virgin Mobile utilizes, at least in part, the Sprint Network.

29. Further, as of the date of the filing of this complaint, Boost, a "pre-paid" wireless service owned by Sprint and operating on Sprint's "4G LTE network," discloses a coverage map

showing "4G LTE Data Coverage." (*See e.g.* https://www.boostmobile.com/#!/coveragemap/.) Therefore, on information and belief, Boost utilizes, at least in part, the Sprint Network.

30. On information and belief, each of Defendants' Accused Instrumentalities that operate in conjunction with the WiMAX Standards ("WiMAX Accused Instrumentalities") practice claims 1-14 of the '810 patent, claims 1-16 of the '916 patents, and claims 1-29 of the '931 patent.

31. On information and belief, each of Defendants' products and methods that operate in conjunction with the LTE Standards ("LTE Accused Instrumentalities") practice claims 1-14 of the '810 patent, claims 1-16 of the '916 patents, and claims 1, 10, and 19, 24, 28, and 29 of the '931 patent.

COUNT I – INFRINGEMENT OF U.S. PATENT NO. 6,891,810

32. The allegations set forth in the foregoing paragraphs 1 through 31 are incorporated into this First Claim for Relief.

33. On May 10, 2005, the '810 patent entitled "Wireless Access System and Associated Method Using Multiple Modulation Formats in TDD Frames According to Subscriber Service Type" was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '810 patent is attached as Exhibit 1.

34. The inventions of the '810 patent resolve technical problems related to the use of a wireless access communications network. For example, the inventions allow parties to provide an improved air interface system for use in a fixed wireless access network that improves usage of the available bandwidth in a cell site. Specifically, as an example of the inventions recited, the system uses multiple modulation groups in the air interface to transmit data to, and to receive data from, a subscriber access device in a cell site and/or a sector within a cell site.

35. The claims of the'810 patent recite one or more inventive concepts that are rooted in wireless communications technology, and overcome problems specifically arising in the realm of wireless communications technology.

36. The claims of the '810 patent recite an invention that is not merely the routine or conventional use of the wireless access communications technology. Instead, to optimize transmission quality for voice and data services, channel conditions between the user equipment (e.g., mobile cell phone and/or computer laptop) and the network base station are dynamically monitored to reduce interference and transmission errors. The '810 patent claims thus specify how the data link between the base station and the user equipment is monitored and configured to yield an improved communications link.

37. The technology claimed in the '810 patent does not preempt all ways of using wireless access communications systems, nor preempt the use of all wireless access communications systems, nor preempt any other well-known or prior art technology.

38. Accordingly, each claim of the '810 patent recites a combination of elements sufficient to ensure that the claim in practice amounts to significantly more than a patent on an ineligible concept.

39. GAS is the assignee and owner of the right, title and interest in and to the '810 patent, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them.

40. Upon information and belief, each Defendant has and continues to directly infringe one or more of claims 1-14 of the '810 patent by making, using, selling, importing and/or providing and causing to be used WiMAX Infringing Instrumentalities and/or LTE

Infringing Instrumentalities, including a wireless access communications system, and related equipment, software and methods, that practice the WiMAX and/or LTE Standards.

41. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 1 of the '810 patent. Claim 1 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to the same wireless access device over time.

42. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 1 of the '810 patent. Claim 1 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. (*See e.g.* IEEE 802.16-2012 at 5; *See also e.g.* IEEE Std 802.16™-2009 at p. 13); Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. (*See e.g.* IEEE 802.16-2012 at p. 5-1, 5-2.) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to the same wireless access device over time. (*See e.g.* IEEE Std 802.16™-2009 at. 293; *See e.g. Nuavami, Technology for Broadband Wireless Access*, at 137.)

43. On information and belief, the LTE Infringing Instrumentalities infringe claim 1 of the ‘810 patent. Claim 1 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex (“TDD”) frames. (*See e.g.* 3GPP TS 36.3 V8.7.0 (2008-12) Technical Specification at p. 23, 24); Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. (*See e.g.* 3GPP TS 36.300 V8.7.0 (2008-12) at 24.) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to the same wireless access device over time. (*See e.g.* 3GPP TS 36.3 V8.7.0 (2008-12) at 68.)

44. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 2 of the ‘810 patent, which depends from claim 1. Claim 2 recites the modem shelf in claim 1 wherein the modulation controller determines the first and second optimum configurations based on channel quality conditions associated with a first channel used to communicate with the first wireless access device, and at least two service types associated with different downlink data.

45. The WiMAX Infringing Instrumentalities infringe claim 2 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include the modulation controller that determines the first and second optimum configurations based on channel quality conditions associated with a first channel used to communicate with the first wireless access device, and at least two service types associated with different downlink data. (*See e.g.* IEEE 802.16-2012 at 293.)

46. The LTE Infringing Instrumentalities infringe claim 2 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include the modulation controller that determines the first and second optimum configurations based on channel quality conditions associated with a first channel used to communicate with the first wireless access device, and at least two service types associated with different downlink data. (*See e.g.* Section 11.1 of 3GPP TS 36.213 V8.8.0 (2009-09.))

47. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 3 of the ‘810 patent, which depends from claim 2. Claim 3 recites the radio frequency modem described in claim 2, wherein the first and second modulation configurations comprises different modulation formats.

48. The WiMAX Infringing Instrumentalities infringe claim 3 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include a radio frequency modem described in claim 2, wherein the first and second modulation configurations comprises different modulation formats. (*See e.g.* IEEE 802.16-2012 at 383, 411.)

49. The LTE Infringing Instrumentalities infringe claim 3 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include a radio frequency modem described in claim 2, wherein the first and second modulation configurations comprises different modulation formats. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09))

50. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 4 of the ‘810 patent, which depends from claim 3. Claim 4 recites the radio frequency modem shelf described in claim 3, wherein the second modulation format is more complex than the first modulation format if said first service type requires a lower bit error rate than said second service type.

51. The WiMAX Infringing Instrumentalities infringe claim 4 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include a radio frequency modem shelf described in claim 3, wherein the second modulation format is more complex than the first modulation format if said first service type requires a lower bit error rate than said second service type. (*See e.g.* IEEE 802.16-2012 at 822.)

52. The LTE Infringing Instrumentalities infringe claim 4 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include a radio frequency modem shelf described in claim 3, wherein the second modulation format is more complex than the first modulation format if said first service type requires a lower bit error rate than said second service type. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09))

53. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 5 of the ‘810 patent, which depends from claim 4. Specifically, claim 5 recites the radio frequency modem shelf of claim 4, wherein the first and second modulation formats comprise one of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM).

54. The WiMAX Infringing Instrumentalities infringe claim 5 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include an RF modem shelf as set forth in claim 4, wherein said first and second modulation formats comprise one of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g.*, IEEE 802.16-2012 at 765; *see also e.g.*, Nuaymi, *WiMAX: Technology for Broadband Wireless Access* at 45.)

55. The LTE Infringing Instrumentalities infringe claim 5 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include an RF modem shelf as set forth in

claim 4, wherein said first and second modulation formats comprise one of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09.))

56. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 6 of the ‘810 patent, which depends from claim 3. Claim 6 recites the radio frequency modem shelf described in claim 3, wherein the first and second modulation configurations comprises different forward error correction code levels.

57. The WiMAX Infringing Instrumentalities infringe claim 6 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include the radio frequency modem shelf described in claim 3, wherein the first and second modulation configurations comprises different forward error correction code levels. (*See e.g.* IEEE 802.16-2012 at 490, 552.)

58. The LTE Infringing Instrumentalities infringe claim 6 of the ‘810 patent. Specifically, the LTE Inf=ringing Instrumentalities include the radio frequency modem shelf described in claim 3, wherein the first and second modulation configurations comprises different forward error correction code levels. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

59. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 7 of the ‘810 patent, which depends from claim 1. Claim 7 recites the radio frequency modem shelf of claim 6, wherein the first error correction code level is more complex than said second error correction code level if the first service type requires a lower bit error rate than the second service type.

