

RUSS, AUGUST & KABAT

1 **RUSS AUGUST & KABAT**
 2 Marc A. Fenster, CA SBN 181067
 3 mfenster@raklaw.com
 4 Reza Mirzaie, CA SBN 246953
 5 rmirzaie@raklaw.com
 6 Philip X. Wang, CA SBN 262239
 7 pwang@raklaw.com
 8 Kent N. Shum, CA SBN 259189
 9 kshum@raklaw.com
 10 Christian Conkle, CA SBN 306374
 11 cconkle@raklaw.com
 12 James N. Pickens, CA SBN 307474
 13 jpickens@raklaw.com
 14 12424 Wilshire Boulevard, 12th Floor
 15 Los Angeles, California 90025
 16 Tele: 310/826-7474
 17 Fax: 310/826-6991

18 *Attorneys for Plaintiff*
 19 XR Communications, LLC
 20 dba Vivato Technologies

21 **UNITED STATES DISTRICT COURT**
 22 **CENTRAL DISTRICT OF CALIFORNIA**

23 XR COMMUNICATIONS, LLC, dba
 24 VIVATO TECHNOLOGIES,

Case No. 5:17-cv-744

Plaintiff,

**COMPLAINT FOR PATENT
 INFRINGEMENT**

v.

25 NEWO CORPORATION d/b/a
 26 AMPED WIRELESS

Defendant.

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1 **I. JURISDICTION AND VENUE**

2 1. This is an action for patent infringement. This Court has subject
3 matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a) because this action
4 arises under the patent laws of the United States, 35 U.S.C. §§ 101 *et seq.*

5 **II. THE PARTIES**

6 2. Plaintiff XR Communications LLC d/b/a Vivato Technologies
7 (“Vivato” or “Plaintiff”) is a limited liability company organized and existing
8 under the laws of Delaware with its principal place of business at 444 S. Cedros
9 Ave., Solana Beach, CA 92075.

10 3. Newo Corporation d/b/a Amped Wireless (“Amped” or “Defendant”) is
11 a corporation organized and existing under the laws of California with its
12 principal place of business at 3450 E Philadelphia St., Ontario, CA 91761.

13 4. This Court has personal jurisdiction over Amped because Amped is
14 incorporated in California and has its principal place of business in California.

15 5. Venue is proper in this federal district pursuant to 28 U.S.C. §§
16 1391(b)-(d) and 1400(b) in that Amped is subject to jurisdiction in this District,
17 resides in this District, has its principal place of business in this District, has done
18 business in this District, has regular and established places of business in this
19 District, has committed acts of infringement in this District, and continues to
20 commit acts of infringement in this District, entitling Plaintiff to relief.

21 **III. BACKGROUND OF THE TECHNOLOGY**

22 6. Vivato was founded in 2000 as a \$80+million venture-backed
23 company with several key innovators in the wireless communication field
24 including Siavash Alamouti, Ken Biba, William Crilly, James Brennan, Edward
25 Casas, and Vahid Tarokh among many others. Wi-Fi/802.11 has become the
26 ubiquitous wireless connection to the Internet and is now integrated into hundreds
27 of millions of mobile devices globally. Vivato was founded to leverage its talent to
28

1 generate intellectual property and deliver Wi-Fi/802.11 wireless connectivity
2 solutions to service the growing demand for bandwidth.

3 7. Over the years, Vivato has developed proven technology, with over
4 400 deployments globally, including private, public and government, and has
5 become a recognized provider of extended range Wi-Fi network infrastructure
6 solutions. Vivato's wireless base stations integrate beamforming phased array
7 antenna design with packet steering technology to deliver high-bandwidth
8 extended range connections to serve multiple users and multiple devices.

9 8. Vivato's patent portfolio includes over 17 issued patents and pending
10 patent applications. The patents-in-suit are directed to specific aspects of wireless
11 communication including adaptively steered antenna technology and beam
12 switching technology.

13 **IV. COUNT ONE: INFRINGEMENT OF UNITED STATES**
14 **PATENT NO. 7,062,296**

15 9. On June 13, 2006, United States Patent No. 7,062,296 ("the '296
16 Patent") was duly and legally issued for inventions entitled "Forced Beam
17 Switching in Wireless Communication Systems Having Smart Antennas." Vivato
18 owns the '296 Patent and holds the right to sue and recover damages for
19 infringement thereof. A copy of the '296 Patent is attached hereto as Exhibit A.

20 10. Defendant has directly infringed and continues to directly infringe
21 numerous claims of the '296 Patent, including at least claim 33, by manufacturing,
22 using, selling, offering to sell, and/or importing into the United States WiFi access
23 points and routers supporting MU-MIMO, including without limitation access
24 points and routers utilizing the IEEE 802.11ac-2013 standard (e.g. Defendant's
25 ALLY AC1900 Dual-band Wi-Fi Router, APA2600M ATHENA-AP High Power
26 AC2600 Wi-Fi Access Point with MU-MIMO, ARTEMIS-AP High Power
27 AC1300 Wi-Fi Access Point with MU-MIMO, RE2600M ATHENA-EX High
28 Power AC2600 Wi-Fi Range Extender with MU-MIMO, REC44M High Power

1 AC2600 Plug-In Wi-Fi Range Extender with MU-MIMO, RE1750A High Power
2 AC1750 Wi-Fi Range Extender with MU-MIMO, RE1300M ARTEMIS-EX High
3 Power AC1300 Wi-Fi Range Extender with MU-MIMO, RE2200T HELIOS-EX
4 High Power AC2200 Wi-Fi Range Extender with DirectLink, RTA1300M
5 ARTEMIS High Power AC1300 Wi-Fi Router with MU-MIMO (“RTA1300M
6 ARTEMIS”), RTA2600-R2 ATHENA R-2 High Power AC2600 Wi-Fi Router
7 with MU-MIMO, and RTA2600 ATHENA High Power AC2600 Wi-Fi Router
8 with MU-MIMO) (collectively the “Accused Products”). Defendant is liable for
9 infringement of the ‘296 Patent pursuant to 35 U.S.C. § 271(a).

10 11. Each of the Accused Products comprises an apparatus for use in a
11 wireless communication system. For example, the RTA1300M ARTEMIS is an
12 apparatus for use in a wireless communication system.

13 12. Each of the Accused Products comprises at least one smart antenna.
14 For example, the RTA1300M ARTEMIS has at least one smart antenna

15 13. Each of the Accused Products comprises at least one transceiver
16 operatively coupled to said smart antenna and configured to send and receive
17 electromagnetic signals using said smart antenna. For example, the RTA1300M
18 ARTEMIS has a Qualcomm IPQ4018 WiFi SoC coupled to the smart antenna to
19 send and receive signals. *See, e.g.*, IEEE 802.11ac-2013 (“802.11ac Standard”)
20 Clauses 22.3.4.5(j), 22.3.4.6(g), 22.3.4.7(h), 22.3.4.8(p), 22.3.4.9.1(q),
21 22.3.4.9.2(q), 22.3.4.10.4(e) (“Analog and RF: Up-convert the resulting complex
22 baseband waveform associated with each transmit chain to an RF signal according
23 to the center frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4,
24 22.3.8; *id.* Clause 22.3.3 and Figure 22-7:

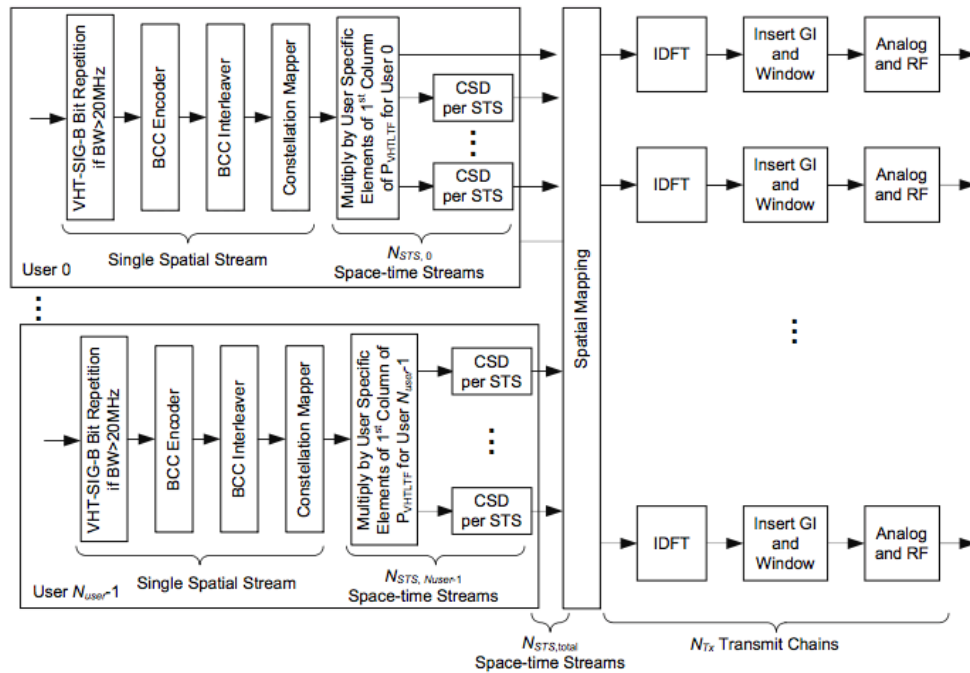
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Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