60. The WiMAX Infringing Instrumentalities infringe claim 7 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include the radio frequency modem shelf

of claim 6, wherein the first error correction code level is more complex than said second error correction code level if the first service type requires a lower bit error rate than the second service type. (*See e.g.* IEEE 802.16-2012 at 490, 552.)

61. The LTE Infringing Instrumentalities infringe claim 7 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include the radio frequency modem shelf of claim 6, wherein the first error correction code level is more complex than said second error correction code level if the first service type requires a lower bit error rate than the second service type. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

62. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 8 of the ‘810 patent. Claim 8 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex (“TDD”) frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to the same wireless access device over time.

63. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 8 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex (“TDD”) frames. (*See e.g.* IEEE 802.16-2012 at 5; *See also e.g.* IEEE Std 802.16™-2009 at p. 13); Each TDD frame contains an uplink for receiving data and a downlink for transmitting

data. (*See e.g.* IEEE 802.16-2012 at p. 5-1, 5-2.) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to the same wireless access device over time. (*See e.g.* IEEE Std 802.16™-2009 at. 293; *See e.g. Nuavami, Technology for Broadband Wireless Access*, at 137.)

64. On information and belief, the LTE Infringing Instrumentalities infringe claim 8 of the '810 patent. The LTE Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. (*See e.g.* 3GPP TS 36.3 V8.7.0 (2008-12) Technical Specification at p. 23, 24); Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. (*See e.g.* 3GPP TS 36.300 V8.7.0 (2008-12) at 24.) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to the same wireless access device over time. (*See e.g.* 3GPP TS 36.3 V8.7.0 (2008-12) at 68.)

65. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 9 of the '810 patent, which depends from claim 8. Claim 9 recites the modem shelf in claim 1 wherein the modulation controller determines the first and second optimum configurations based on channel quality conditions associated with a first channel used to communicate with the first wireless access device, and at least two service types associated with different downlink data.

66. The WiMAX Infringing Instrumentalities infringe claim 9 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include the modulation controller that determines the first and second optimum configurations based on channel quality conditions associated with a first channel used to communicate with the first wireless access device, and at least two service types associated with different downlink data. (*See e.g.* IEEE 802.16-2012 at 293.)

67. The LTE Infringing Instrumentalities infringe claim 9 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include the modulation controller that determines the first and second optimum configurations based on channel quality conditions associated with a first channel used to communicate with the first wireless access device, and at least two service types associated with different downlink data. (*See e.g.* Section 11.1 of 3GPP TS 36.213 V8.8.0 (2009-09.))

68. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 10 of the ‘810 patent, which depends from claim 9. Claim 10 recites the wireless access network described in claim 9, wherein the first and second modulation configurations comprises different modulation formats.

69. The WiMAX Infringing Instrumentalities infringe claim 10 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include a radio frequency modem described in claim 9, wherein the first and second modulation configurations comprises different modulation formats. (*See e.g.* IEEE 802.16-2012 at 383, 411.)

70. The LTE Infringing Instrumentalities infringe claim 10 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include the wireless access network described

in claim 9, wherein the first and second modulation configurations comprises different modulation formats. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09))

71. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 11 of the '810 patent, which depends from claim 10. Claim 11 recites the wireless access network described in claim 10, wherein the second modulation format is more complex than the first modulation format if said first service type requires a lower bit error rate than said second service type.

72. The WiMAX Infringing Instrumentalities infringe claim 11 of the '810 patent. Specifically, the WiMAX Infringing Instrumentalities include the wireless access network described in claim 10, wherein the second modulation format is more complex than the first modulation format if said first service type requires a lower bit error rate than said second service type. (*See e.g.* IEEE 802.16-2012 at 822.)

73. The LTE Infringing Instrumentalities infringe claim 11 of the '810 patent. Specifically, the LTE Infringing Instrumentalities include a radio frequency modem shelf described in claim 10, wherein the second modulation format is more complex than the first modulation format if said first service type requires a lower bit error rate than said second service type. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09))

74. The WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities claim 12 of the '810 patent, which depends from claim 11. Specifically, claim 12 recites the wireless access network of claim 11, wherein the first and second modulation formats comprise one of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM).

75. The WiMAX Infringing Instrumentalities infringe claim 12 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include an RF modem shelf as set forth in claim 4, wherein said first and second modulation formats comprise one of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g*., IEEE 802.16-2012 at 765; *see also e.g*., Nuaymi, *WiMAX: Technology for Broadband Wireless Access* at 45.)

76. The LTE Infringing Instrumentalities infringe claim 12 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include the wireless access network as set forth in claim 11, wherein said first and second modulation formats comprise one of quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09.))

77. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 13 of the ‘810 patent, which depends from claim 8. Claim 13 recites the wireless access network described in claim 9, wherein the first and second modulation configurations comprises different forward error correction code levels.

78. The WiMAX Infringing Instrumentalities infringe claim 13 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include the wireless access network described in claim 9, wherein the first and second modulation configurations comprises different forward error correction code levels. (*See e.g.* IEEE 802.16-2012 at 464, 490, and 552.)

79. The LTE Infringing Instrumentalities infringe claim 13 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include the wireless access network described in claim 9, wherein the first and second modulation configurations comprises different forward error correction code levels. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

80. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 14 of the ‘810 patent, which depends from claim 8. Claim 14 recites the wireless access network described in claim 13, wherein the first error correction code level is more complex than said second error correction code level if the first service type requires a lower bit error rate than the second service type.

81. The WiMAX Infringing Instrumentalities infringe claim 14 of the ‘810 patent. Specifically, the WiMAX Infringing Instrumentalities include the wireless access network of claim 13, wherein the first error correction code level is more complex than said second error correction code level if the first service type requires a lower bit error rate than the second service type. (*See e.g.* IEEE 802.16-2012 at 490, 552.)

82. The LTE Infringing Instrumentalities infringe claim 14 of the ‘810 patent. Specifically, the LTE Infringing Instrumentalities include the radio frequency modem shelf of claim 13, wherein the first error correction code level is more complex than said second error correction code level if the first service type requires a lower bit error rate than the second service type. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

83. On information and belief, the Accused Instrumentalities are used marketed, provided to, and/or used by or for each Defendant’s partners, clients, customers and end users across the country and in this District.

84. Upon information and belief, since at least the time each Defendant received notice, Defendant has induced and continues to induce others to infringe at least one claim of the ’810 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 each

Defendant's partners, clients, customers, and end users, whose use of the Accused Instrumentalities constitutes direct infringement of at least one claim of the '810 patent.

85. In particular, each Defendant's actions that aid and abet others such as its partners, customers, clients, and end users to infringe include advertising and distributing the Accused Instrumentalities and providing instruction materials, training, and services regarding the Accused Instrumentalities. On information and belief, each Defendant has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because each Defendant has had actual knowledge of the '810 patent and knowledge that its acts were inducing infringement of the '810 patent since at least the date each Defendant received notice that such activities infringed the '810 patent.

86. Upon information and belief, each Defendant is liable as a contributory infringer of the '810 patent under 35 U.S.C. § 271(c) by offering to sell, selling and importing into the United States wireless communications devices to be especially made or adapted for use in an infringement of the '810 patent. The Accused Instrumentalities are a material component for use in practicing the '810 patent and are specifically made and are not a staple article of commerce suitable for substantial non-infringing use.

87. GAS has been harmed by each Defendant's infringing activities.

COUNT II – INFRINGEMENT OF U.S. PATENT NO. 7,173,916

88. The allegations set forth in the foregoing paragraphs 1 through 87 are incorporated into this Second Claim for Relief.

89. On February 6, 2007, U.S. Patent No. 7,173,916 ("the '916 patent"), entitled "Wireless Access System Using Multiple Modulation Formats in TDD Frames and Method of Operation," was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the '916 patent is attached as Exhibit 2.