14. Each of the Accused Products comprises logic operatively coupled to said transceiver and configured to selectively allow a second device to operatively associate with a beam downlink transmittable to said second device using said smart antenna. For example, the RTA1300M ARTEMIS allows a client device to operatively associate with a beam downlink transmittable to that client device using the smart antenna. *See, e.g.*, 802.11ac Standard Clause 8.5.23.3 (“The Group ID Management frame is an Action frame of category VHT. It is transmitted by the AP to assign or change the user position of a STA for one or more group IDs. The Action field of a Group ID Management frame contains the information shown in Table 8-281aj”); *id.* Clause 8.4.1.51 (“The Membership Status Array field is used in the Group ID Management frame (see 8.5.23.3). The length of the field is 8 octets. An 8 octet Membership Status Array field (indexed by the group ID) consists of a 1-bit Membership Status subfield for each of the 64 group IDs, as shown in Figure 8-80f. * * * Within the 8 octet Membership Status Array field, the 1-bit Membership Status subfield for each group ID is set as follows: — Set to 0 if the STA is not a member of the group — Set to 1 if STA is a member of the group

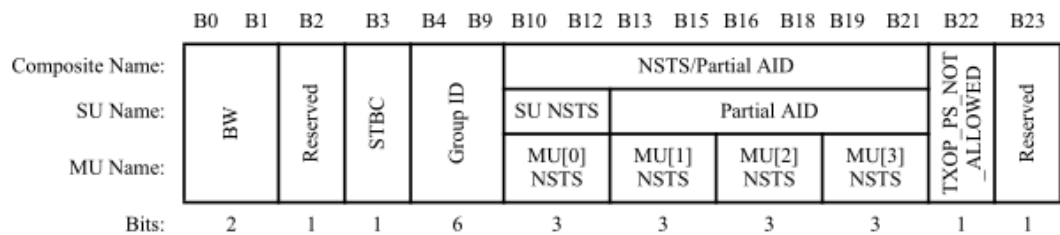
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1 The Membership Status subfields for group ID 0 (transmissions to AP) and group
 2 ID 63 (downlink SU transmissions) are reserved.”); *id.* Clause 8.4.1.52 (“The User
 3 Position Array field is used in the Group ID Management frame (see 8.5.23.3). The
 4 length of the field is 16 octets. A 16 octet User Position Array field (indexed by the
 5 Group ID) consists of a 2-bit User Position subfield for each of the 64 group IDs,
 6 as shown in Figure 8-80g. * * * If the Membership Status subfield for a particular
 7 group ID is 1, then the corresponding User Position subfield is encoded as shown
 8 in Table 8-531.”); *id.* Table 8-531:

9 **Table 8-531—Encoding of User Position subfield**

| User Position subfield value | User position |
|------------------------------|---------------|
| 00 | 0 |
| 01 | 1 |
| 10 | 2 |
| 11 | 3 |

15 *Id.* Clause 22.3.8.3.3 (“The VHT-SIG-A field carries information required to
 16 interpret VHT PPDUs. The structure of the VHT-SIG-A field for the first part
 17 (VHT-SIG-A1) is shown in Figure 22-18 and for the second part (VHT-SIG-A2) is
 18 shown in Figure 22-19.”); *id.* Figure 22-18:



23 **Figure 22-18—VHT-SIG-A1 structure**

24 *Id.* Clause 22.3.11.4:

1 When a STA receives a VHT MU PPDU where the Group ID field in VHT-SIG-A has the value k and where
2 MembershipStatusInGroupID[k] is equal to 1, then the number of space-time streams for that STA is
3 indicated in the MU[UserPositionInGroupID[k]] NSTS field in VHT-SIG-A. The space-time streams of
4 different users are ordered in accordance to user position values, i.e., the space-time streams for the user in
5 user position 0 come first, followed by the space-time streams for the user in position 1, followed by the
6 space-time streams for the user in position 2, and followed by the space-time streams for the user in
7 position 3.

8 A STA is also able to identify the space-time streams intended for other STAs that act as interference. VHT-
9 LTF symbols in the VHT MU PPDU are used to measure the channel for the space-time streams intended
10 for the STA and can also be used to measure the channel for the interfering space-time streams. To
11 successfully demodulate the space-time streams intended for the STA, the STA may use the channel state
12 information for all space-time streams to reduce the effect of interfering space-time streams.

13 *Id.* Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require
14 knowledge of the channel state to compute a steering matrix that is applied to the
15 transmitted signal to optimize reception at one or more receivers. The STA
16 transmitting using the steering matrix is called the VHT beamformer and a STA for
17 which reception is optimized is called a VHT beamformee. An explicit feedback
18 mechanism is used where the VHT beamformee directly measures the channel
19 from the training symbols transmitted by the VHT beamformer and sends back a
20 transformed estimate of the channel state to the VHT beamformer. The VHT
21 beamformer then uses this estimate, perhaps combining estimates from multiple
22 VHT beamformees, to derive the steering matrix.”); *id.* Clause 9.31.5.2 (“A VHT
23 beamformer shall initiate a sounding feedback sequence by transmitting a VHT
24 NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT
25 beamformer shall include in the VHT NDP Announcement frame one STA Info
26 field for each VHT beamformee that is expected to prepare VHT Compressed
27 Beamforming feedback and shall identify the VHT beamformee by including the
28 VHT beamformee’s AID in the AID subfield of the STA Info field. The VHT NDP
Announcement frame shall include at least one STA Info field.”); *id.* (“A non-AP
VHT beamformee that receives a VHT NDP Announcement frame... shall
transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
Beamforming Report Poll with RA matching its MAC address and a non-
bandwidth signaling TA obtained from the TA field matching the MAC address of

1 the VHT beamformer.”); *id.* Clauses 8.5.23.2, 8.4.1.48, 8.4.1.49; *id.* Clauses
 2 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a)
 3 (“Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1.”); *id.* Clauses
 4 22.3.10.11.1, 22.3.11.2; IEEE 802.11-2012 Clause 20.3.12.3.6.

5 15. Each of the Accused Products comprises logic configured to
 6 determine information from at least one uplink transmission receivable from said
 7 second device through said smart antenna. For example, the RTA1300M
 8 ARTEMIS determines information from a VHT Compressed Beamforming frame
 9 received from a client device through its smart antenna. *See, e.g.*, 802.11ac
 10 Standard Clauses 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5.1, 9.31.5.2; IEEE 802.11-
 11 2012 Clause 20.3.12.3.6.

12 16. Each of the Accused Products comprises logic configured to
 13 determine if said associated second device should operatively associate with a
 14 different beam downlink transmittable using said smart antenna based on said
 15 determined information. For example, the RTA1300M ARTEMIS determines,
 16 based on the information received in a VHT Compressed Beamforming frame, if
 17 the client device should operatively associate with a different beam downlink
 18 transmittable using the smart antenna. *See, e.g.*, 802.11ac Standard Clauses
 19 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.11.2:

20 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 21 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 22 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 23 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,v)$ and $\psi(k,u)$, are quantized
 according to Table 8-53e. The number of bits for quantization is chosen by the beamformee, based on the
 indication from the beamformer as to whether the feedback is requested for SU-MIMO beamforming or DL-
 MU-MIMO beamforming. The compressed beamforming feedback using 20.3.12.3.6 is the only Clause 22
 beamforming feedback format defined.

24 The beamformee shall generate the beamforming feedback matrices with the number of rows (N_r) equal to
 the N_{STS} of the NDP.

25 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 26 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 27 matrix Q_k . For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix
 $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ ($0 \leq u \leq N_{user} - 1$) in order to suppress crosstalk
 28 between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k
 is implementation specific.

1 17. Each of the Accused Products comprises logic configured to allow
2 said second device to operatively associate with said different beam if said
3 associated second device should operatively associate with a different beam and
4 selectively identify that said second device is not allowed to operatively associate
5 with said beam. For example, the RTA1300M ARTEMIS allows a client device to
6 operatively associate with a beam that is different from the beam with which the
7 client was associated previously, and to identify that the client device is not
8 allowed to operatively associate with the prior beam. *See, e.g.*, 802.11ac Standard
9 Clause 10.40 (“An AP determines the possible combinations of STAs that can be
10 addressed by a VHT MU PPDU by assigning STAs to groups and to specific user
11 positions within those groups. Assignments or changes of user positions
12 corresponding to one or more Group IDs shall be performed using a Group ID
13 Management frame defined in 8.5.23.3...A VHT MU PPDU shall be transmitted to
14 a STA based on the content of the Group ID Management frame most recently
15 transmitted to the STA and for which an acknowledgement was received.”); *id.*
16 Clause 8.5.23.3 (“The Group ID Management frame is an Action frame of category
17 VHT. It is transmitted by the AP to assign or change the user position of a STA for
18 one or more group IDs. The Action field of a Group ID Management frame
19 contains the information shown in Table 8-281aj”); *id.* Clause 8.4.1.51 (“The
20 Membership Status Array field is used in the Group ID Management frame (see
21 8.5.23.3). The length of the field is 8 octets. An 8 octet Membership Status Array
22 field (indexed by the group ID) consists of a 1-bit Membership Status subfield for
23 each of the 64 group IDs, as shown in Figure 8-80f. * * * Within the 8 octet
24 Membership Status Array field, the 1-bit Membership Status subfield for each
25 group ID is set as follows: — Set to 0 if the STA is not a member of the group —
26 Set to 1 if STA is a member of the group The Membership Status subfields for
27 group ID 0 (transmissions to AP) and group ID 63 (downlink SU transmissions)
28 are reserved.”); *id.* Clause 8.4.1.52 (“The User Position Array field is used in the