90. The inventions of the ’916 patent resolve technical problems related to the use of wireless communications technology. For example, the inventions allow parties to provide an improved air interface system for use in a fixed wireless access network that maximizes usage of the available bandwidth in a cell site. Specifically, the system uses multiple modulation groups in the air interface to transmit data to, and to receive data from, a subscriber access device in a cell site and/or a sector within a cell site.

91. The claims of the ‘916 patent recite one or more inventive concepts that are rooted in wireless communications technology, and overcome problems specifically arising in the realm of wireless communications technology.

92. The claims of the ’916 patent recite an invention that is not merely the routine or conventional use of the wireless access communications technology. Instead, to optimize transmission quality for voice and data services, channel conditions between the user equipment (e.g., mobile cell phone and/or computer laptop) and the network base station are dynamically monitored to reduce interference and transmission errors. The ’916 patent claims thus specify how the data link between the base station and the user equipment is monitored and configured to yield an optimized communications link.

93. The technology claimed in the ‘916 patent does not preempt all ways of using wireless communications technology, nor preempt the use of wireless communications technology, nor preempt any other well-known or prior art technology.

94. Accordingly, each claim of the ‘916 patent recites a combination of elements sufficient to ensure that the claim in practice amounts to significantly more than a patent on an ineligible concept.

95. GAS is the assignee and owner of the right, title and interest in and to the ‘916 patent, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them.

96. Upon information and belief, each Defendant has and continues to directly infringe one or more claims of the ‘916 patent by making, using, selling, importing and/or providing and causing to be used a wireless network implementing the WiMAX and LTE Standards.

97. Upon information and belief, Defendant has and continues to directly infringe one or more claims of the ‘916 patent by making, using, selling, importing and/or providing and causing to be used a mobile wireless network implementing the WiMAX and LTE Standards.

98. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 1 of the ‘916 patent. Claim 1 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex (“TDD”) frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access devices over time.

99. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 1 of the ‘916 patent. The WiMAX Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex (“TDD”)

frames. (*See e.g.* IEEE 802.16-2012 at 5; *See also e.g.* IEEE Std 802.16™-2009 at p. 13); Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. (*See e.g.* IEEE 802.16-2012 at p. 5-1, 5-2.) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access devices over time. (*See e.g.* IEEE Std 802.16™-2009 at. 293; *See e.g. Nuavami, Technology for Broadband Wireless Access*, at 137.)

100. On information and belief, the LTE Infringing Instrumentalities infringe claim 1 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. (*See e.g.* 3GPP TS 36.201 V8.3.0 (2009-03) Technical Specification at Section 4.2.1, p. 26); Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. (*See e.g.* 3GPP TS 36.300 V8.7.0 (2008-12.)) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices, and adjusts the modulation configuration over time so that different configurations are used to send data to the different wireless access device over time. (*See e.g.* Section 11.1 of 3GPP TS 36.213 V8.8.0 (2009-09.))

101. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 2 of the '916 patent, which depends from claim 1. Claim 2 recites the radio frequency modem shelf in claim 1 wherein the modulation controller

determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices.

102. The WiMAX Infringing Instrumentalities infringe claim 2 of the ‘916 patent. Specifically, the WiMAX Infringing Instrumentalities include the radio frequency modem shelf in claim 1 wherein the modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. (*See e.g.* IEEE 802.16-2009 at 468.)

103. The LTE Infringing Instrumentalities infringe claim 2 of the ‘916 patent. Specifically, the LTE Infringing Instrumentalities include the radio frequency modem shelf in claim 1 wherein the modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. (*See e.g.* Section 11.1 of 3GPP TS 36.213 V8.8.0 (2009-09) at 33.)

104. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 3 of the ‘916 patent, which depends from claim 1. Claim 3 recites the radio frequency modem described in claim 2, wherein the first and second modulation configurations comprise different modulation formats.

105. The WiMAX Infringing Instrumentalities infringe claim 3 of the ‘916 patent. Specifically, the WiMAX Infringing Instrumentalities include a radio frequency modem described in claim 2, wherein the first and second modulation configurations comprise different modulation formats. (*See e.g.* IEEE 802.16-2012 at 822.)

106. The LTE Infringing Instrumentalities infringe claim 3 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include a radio frequency modem described in claim 2, wherein the first and second modulation configurations comprise different modulation formats. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09))

107. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 4 of the '916 patent, which depends from claim 1. Claim 4 recites the radio frequency modem shelf described in claim 3, wherein the second modulation format is more complex than the first modulation format if the first channel used to communicate with the first wireless access device is noisier than the second channel used to communicate with the second wireless access device.

108. The WiMAX Infringing Instrumentalities infringe claim 4 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include the radio frequency modem shelf described in claim 3, wherein the second modulation format is more complex than the first modulation format if the first channel used to communicate with the first wireless access device is noisier than the second channel used to communicate with the second wireless access device. (*See e.g.* IEEE 802.16-2012 at 822.)

109. The LTE Infringing Instrumentalities infringe claim 4 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include the radio frequency modem shelf described in claim 3, wherein the second modulation format is more complex than the first modulation format if the first channel used to communicate with the first wireless access device is noisier than the second channel used to communicate with the second wireless access device. (*See e.g.* 3GPP TS 36.213 V8.8.0 (2009-09) at 48.)

110. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities claim 5 of the '916 patent, which depends from claim 4. Specifically, claim 5 recites the radio frequency modem shelf of claim 4, wherein the first and second modulation formats comprise one of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM).

111. The WiMAX Infringing Instrumentalities infringe claim 5 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include an RF modem shelf as set forth in claim 4, wherein said first and second modulation formats comprise one of quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g.*, http://perso.telecom-paristech.fr/~coupecho/publis/vtc08spring1.pdf.; *see* e.g., 802.16 (2012) at 824.)

112. The LTE Infringing Instrumentalities infringe claim 5 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include an RF modem shelf as set forth in claim 4, wherein said first and second modulation formats comprise one of quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09.))

On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 6 of the '916 patent. Claim 6 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and

adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access device over time. The modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. The first modulation configuration comprises a first modulation format and said second modulation configuration comprises a different second modulation format. Finally, the first modulation configuration comprises a first forward error correction code level and said second modulation configuration comprises a different second forward error correction code level.

113. The WiMAX Infringing Instrumentalities infringe claim 6 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access device over time. The modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. The first modulation configuration comprises a first modulation format and said second modulation configuration comprises a different second modulation format. Finally, the first modulation configuration comprises a first forward error correction code level and said second modulation configuration comprises a different second forward error correction code level. The first and

second modulation configurations comprises different forward error correction code levels. (*See e.g.* IEEE 802.16-2012 at 464.)

114. The LTE Infringing Instrumentalities infringe claim 6 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access device over time. The modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. The first modulation configuration comprises a first modulation format and said second modulation configuration comprises a different second modulation format. Finally, the first modulation configuration comprises a first forward error correction code level and said second modulation configuration comprises a different second forward error correction code level. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

115. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 7 of the '916 patent, which is dependent from claim 6. Claim 7 recites the radio frequency modem shelf as set forth in claim 6 wherein the first error correction code level is more complex than the second error correction code level if channel conditions associated with the first channel used to communicate with the first wireless access

device are noisier than channel conditions associated with a second channel used to communicate with the second wireless access device.

116. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 7 of the '916 patent, which is dependent from claim 6. Claim 7 recites the radio frequency modem shelf as set forth in claim 6 wherein said first error correction code level is more complex than said second error correction code level if channel conditions associated with a first channel used to communicate with said first wireless access device are noisier than channel conditions associated with a second channel used to communicate with said second wireless access device. (*See e.g.* IEEE 802.16-2012 at 464, 491.)

117. On information and belief, the LTE Infringing Instrumentalities infringe claim 7 of the '916 patent, which is dependent from claim 6. Claim 7 recites the RF modem shelf as set forth in claim 6 wherein said first error correction code level is more complex than said second error correction code level if channel conditions associated with a first channel used to communicate with said first wireless access device are noisier than channel conditions associated with a second channel used to communicate with said second wireless access device. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

118. On information and belief, the WiMAX and LTE Infringing Instrumentalities infringe claim 8 of the '916 patent. Specifically, the Accused Instrumentalities include the radio frequency modem shelf in claim 6, wherein the first and second modulation configurations comprise different physical beaming techniques.

119. On information and belief, the WiMAX Instrumentalities infringe claim 8 of the '916 patent. Specifically, the WiMAX Instrumentalities include the radio frequency modem shelf in claim 6, wherein the first and second modulation configurations comprise different

physical beaming techniques. (*see e.g*. https://en.wikipedia.org/wiki/Adaptive_beamformer; *see also* e.g., http://www.WiMAXforum.org/sites/WiMAXforum.org/files/document_library/WiMAX_802.16m.pdf; see also 802.16 (2012) at 671, 831, 839.)

120. On information and belief, the LTE Infringing Instrumentalities infringe claim 8 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include the radio frequency modem shelf in claim 6, wherein the first and second modulation configurations comprise different physical beaming techniques. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 15 (2009-09.))

121. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 9 of the '916 patent. Claim 9 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access devices over time.

122. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 9 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. (*See e.g.* IEEE 802.16-2012 at 5; *See e.g.* IEEE Std 802.16™-2012 at Section 1.4.1 at p. 13.) Each TDD frame contains an uplink for receiving data and a downlink for

transmitting data. (*See e.g.* IEEE 802.16-2012, Section 1.4.1, p. 5; *See e.g.* IEEE Std 802.16™-2012 at Section 1.4.1 at p. 5.) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices, and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access device over time. (*See e.g.* IEEE Std 802.16™-2012 at Section 6.3.5.1,p. 293; *See e.g. Nuavami, Technology for Broadband Wireless Access*, at 137; *See e.g.* IEEE 802.16-2012 at Section 8.1.4.4.7 at p. 786.)

123. On information and belief, the LTE Infringing Instrumentalities infringe claim 9 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. (*See e.g.* 3GPP TS 36.201 V8.3.0 (2009-03) Technical Specification at Section 4.2.1, p. 26); Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. (*See e.g.* 3GPP TS 36.300 V8.7.0 (2008-12.) Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices , and adjusts the modulation configuration over time so that different configurations are used to send data to the different wireless access device over time. (*See e.g.* Section 11.1 of 3GPP TS 36.213 V8.8.0(2009-09.))

124. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 10 of the '916 patent, which depends from claim 9. Claim 10 recites the wireless access network in claim 9 wherein the modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices.

125. The WiMAX Infringing Instrumentalities infringe claim 10 of the ‘916 patent. Specifically, the WiMAX Infringing Instrumentalities include the wireless access network in claim 9 wherein the modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. (*See e.g.* IEEE 802.16-2009 at 468.)

126. The LTE Infringing Instrumentalities infringe claim 10 of the ‘916 patent. Specifically, the LTE Infringing Instrumentalities include the wireless access network in claim 9 wherein the modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. (*See e.g.* Section 11.1 of 3GPP TS 36.213 V8.8.0 (2009-09) at 33.)

127. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 11 of the ‘916 patent, which depend from claim 9. Claim 11 recites the wireless access network in claim 10, wherein the first and second modulation configurations comprises different modulation formats.

128. The WiMAX Infringing Instrumentalities infringe claim 11 of the ‘916 patent. Specifically, the WiMAX Infringing Instrumentalities include a wireless network described in claim 10, wherein the first and second modulation configurations comprises different modulation formats. (*See e.g.* IEEE 802.16-2012 at 822.)

129. The LTE Infringing Instrumentalities infringe claim 11 of the ‘916 patent. Specifically, the LTE Infringing Instrumentalities include the wireless access network described

in claim 10, wherein the first and second modulation configurations comprises different modulation formats. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09))

130. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 12 of the '916 patent, which depends from claim 9. Claim 12 recites the wireless access network described in claim 11, wherein the second modulation format is more complex than the first modulation format if the first channel used to communicate with the first wireless access device is noisier than the second channel used to communicate with the second wireless access device.

131. The WiMAX Infringing Instrumentalities infringe claim 12 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include the wireless access network described in claim 11, wherein the second modulation format is more complex than the first modulation format if the first channel used to communicate with the first wireless access device is noisier than the second channel used to communicate with the second wireless access device. (*See e.g.* IEEE 802.16-2012 at 822.)

132. The LTE Infringing Instrumentalities infringe claim 12 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include wireless access network described in claim 11, wherein the second modulation format is more complex than the first modulation format if the first channel used to communicate with the first wireless access device is noisier than the second channel used to communicate with the second wireless access device. (*See e.g.* 3GPP TS 36.213 V8.8.0 (2009-09) at 48.)

133. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities claim 13 of the '916 patent, which depends from claim 11. Specifically, claim 13 recites fixed wireless access network of claim 12, wherein the first and

second modulation formats comprise one of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM).

134. The WiMAX Infringing Instrumentalities infringe claim 13 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include the wireless access network in claim 12, wherein said first and second modulation formats comprise one of quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g.*, http://perso.telecom-paristech.fr/~coupecho/publis/vtc08spring1.pdf.; *see* e.g., 802.16 (2012) at 824.)

135. The LTE Infringing Instrumentalities infringe claim 13 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include the wireless access network set forth in claim 12, wherein said first and second modulation formats comprise one of quadrature phase shift keying (QPSK), and 16 quadrature amplitude modulation (16 QAM). (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09.))

136. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 14 of the '916 patent. Claim 14 recites a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access device over time. The modulation controller determines the first and second optimum configurations based on channel quality conditions

associated with channels used to communicate with the first and second wireless access devices. The first modulation configuration comprises a first modulation format and said second modulation configuration comprises a different second modulation format. Finally, the first modulation configuration comprises a first forward error correction code level and said second modulation configuration comprises a different second forward error correction code level.

137. The WiMAX Infringing Instrumentalities infringe claim 14 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex ("TDD") frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access device over time. The modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. The first modulation configuration comprises a first modulation format and said second modulation configuration comprises a different second modulation format. Finally, the first modulation configuration comprises a first forward error correction code level and said second modulation configuration comprises a different second forward error correction code level. The first and second modulation configurations comprises different forward error correction code levels. (*See e.g.* IEEE 802.16-2012 at 464.)

138. The LTE Infringing Instrumentalities infringe claim 14 of the ‘916 patent. Specifically, the LTE Infringing Instrumentalities include a modem shelf used in a cellular wireless network that includes a first radio frequency modem capable of communicating with multiple wireless access devices using Time Division Duplex (“TDD”) frames. Each TDD frame contains an uplink for receiving data and a downlink for transmitting data. Additionally, the modem shelf includes a modulation controller associated with the modem shelf that determines an optimum modulation configuration for each of the wireless access devices and adjusts the modulation configuration over time so that different configurations are used to send data to different wireless access device over time. The modulation controller determines the first and second optimum configurations based on channel quality conditions associated with channels used to communicate with the first and second wireless access devices. The first modulation configuration comprises a first modulation format and said second modulation configuration comprises a different second modulation format. Finally, the first modulation configuration comprises a first forward error correction code level and said second modulation configuration comprises a different second forward error correction code level. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

139. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 15 of the ‘916 patent, which is dependent from claim 14. Claim 15 recites the wireless access network as set forth in claim 14 wherein said first error correction code level is more complex than said second error correction code level if channel conditions associated with a first channel used to communicate with said first wireless access device are noisier than channel conditions associated with a second channel used to communicate with said second wireless access device.

140. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 15 of the '916 patent, which is dependent from claim 14. The WiMAX Infringing Instrumentalities include the wireless access network as set forth in claim 14 wherein said first error correction code level is more complex than said second error correction code level if channel conditions associated with a first channel used to communicate with said first wireless access device are noisier than channel conditions associated with a second channel used to communicate with said second wireless access device. (*See e.g.* IEEE 802.16-2012 at 464, 491.)