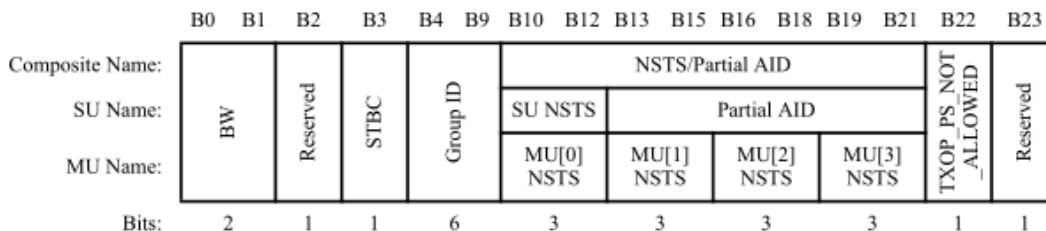
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1 Group ID Management frame (see 8.5.23.3). The length of the field is 16 octets. A
 2 16 octet User Position Array field (indexed by the Group ID) consists of a 2-bit
 3 User Position subfield for each of the 64 group IDs, as shown in Figure 8-80g. * *
 4 * If the Membership Status subfield for a particular group ID is 1, then the
 5 corresponding User Position subfield is encoded as shown in Table 8-531.”); *id.*
 6 Table 8-531:

7 **Table 8-531—Encoding of User Position subfield**

| User Position subfield value | User position |
|------------------------------|---------------|
| 00 | 0 |
| 01 | 1 |
| 10 | 2 |
| 11 | 3 |

13 *Id.* Clause 22.3.8.3.3 (“The VHT-SIG-A field carries information required to
 14 interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part
 15 (VHT-SIG-A1) is shown in Figure 22-18 and for the second part (VHT-SIG-A2) is
 16 shown in Figure 22-19.”); *id.* Figure 22-18:



21 **Figure 22-18—VHT-SIG-A1 structure**

22 *Id.* Clause 22.3.11.4:

23 When a STA receives a VHT MU PPDU where the Group ID field in VHT-SIG-A has the value k and where
 24 MembershipStatusInGroupID[k] is equal to 1, then the number of space-time streams for that STA is
 25 indicated in the MU[UserPositionInGroupID[k]] NSTS field in VHT-SIG-A. The space-time streams of
 26 different users are ordered in accordance to user position values, i.e., the space-time streams for the user in
 27 user position 0 come first, followed by the space-time streams for the user in position 1, followed by the
 28 space-time streams for the user in position 2, and followed by the space-time streams for the user in
 position 3.

A STA is also able to identify the space-time streams intended for other STAs that act as interference. VHT-LTF symbols in the VHT MU PPDU are used to measure the channel for the space-time streams intended for the STA and can also be used to measure the channel for the interfering space-time streams. To successfully demodulate the space-time streams intended for the STA, the STA may use the channel state information for all space-time streams to reduce the effect of interfering space-time streams.