141. On information and belief, the LTE Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 15 of the '916 patent, which is dependent from claim 14. Specifically, the LTE Infringing Instrumentalities include the wireless access network shelf as set forth in claim 14 wherein said first error correction code level is more complex than said second error correction code level if channel conditions associated with a first channel used to communicate with said first wireless access device are noisier than channel conditions associated with a second channel used to communicate with said second wireless access device._(*See e.g.* 3GPP TS 36.213 V8.8.0 at 48 (2009-09 at 18-19.))

142. On information and belief, the WiMAX and LTE Infringing Instrumentalities infringe claim 16 of the '916 patent. Claim 16 recites the wireless access network in claim 10, wherein the first and second modulation configurations comprise different physical beaming techniques.

143. The WiMAX Infringing Instrumentalities Infringe claim 16 of the '916 patent. Specifically, the WiMAX Infringing Instrumentalities include the wireless access network in claim 10, wherein the first and second modulation configurations comprise different physical beaming techniques. (*see e.g*. https://en.wikipedia.org/wiki/Adaptive_beamformer; *see also* e.g.,

http://www.WiMAXforum.org/sites/WiMAXforum.org/files/document_library/WiMAX_802.16m.pdf; see also 802.16 (2012) at 671, 831, 839.)

144. On information and belief, the LTE Infringing Instrumentalities infringe claim 16 of the '916 patent. Specifically, the LTE Infringing Instrumentalities include the wireless access network in claim 10, wherein the first and second modulation configurations comprise different physical beaming techniques. (*See e.g.* 3GPP TS 36.213 V8.8.0 at 15 (2009-09.))

145. On information and belief, these Accused Instrumentalities are marketed, provided to, and/or used by or for each Defendant's partners, clients, customers and end users across the country and in this District.

146. Each Defendant was made aware of the '916 patent and its infringement thereof at least as early as the filing of this Complaint.

147. Upon information and belief, since at least the time each Defendant received notice, each Defendant has induced and continues to induce others to infringe at least one claim of the '916 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 each Defendant's partners, clients, customers, and end users, whose use of the Accused Instrumentalities constitutes direct infringement of at least one claim of the '916 patent.

148. In particular, each Defendant's actions that aid and abet others such as its partners, customers, clients, and end users to infringe include advertising and distributing the Accused Instrumentalities and providing instruction materials, training, and services regarding the Accused Instrumentalities. On information and belief, each Defendant has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because each Defendant has had actual knowledge of the '916 patent and

knowledge that its acts were inducing infringement of the ‘916 patent since at least the date each Defendant received notice that such activities infringed the ‘916 patent.

149. Upon information and belief, each Defendant is liable as a contributory infringer of the ‘916 patent under 35 U.S.C. § 271(c) by offering to sell, selling and importing into the United States computerized trading platforms to be especially made or adapted for use in an infringement of the ‘916 patent. The Accused Instrumentalities are a material component for use in practicing the ‘916 patent and are specifically made and are not a staple article of commerce suitable for substantial non-infringing use.

COUNT III – INFRINGEMENT OF U.S. PATENT NO. 7, 230, 931

150. The allegations set forth in the foregoing paragraphs 1 through 149 are incorporated into this Second Claim for Relief.

151. On February 6, 2007, U.S. Patent No. 7,230,931 (“the ’931 patent”), entitled “Wireless Access Sytem Using Selectively Adaptable Beam Forming In TDD Frames and Method of Operation,” was duly and legally issued by the United States Patent and Trademark Office. A true and correct copy of the ’931 patent is attached as Exhibit 3.

152. The inventions of the ’931 patent resolve technical problems related to the use of wireless communications technology. For example, the inventions allow parties to provide an improved air interface system for use in a fixed wireless access network that maximizes usage of the available bandwidth in a cell site while utilizing a beamforming configuration to transmit data between mobile user devices and a series of base stations. Specifically, the system uses, for example, multiple modulation groups and a beamforming configuration in the air interface to transmit data to, and to receive data from, a subscriber access device in a cell site and/or a sector within a cell site.

153. The claims of the ‘931 patent recite one or more inventive concepts that are rooted in utilizing a beamforming configuration in a wireless communications network, and overcome problems specifically arising in the realm of wireless communications technology.

154. The claims of the ’931 patent recite an invention that is not merely the routine or conventional use of beamformining in wireless access communications technology. Instead, to improve transmission quality for voice and data services, channel conditions between the user equipment (e.g., mobile cell phone and/or computer laptop) and the network base station are dynamically monitored to reduce interference and transmission errors. The ’931 patent claims thus specify how the data link between the base station and the user equipment is monitored and configured, for example through beamforming to yield an improved communications link.

155. The technology claimed in the ‘931 patent does not preempt all ways of using beamforming configurations in wireless communications technology, nor preempt the use of wireless communications technology, nor preempt any other well-known or prior art technology.

156. Accordingly, each claim of the ‘931 patent recites a combination of elements sufficient to ensure that the claim in practice amounts to significantly more than a patent on an ineligible concept.

157. GAS is the assignee and owner of the right, title and interest in and to the ‘931 patent, including the right to assert all causes of action arising under said patents and the right to any remedies for infringement of them.

158. Upon information and belief, each Defendant has and continues to directly infringe one or more claims of the ‘931 patent by making, using, selling, importing and/or providing and causing to be used a wireless network implementing the WiMAX and LTE Standards.

159. Upon information and belief, Defendant has and continues to directly infringe one or more claims of the ‘931 patent by making, using, selling, importing and/or providing and causing to be used a mobile wireless network implementing the WiMAX and LTE Standards.

160. On information and belief, the WiMAX Infringing Instrumentalities and LTE Infringing Instrumentalities infringe claim 1 of the ‘931 patent. Claim 1 recites a wireless access network plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in a cell site associated with the wireless access network. Additionally, there is a transceiver associated with a first of these plurality of base stations comprising transmit path circuitry associated with a beam forming network capable of transmitting directed scanning beam signals each directed to substantially only wireless access devices within a different one of a plurality of sectors of a cell site associated with said first base station. Additionally the path transmit circuitry transmits, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of said sectors. The broadcast beam signal comprises a start of frame field, and subsequently transmits, in a downlink portion of said TDD frame, first downlink data traffic to substantially only wireless access devices within one of said sectors using one of said directed scanning beam signals.

161. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 1 of the ‘931 patent. The WiMAX Infringing Instrumentalities a wireless access network, comprising a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in a cell site associated with the wireless access network. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page5.) Additionally, there

is a transceiver associated with a first of these plurality of base stations comprising transmit path circuitry associated with a beam forming network capable of transmitting directed scanning beam signals each directed to substantially only wireless access devices within a different one of a plurality of sectors of a cell site associated with said first base station. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf.) Additionally the path transmit circuitry transmits, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of said sectors. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page53.) The broadcast beam signal comprises a start of frame field, and subsequently transmits, in a downlink portion of said TDD frame, first downlink data traffic to substantially only wireless access devices within one of said sectors using one of said directed scanning beam signals. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page13.)

162. On information and belief, the LTE Infringing Instrumentalities infringe claim 1 of the ‘916 patent. Specifically, the LTE Infringing Instrumentalities include wireless access network comprising a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in a cell site associated with the wireless access network. (*See e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf page15; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf at page 8.) Additionally, there is a transceiver associated with a first of these plurality of base stations comprising transmit path circuitry associated with a beam forming network capable of

transmitting directed scanning beam signals each directed to substantially only wireless access devices within a different one of a plurality of sectors of a cell site associated with said first base station. (*See e.g.,* http://www.etsi.org/deliver/etsi_ts/136100_136199/136104/10.02.00_60/ts_136104v100200p.pdf , page 21.) Additionally the path transmit circuitry transmits, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of said sectors. The broadcast beam signal comprises a start of frame field, and subsequently transmits, in a downlink portion of said TDD frame, first downlink data traffic to substantially only wireless access devices within one of said sectors using one of said directed scanning beam signals. (*See e.g.,* http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf, page 15; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf page 8; *see also e.g.*, ftp://www.3gpp.org/Information/presentations/presentations_2012/2012_11_Beijing_Presentations/07_02_EPC%20progress%20in%20China%20v1.0.pdf page3; see also e.g., *Source:* http://www.etsi.org/deliver/etsi_ts/136100_136199/136104/10.02.00_60/ts_136104v100200p.pdf , page 2; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 45; *see also e.g.*, http://tech-books-pdf.googlecode.com/git/LTE/RS/RandS_LTE_2E.pdf page 16.)

163. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 2 of the ‘931 patent. Claim 2 recites the transceiver as set forth in claim 1, wherein said

broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals.

164. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 2 of the ‘916 patent. Specifically, the WiMAX Infringing Instrumentaities include the transceiver as set forth in claim 1, wherein said broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf, page14.)

165. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 3 of the ‘931 patent. Claim 3 recites the transceiver as set forth in claim 2 wherein said scanning beam information identifies a downlink time slot in said downlink portion, during which one of said directed scanning beam signals transmits said downlink data traffic.

166. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 3 of the ‘931 patent. Specifically, the WiMAX Infringing Instrumentalities includes the transceiver as set forth in claim 2 wherein said scanning beam information identifies a downlink time slot in said downlink portion, during which one of said directed scanning beam signals transmits said downlink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14.)

167. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 4 of the ‘931 patent. Claim 4 recites the transceiver as set forth in claim 3 wherein said scanning beam information identifies at least one modulation format associated with one of said directed scanning beam signals.

168. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 4 of the ‘931 patent. Specifically, the WiMAX Infringing Instrumentalities include the transceiver as set forth in claim 3 wherein said scanning beam information identifies at least one modulation format associated with one of said directed scanning beam signals. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14.)

169. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 5 of the ‘931 patent. Claim 5 recites the transceiver as set forth in claim 3 wherein said scanning beam information identifies at least one forward error correction code level associated with said one of said directed scanning beam signals.

170. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 5 of the ‘931 patent. Specifically, the WiMAX Infringing Instrumentalities include the transceiver as set forth in claim 3 wherein said scanning beam information identifies at least one forward error correction code level associated with said one of said directed scanning beam signals. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf.)

171. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 6 of the ‘931 patent. Claim 6 recites the transceiver as set forth in claim 2, further comprising receive path circuitry associated with said beam forming network capable of receiving uplink data traffic transmitted by at least one wireless access device in an uplink portion of said TDD frame.

172. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 6 of the ‘931 patent. Specifically, the WiMAX Infringing Instrumentalities include the transceiver as set forth in claim 2, further comprising receive path circuitry associated with said beam forming network capable of receiving uplink data traffic transmitted by at least one

wireless access device in an uplink portion of said TDD frame. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page25.)

173. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 7 of the '931 patent. Claim 7 recites the transceiver as set forth in claim 6, wherein said first beam map further contains uplink transmission information identifying an uplink time slot in said uplink portion during which said at least one wireless access device transmits said uplink data traffic.

174. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 7 of the '931 patent. Specifically, the WiMAX Infringing Instrumentalities include the transceiver as set forth in claim 6, wherein said first beam map further contains uplink transmission information identifying an uplink time slot in said uplink portion during which said at least one wireless access device transmits said uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page25; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page108.)

175. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 8 of the '931 patent. Claim 8 recites the transceiver as set forth in claim 7 wherein said uplink transmission information further identifies at least one modulation format used by said at least one wireless access device to transmit said uplink data traffic.

176. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 8 of the '931 patent. Specifically, the WiMAX Infringing Instrumentalities include the transceiver as set forth in claim 7 wherein said uplink transmission information further identifies at least one modulation format used by said at least one wireless access device to transmit said

uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page792.)

177. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 9 of the '931 patent. Claim 9 recites the transceiver as set forth in claim 8 wherein said uplink transmission information further identifies at least one one forward error correction code level used by said at least one wireless access device to transmit said uplink data traffic.

178. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 9 of the '931 patent. Specifically, the WiMAX Infringing Instrumentalities include the transceiver as set forth in claim 8 wherein said uplink transmission information further identifies at least one one forward error correction code level used by said at least one wireless access device to transmit said uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page768; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page796.)

179. On information and belief, the LTE and WiMAX Infringing Instrumentalities infringe claim 10 of the '931 patent. Claim 10 recites a fixed wireless access network comprising a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in a cell site associated with the subscriber premises in a cell site associated with said each base station. Additionally, each of these base stations comprises transmit path circuitry associated with a beam forming network capable of transmitting directed scanning beam signals each directed to substantially only wireless access devices within a different one of a plurality of sectors of a cell site associated with said first base station. Additionally the path transmit circuitry transmits, at the start of a TDD frame, a broadcast beam

signal to wireless access devices within more than one of said sectors. The broadcast beam signal comprises a start of frame field, and subsequently transmits, in a downlink portion of said TDD frame, first downlink data traffic to substantially only wireless access devices within one of said sectors using one of said directed scanning beam signals.

180. The WiMAX Infringing Instrumentalities infringe claim 10 of the '931 patent. Specifically, the WiMAX Infringing Instrumentalities include a fixed wireless access network comprising a a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in a cell site associated with the subscriber premises in a cell site associated with said each base station. (*See e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf page15.) Additionally, each of these base stations comprises transmit path circuitry associated with a beam forming network capable of transmitting directed scanning beam signals each directed to substantially only wireless access devices within a different one of a plurality of sectors of a cell site associated with said first base station. Additionally the path transmit circuitry transmits, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of said sectors. The broadcast beam signal comprises a start of frame field, and subsequently transmits, in a downlink portion of said TDD frame, first downlink data traffic to substantially only wireless access devices within one of said sectors using one of said directed scanning beam signals. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page767; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page834.)

181. The LTE Infringing Instrumentalities infringe claim 10 of the '931 patent. Specifically, the LTE Infringing Instrumentalities include a fixed wireless access network comprising a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in a cell site associated with the subscriber premises in a cell site associated with said each base station. (*See e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf page 15.) Additionally, each of these base stations comprises transmit path circuitry associated with a beam forming network capable of transmitting directed scanning beam signals each directed to substantially only wireless access devices within a different one of a plurality of sectors of a cell site associated with said first base station. (*See e.g.*, http://www.etsi.org/deliver/etsi_ts/136100_136199/136104/10.02.00_60/ts_136104v100200p.pdf page 21; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136100_136199/136104/10.02.00_60/ts_136104v100200p.pdf page 51; see also e.g., https://gdmissionsystems.com/wp-content/uploads/2015/06/D-LTEV6-03-0415-1-2.pdf at page 1; *see also e.g.*, http://www.commscope.com/Blog/Cells--Sectors-and-Antenna-Beamforming/; *see also e.g.*, https://cdn.rohde-schwarz.com/pws/dl_downloads/dl_application/application_notes/1ma191/1MA191_0E_LTE_release_9_technology.pdf, at page 25.) Additionally the path transmit circuitry transmits, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of said sectors. (*See e.g.*, https://gdmissionsystems.com/wp-content/uploads/2015/06/D-LTEV6-03-0415-1-2.pdf, page 1.) The broadcast beam signal comprises a start of frame field, and subsequently transmits, in a downlink portion of said TDD frame, first downlink data traffic to

substantially only wireless access devices within one of said sectors using one of said directed scanning beam signals. (*See e.g.*, http://tech-books-pdf.googlecode.com/git/LTE/RS/RandS_LTE_2E.pdf page, 30; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page12; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf, page 51; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 66; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page69; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf at page11; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page12; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf at page47.)

182. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 11 of the ‘931 patent. Claim 11 recites the fixed wireless access network as set forth in claim 10, wherein said broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals.

183. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 11 of the ‘931 patent. The WiMAX Infringing Instrumentalities include the fixed wireless access network as set forth in claim 10, wherein said broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14; *see also e.g*., *Source:* http://standards.ieee.org/getieee802/download/802.16-2012.pdf page17.)

184. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 12 of the ‘931 patent. Claim 12 the fixed wireless access network as set forth in claim 11 wherein said scanning beam information identifies a downlink time slot in said downlink portion during which one of said directed scanning beam signals transmits said downlink data traffic.

185. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 12 of the ‘931 patent. The WiMAX Infringing Instrumentalities include the fixed wireless access network as set forth in claim 11 wherein said scanning beam information identifies a downlink time slot in said downlink portion during which one of said directed scanning beam signals transmits said downlink data traffic. (*See.e.g.* http://standards.ieee.org/getieee802/download/802.16-2012.pdf page17; *see also e.g*. http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14.)

186. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 13 of the ‘931 patent. Claim 13 the fixed wireless access network as set forth in claim 12 wherein said scanning beam information identifies at least one modulation format associated with said one of said directed scanning beam signals.

187. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 13 of the '931 patent. The WiMAX Infringing Instrumentalities include the fixed wireless access network as set forth in claim 12 wherein said scanning beam information identifies at least one modulation format associated with said one of said directed scanning beam signals. (*See e.g*. http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14.)

188. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 14 of the '931 patent. Claim 14 recites the fixed wireless access network as set forth in claim 12, wherein said scanning beam information identifies at least one forward error correction code level associated with said one of said directed scanning beam signals.

189. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 14 of the '931 patent. The WiMAX Infringing Instrumentalities include the fixed wireless access network as set forth in claim 12, wherein said scanning beam information identifies at least one forward error correction code level associated with said one of said directed scanning beam signals. (*See e.g.,* http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14; *see also e.g.,* http://standards.ieee.org/getieee802/download/802.16-2012.pdf page1437.)

190. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 15 of the '931 patent. Claim 15 recites the fixed wireless access network as set forth in claim 11 wherein said each base station further comprises receive path circuitry associated with said beam forming network capable of receiving uplink data traffic transmitted by at least one wireless access device in an uplink portion of said TDD frame.

191. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 15 of the '931 patent. The WiMAX Infringing Instrumentalities include the fixed wireless access network as set forth in claim 11 wherein said each base station further comprises receive

path circuitry associated with said beam forming network capable of receiving uplink data traffic transmitted by at least one wireless access device in an uplink portion of said TDD frame. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14; *see also e.g.*, ttp://standards.ieee.org/getieee802/download.)

192. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 16 of the '931 patent. Claim 16 recites the fixed wireless access network as set forth in claim 15 wherein said first beam map further contains uplink transmission information identifying an uplink time slot in said uplink portion during which said at least one wireless access device transmits said uplink data traffic.

193. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 16 of the '931 patent. The WiMAX Infringing Instrumentalities include the fixed wireless access network as set forth in claim 15 wherein said first beam map further contains uplink transmission information identifying an uplink time slot in said uplink portion during which said at least one wireless access device transmits said uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 25; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page25.)

194. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 17 of the '931 patent. Claim 17 recites the fixed wireless access network as set forth in claim 16 wherein said uplink transmission information further identifies at least one modulation format used by said at least one wireless access device to transmit said uplink data traffic.

195. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 17 of the '931 patent. The WiMAX Infringing Instrumentalities include the fixed wireless access network as set forth in claim 16 wherein said uplink transmission information further

identifies at least one modulation format used by said at least one wireless access device to transmit said uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page25.)

196. On information and belief, the WiMAX Infringing Instrumentalities infringe claim 18 of the '931 patent. Claim 18 recites the fixed wireless access network as set forth in claim 17 wherein said uplink transmission information further identifies at least one at least one forward error correction code level used by said at least one wireless access device to transmit said uplink data traffic.

197. The WiMAX Infringing Instrumentalities infringe claim 18 of the '931 patent. Specifically, the WiMAX Infringing Instrumentalities include include the fixed wireless access network as set forth in claim 17 wherein said uplink transmission information further identifies at least one at least one forward error correction code level used by said at least one wireless access device to transmit said uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page768; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page796.)

198. The WiMAX and LTE Infringing Instrumentalities infringe claim 19 of the '931 patent. Claim 19 recites a wireless access network comprising a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in an associated cell site of the wireless access network. Additionally, there is a method of communicating with a first of said plurality of base stations comprising the steps of transmitting, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of a plurality of sectors within the associated cell site. Additionally, the broadcast beam signal comprising a start

of frame field capable of synchronizing receivers in said wireless access devices. Further, the method of communicating with a first of said plurality of base station comprises the step of transmitting, in a downlink portion of said TDD frame, first downlink datea traffic to substantially only wireless access devices in a first of said sectors using a first directed scanning beam signal.

199. The WiMAX Infringing Instrumentalities infringe claim 19 of the '931 patent. The WiMAX Infringing Instrumentlaities include a wireless access network comprising a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD) communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in an associated cell site of the wireless access network. Additionally, there is a method of communicating with a first of said plurality of base stations comprising the steps of transmitting, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of a plurality of sectors within the associated cell site. Additionally, the broadcast beam signal comprising a start of frame field capable of synchronizing receivers in said wireless access devices. Further, the method of communicating with a first of said plurality of base station comprises the step of transmitting, in a downlink portion of said TDD frame, first downlink datea traffic to substantially only wireless access devices in a first of said sectors using a first directed scanning beam signal. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page5; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page767.)

200. The LTE Infringing Instrumentalities infringe claim 19 of the '931 patent. The LTE Infringing Instrumentalities include a wireless access network comprising a plurality of base stations, each of which are capable of bidirectional time division duplex (TDD)

communication with wireless access devices, or user devices, displosed at a plurality of subscriber premises in an associated cell site of the wireless access network. Additionally, there is a method of communicating with a first of said plurality of base stations comprising the steps of transmitting, at the start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of a plurality of sectors within the associated cell site. Additionally, the broadcast beam signal comprising a start of frame field capable of synchronizing receivers in said wireless access devices. Further, the method of communicating with a first of said plurality of base station comprises the step of transmitting, in a downlink portion of said TDD frame, first downlink datea traffic to substantially only wireless access devices in a first of said sectors using a first directed scanning beam signal. (*See e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf page 15; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136201/08.03.00_60/ts_136201v080300p.pdf page 8; *see also e.g.*, ftp://www.3gpp.org/Information/presentations/presentations_2012/2012_11_Beijing_Presentations/07_02_EPC%20progress%20in%20China%20v1.0.pdf at p. 3; see also e.g., http://www.commscope.com/Blog/Cells--Sectors-and-Antenna-Beamforming; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 45; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 66; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 69; *see also e.g.*,

http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 11.)

201. The WiMAX Infringing Instrumentalities infringe claim 20 of the '931 patent. Claim 20 recites the method as set forth in claim 19 wherein said broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to receive said first directed scanning beam signal.

202. The WiMAX Infringing Instrumentalities infringe claim 20 of the '931 patent. The WiMAX Infringing Instrumentalities include the method as set forth in claim 19 wherein said broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to receive said first directed scanning beam signal. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 14; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf.)

203. The WiMAX and LTE Infringing Instrumentalities infringe claim 21 of the '931 patent. Claim 21 recites the method as set forth in claim 20 wherein said scanning beam information identifies a downlink time slot in said downlink portion during which said first directed scanning beam signal transmits said downlink data traffic**.**

204. The WiMAX Infringing Instrumentalities infringe claim 21 of the '931 patent. The WiMAX Infringing Instrumentalities include the method as set forth in claim 20 wherein said scanning beam information identifies a downlink time slot in said downlink portion during which said first directed scanning beam signal transmits said downlink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 14; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 768.)

205. The WiMAX Infringing Instrumentalities infringe claim 22 of the ‘931 patent. Claim 22 recites the method as set forth in claim 21 wherein said scanning beam information identifies at least one modulation format associated with said first directed scanning beam signal.