1 *Id.* Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require
 2 knowledge of the channel state to compute a steering matrix that is applied to the
 3 transmitted signal to optimize reception at one or more receivers. The STA
 4 transmitting using the steering matrix is called the VHT beamformer and a STA for
 5 which reception is optimized is called a VHT beamformee. An explicit feedback
 6 mechanism is used where the VHT beamformee directly measures the channel
 7 from the training symbols transmitted by the VHT beamformer and sends back a
 8 transformed estimate of the channel state to the VHT beamformer. The VHT
 9 beamformer then uses this estimate, perhaps combining estimates from multiple
 10 VHT beamformees, to derive the steering matrix.”); *id.* Clause 9.31.5.2 (“A VHT
 11 beamformer shall initiate a sounding feedback sequence by transmitting a VHT
 12 NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT
 13 beamformer shall include in the VHT NDP Announcement frame one STA Info
 14 field for each VHT beamformee that is expected to prepare VHT Compressed
 15 Beamforming feedback and shall identify the VHT beamformee by including the
 16 VHT beamformee’s AID in the AID subfield of the STA Info field. The VHT NDP
 17 Announcement frame shall include at least one STA Info field.”); *id.* (“A non-AP
 18 VHT beamformee that receives a VHT NDP Announcement frame... shall
 19 transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
 20 Beamforming Report Poll with RA matching its MAC address and a non-
 21 bandwidth signaling TA obtained from the TA field matching the MAC address of
 22 the VHT beamformer.”); *id.* Clauses 8.5.23.2, 8.4.1.48, 8.4.1.49; *id.* Clauses
 23 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a)
 24 (“Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1.”); *id.* Clauses
 25 22.3.10.11.1, 22.3.11.2; IEEE 802.11-2012 Clause 20.3.12.3.6.

26 18. Defendant has been and is now indirectly infringing at least one claim
 27 of the ‘296 Patent in accordance with 35 U.S.C. § 271(b) in this district and
 28 elsewhere in the United States. More specifically, Defendant have been and are

1 now actively inducing direct infringement by other persons (e.g., Defendant's
2 customers who use, sell or offer for sale the Accused Products).

3 19. By at least the filing of this complaint, Defendant had knowledge of
4 the '296 Patent, and that its actions resulted in a direct infringement of the '296
5 Patent, and knew or were willfully blind that their actions would induce direct
6 infringement by others and intended that their actions would induce direct
7 infringement by others.

8 20. Defendant actively induces such infringement by, among other things,
9 providing user manuals and other instruction material for their devices that induce
10 their customers to use Defendant's devices in their normal and customary way to
11 infringe the '296 Patent. For example, Defendant's website provides instructions
12 for using the Accused Products on wireless communication systems, and to utilize
13 their beamforming and MU-MIMO functionalities. Through its manufacture and
14 sales of their devices, Defendant specifically intended for its customers to infringe
15 claims of the '296 Patent. Further, Defendant was aware that these normal and
16 customary activities would infringe the '296 Patent. Defendant performed the acts
17 that constitute induced infringement, and that would induce actual infringement,
18 with knowledge of the '296 Patent and with the knowledge or willful blindness that
19 the induced acts would constitute direct infringement.

20 21. Accordingly, a reasonable inference is that Defendant specifically
21 intended for others, such as their customers, to directly infringe one or more claims
22 of the '296 Patent in the United States because Defendant had knowledge of the
23 '296 Patent and actively induced others (e.g., its customers) to directly infringe the
24 '296 Patent by using, selling, or offering to sell the Accused Products and the MU-
25 MIMO functionality within the Accused Products.

26 22. Defendant also infringes other claims of the '296 Patent, directly and
27 through inducing infringement, for similar reasons as explained above with respect
28 to Claim 33.

1 23. The '296 Patent is valid and enforceable.

2 24. Defendant's infringement of the '296 Patent has damaged Vivato, and
3 Defendant is liable to Vivato in an amount to be determined at trial that
4 compensates Vivato for the infringement, which by law can be no less than a
5 reasonable royalty.

6 25. As a result of Defendant's infringement of the '296 Patent, Vivato has
7 suffered irreparable harm and will continue to suffer loss and injury.

8 **V. COUNT TWO: INFRINGEMENT OF UNITED STATES**
9 **PATENT NO. 7,729,728**

10 26. On June 1, 2010, United States Patent No. 7,729,728 ("the '728
11 Patent") was duly and legally issued for inventions entitled "Forced Beam
12 Switching in Wireless Communication Systems Having Smart Antennas." Vivato
13 owns the '728 Patent and holds the right to sue and recover damages for
14 infringement thereof. A copy of the '728 Patent is attached hereto as Exhibit B.