206. The WiMAX Infringing Instrumentalities infringe claim 22 of the ‘931 patent. The WiMAX Infringing Instrumentliaties include the method as set forth in claim 21 wherein said scanning beam information identifies at least one modulation format associated with said first directed scanning beam signal. (*See e.g*., http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 14.)

207. The WiMAX Infringing Instrumentalities infringe claim 23 of the ‘931 patent. Claim 23 recites the method as set forth in claim 21 wherein said scanning beam information identifies at least one forward error correction code level associated with said directed scanning beam signal.

208. The WiMAX Infringing Instrumentalities infringe claim 23 of the ‘931 patent. The WiMAX Instrumentalities include the method as set forth in claim 21 wherein said scanning beam information identifies at least one forward error correction code level associated with said directed scanning beam signal. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page14; *see also e.g*., http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 1437.)

209. The WiMAX and LTE Infringing Instrumentalities infringe claim 24 of the ‘931 patent. Claim 24 recites the method as set forth in claim 20 further the step of receiving uplink data traffic transmitted by at least one wireless access device in an uplink portion of said TDD frame.

210. The WiMAX Infringing Instrumentalities infringe claim 24 of the ‘931 patent. The WiMAX Infringing Instrumentalities include the method as set forth in claim 20 further the step of receiving uplink data traffic transmitted by at least one wireless access device in an uplink portion of said TDD frame. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf, page25; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf, page14.)

211. The LTE Infringing Instrumentalities infringe claim 24 of the ‘931 patent. The LTE Infringing Instrumentalities include the method as set forth in claim 20 further the step of receiving uplink data traffic transmitted by at least one wireless access device in an uplink portion of said TDD frame. (*See e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 11; *see also e.g.*, http://www.etsi.org/deliver/etsi_ts/136200_136299/136211/08.08.00_60/ts_136211v080800p.pdf page 12.)

212. The WiMAX Infringing Instrumentalities infringe claim 25 of the ‘931 patent. Claim 25 recites the method as set forth in claim 24 wherein said first beam map further contains uplink transmission information identifying an uplink time slot in said uplink portion during which said at least one wireless access device transmits said uplink data traffic.

213. The WiMAX Infringing Instrumentalities infringe claim 25 of the ‘931 patent. The WiMAX Infringing Instrumentalities include the method as set forth in claim 24 wherein said first beam map further contains uplink transmission information identifying an uplink time slot in said uplink portion during which said at least one wireless access device transmits said

uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page25; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page108.)

214. The WiMAX Infringing Instrumentalities infringe claim 26 of the '931 patent. Claim 26 recites the method as set forth in claim 25 wherein said uplink transmission information further identifies at least one modulation format used by said at least one wireless access device to transmit said uplink data traffic.

215. The WiMAX Infringing Instrumentalities infringe claim 26 of the '931 patent. The WiMAX Infringing Instrumentalities include the method as set forth in claim 25 wherein said uplink transmission information further identifies at least one modulation format used by said at least one wireless access device to transmit said uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 792; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 25.)

216. The WiMAX Infringing Instrumentalities infringe claim 27 of the '931 patent. Claim 27 the method as set forth in claim 26 wherein said uplink transmission information further identifies at least one at least one forward error correction code level used by said at least one wireless access device to transmit said uplink data traffic.

217. The WiMAX Infringing Instrumentalities infringe claim 27 of the '931 patent. The WiMAX Infringing Instrumentalities include the method as set forth in claim 26 wherein said uplink transmission information further identifies at least one at least one forward error correction code level used by said at least one wireless access device to transmit said uplink data traffic. (*See e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page768; *see also e.g.*, http://standards.ieee.org/getieee802/download/802.16-2012.pdf page13.)

218. The WiMAX and LTE Infringing Instrumentalities infringe claim 28 of the ‘931 patent. Claim 28 recites the transceiver as set forth in claim 1 wherein said transmit path circuitry transmits, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices within an other of said sectors using an other of said directed scanning beam signals.

219. The WiMAX Infringing Instrumentalities infringe claim 28 of the ‘931 patent. The WiMAX Infringing Instrumentalities include the transceiver as set forth in claim 1 wherein said transmit path circuitry transmits, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices within an other of said sectors using an other of said directed scanning beam signals. (*See e.g.,* http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 768; *see also e.g.,* http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 860, 861.)

220. The LTE Infringing Instrumentalities infringe claim 28 of the ‘931 patent. The LTE Infringing Instrumentalities include the transceiver as set forth in claim 1 wherein said transmit path circuitry transmits, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices within an other of said sectors using an other of said directed scanning beam signals. (*See e.g.*, http://www.commscope.com/Blog/Cells--Sectors-and-Antenna-Beamforming/; *see also e.g.,* http://downloads.hindawi.com/journals/ijap/2013/764507.pdf page 2.)

221. The WiMAX and LTE Infringing Instrumentalities infringe claim 29 of the ‘931 patent. Claim 28 recites the method set forth in claim 19, further transmitting, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices in a second of said sectors using a second directed scanning beam signal.

222. The WiMAX Infringing Instrumentalities infringe claim 29 of the '931 patent. The WiMAX Infringing Instrumentalities include the method set forth in claim 19, further comprising transmitting, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices in a second of said sectors using a second directed scanning beam signal. (*See e.g*. http://standards.ieee.org/getieee802/download/802.16-2012.pdf page13; *see also e.g*., http://standards.ieee.org/getieee802/download/802.16-2012.pdf page 768.)

223. The LTE Infringing Instrumentalities infringe claim 29 of the '931 patent. The LTE Infringing Instrumentalities include the method set forth in claim 19, further comprising transmitting, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices in a second of said sectors using a second directed scanning beam signal. (*See e.g*., http://www.commscope.com/Blog/Cells--Sectors-and-Antenna-Beamforming/; *see also e.g*., http://downloads.hindawi.com/journals/ijap/2013/764507.pdf page 2.)

224. On information and belief, these Accused Instrumentalities are marketed, provided to, and/or used by or for each Defendant's partners, clients, customers and end users across the country and in this District.

225. Each Defendant was made aware of the '931 patent and its infringement thereof at least as early as the filing of this Complaint.

226. Upon information and belief, since at least the time each Defendant received notice, each Defendant has induced and continues to induce others to infringe at least one claim of the '931 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 each

Defendant's partners, clients, customers, and end users, whose use of the Accused Instrumentalities constitutes direct infringement of at least one claim of the '931 patent.

227. In particular, each Defendant's actions that aid and abet others such as its partners, customers, clients, and end users to infringe include advertising and distributing the Accused Instrumentalities and providing instruction materials, training, and services regarding the Accused Instrumentalities. On information and belief, each Defendant has engaged in such actions with specific intent to cause infringement or with willful blindness to the resulting infringement because each Defendant has had actual knowledge of the '931 patent and knowledge that its acts were inducing infringement of the '931 patent since at least the date each Defendant received notice that such activities infringed the '931 patent.

228. Upon information and belief, each Defendant is liable as a contributory infringer of the '931 patent under 35 U.S.C. § 271(c) by offering to sell, selling and importing into the United States computerized trading platforms to be especially made or adapted for use in an infringement of the '931 patent. The Accused Instrumentalities are a material component for use in practicing the '931 patent and are specifically made and are not a staple article of commerce suitable for substantial non-infringing use.

229. GAS has been harmed by each Defendant's infringing activities.

JURY DEMAND

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

PRAYER FOR RELIEF

WHEREFORE, Plaintiff GAS demands judgment for itself and against each Defendant as follows:

A. An adjudication that each Defendant has infringed the ’810, ‘916, and ‘931 patents;

B. An award of damages to be paid by each Defendant adequate to compensate GAS for each Defendant’s past infringement of said patents, 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. A declaration that this case is exceptional under 35 U.S.C. § 285, and an award of Plaintiff’s reasonable attorneys’ fees; and

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

Dated: April 30, 2016

DEVLIN LAW FIRM LLC

/s/ Robert Kiddie

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