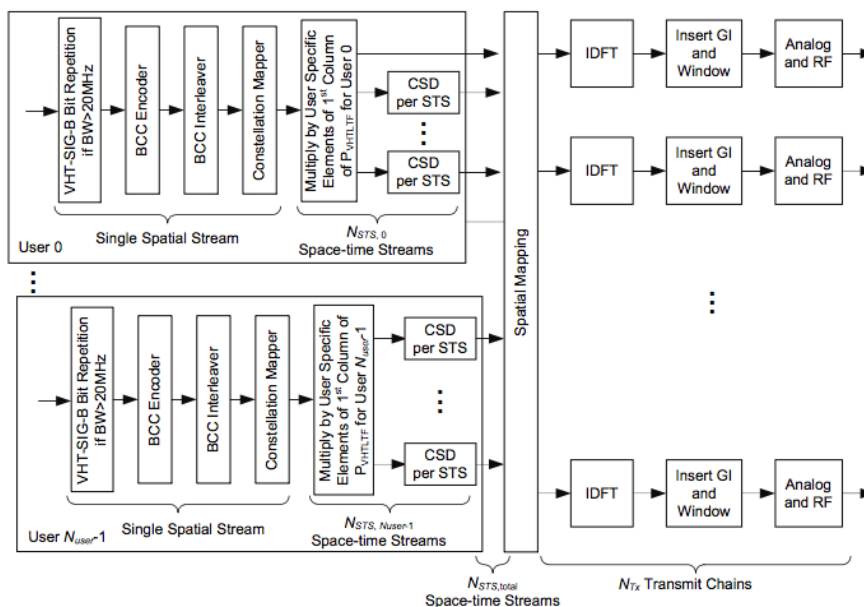
15 27. Defendant has directly infringed and continues to directly infringe
16 numerous claims of the '728 Patent, including at least claim 16, by manufacturing,
17 using, selling, offering to sell, and/or importing into the United States the Accused
18 Products. Defendant is liable for infringement of the '728 Patent pursuant to 35
19 U.S.C. § 271(a).

20 28. Each of the Accused Products comprises a wireless communication
21 system. For example, the RTA1300M ARTEMIS is a wireless access point for use
22 in a Wi-Fi network.

23 29. Each of the Accused Products comprises a phased array antenna
24 configured to transmit beam downlinks. *See, e.g.*: 802.11ac Standard Clause
25 8.4.2.58.6, Table 8-128.

26 30. Each of the Accused Products comprises a transceiver operatively
27 coupled to the phased array antenna and configured to send and receive
28 electromagnetic signals via the phased array antenna. For example, the

1 RTA1300M ARTEMIS has a Qualcomm IPQ4018 WiFi SoC that is configured to
 2 send and receive electromagnetic signals via the phased array antenna. *See, e.g.,*
 3 802.11ac Standard Clauses 22.3.4.5(j), 22.3.4.6(g), 22.3.4.7(h), 22.3.4.8(p),
 4 22.3.4.9.1(q), 22.3.4.9.2(q), 22.3.4.10.4(e) (“Analog and RF: Up-convert the
 5 resulting complex baseband waveform associated with each transmit chain to an
 6 RF signal according to the center frequency of the desired channel and transmit.”);
 7 *id.* Clauses 22.3.7.4, 22.3.8; *id.* Clause 22.3.3 and Figure 22-7:



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Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

31. Each of the Accused Products comprises an access point that includes the phased array antenna and the transceiver. For example, the RTA1300M ARTEMIS comprises an access point that includes a phased antenna array and a Qualcomm IPQ4018 WiFi SoC.

32. Each of the Accused Products comprises an access point that includes the phased array antenna and the transceiver that is configured to selectively allow a receiving device to operatively associate with a beam downlink transmitted to the receiving device via the phased array antenna. *See, e.g.,* 802.11ac Standard Clause 8.5.23.3 (“The Group ID Management frame is an Action frame of category VHT.

1 It is transmitted by the AP to assign or change the user position of a STA for one
 2 or more group IDs. The Action field of a Group ID Management frame contains
 3 the information shown in Table 8-281aj”); *id.* Clause 8.4.1.51 (“The Membership
 4 Status Array field is used in the Group ID Management frame (see 8.5.23.3). The
 5 length of the field is 8 octets. An 8 octet Membership Status Array field (indexed
 6 by the group ID) consists of a 1-bit Membership Status subfield for each of the 64
 7 group IDs, as shown in Figure 8-80f. * * * Within the 8 octet Membership Status
 8 Array field, the 1-bit Membership Status subfield for each group ID is set as
 9 follows: — Set to 0 if the STA is not a member of the group — Set to 1 if STA is a
 10 member of the group The Membership Status subfields for group ID 0
 11 (transmissions to AP) and group ID 63 (downlink SU transmissions) are
 12 reserved.”); *id.* Clause 8.4.1.52 (“The User Position Array field is used in the
 13 Group ID Management frame (see 8.5.23.3). The length of the field is 16 octets. A
 14 16 octet User Position Array field (indexed by the Group ID) consists of a 2-bit
 15 User Position subfield for each of the 64 group IDs, as shown in Figure 8-80g. * *
 16 * If the Membership Status subfield for a particular group ID is 1, then the
 17 corresponding User Position subfield is encoded as shown in Table 8-531.”); *id.*
 18 Table 8-531:

19 **Table 8-531—Encoding of User Position subfield**

| User Position subfield value | User position |
|------------------------------|---------------|
| 00 | 0 |
| 01 | 1 |
| 10 | 2 |
| 11 | 3 |

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 25 *Id.* Clause 22.3.8.3.3 (“The VHT-SIG-A field carries information required to
 26 interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part
 27 (VHT-SIG-A1) is shown in Figure 22-18 and for the second part (VHT-SIG-A2) is
 28 shown in Figure 22-19.”); *id.* Figure 22-18:

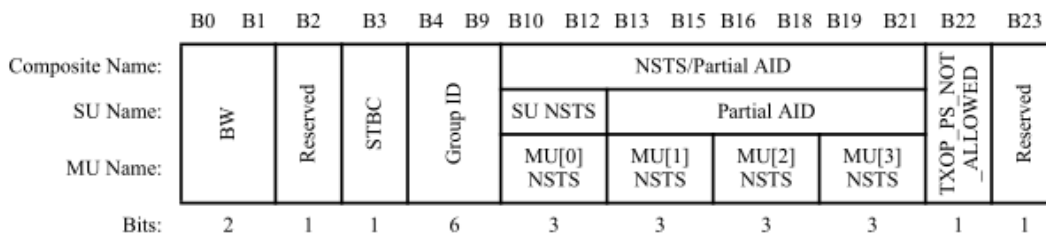


Figure 22-18—VHT-SIG-A1 structure

Id. Clause 22.3.11.4:

When a STA receives a VHT MU PPDU where the Group ID field in VHT-SIG-A has the value k and where MembershipStatusInGroupID[k] is equal to 1, then the number of space-time streams for that STA is indicated in the MU[UserPositionInGroupID[k]] NSTS field in VHT-SIG-A. The space-time streams of different users are ordered in accordance to user position values, i.e., the space-time streams for the user in user position 0 come first, followed by the space-time streams for the user in position 1, followed by the space-time streams for the user in position 2, and followed by the space-time streams for the user in position 3.

A STA is also able to identify the space-time streams intended for other STAs that act as interference. VHT-LTF symbols in the VHT MU PPDU are used to measure the channel for the space-time streams intended for the STA and can also be used to measure the channel for the interfering space-time streams. To successfully demodulate the space-time streams intended for the STA, the STA may use the channel state information for all space-time streams to reduce the effect of interfering space-time streams.

Id. Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require knowledge of the channel state to compute a steering matrix that is applied to the transmitted signal to optimize reception at one or more receivers. The STA transmitting using the steering matrix is called the VHT beamformer and a STA for which reception is optimized is called a VHT beamformee. An explicit feedback mechanism is used where the VHT beamformee directly measures the channel from the training symbols transmitted by the VHT beamformer and sends back a transformed estimate of the channel state to the VHT beamformer. The VHT beamformer then uses this estimate, perhaps combining estimates from multiple VHT beamformees, to derive the steering matrix.”); *id.* Clause 9.31.5.2 (“A VHT beamformer shall initiate a sounding feedback sequence by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame one STA Info field for each VHT beamformee that is expected to prepare VHT Compressed Beamforming feedback and shall identify the VHT beamformee by including the VHT beamformee’s AID in the AID subfield of the STA Info field. The VHT NDP

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1 Announcement frame shall include at least one STA Info field.”); *id.* (“A non-AP
2 VHT beamformee that receives a VHT NDP Announcement frame... shall
3 transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
4 Beamforming Report Poll with RA matching its MAC address and a non-
5 bandwidth signaling TA obtained from the TA field matching the MAC address of
6 the VHT beamformer.”); *id.* Clauses 8.5.23.2, 8.4.1.48, 8.4.1.49; *id.* Clauses
7 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a)
8 (“Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1.”); *id.* Clauses
9 22.3.10.11.1, 22.3.11.2; IEEE 802.11-2012 Clause 20.3.12.3.6.

10 33. Each of the Accused Products comprises an access point that includes
11 the phased array antenna and the transceiver that is configured to receive an uplink
12 transmission from the receiving device through the phased array antenna. For
13 example, the RTA1300M ARTEMIS is configured to receive a VHT Compressed
14 Beamforming Feedback frame from a “receiving device” such as a connected
15 laptop or smartphone through its phased-array antenna. *See, e.g.*, 802.11ac
16 Standard Clauses 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5.1, 9.31.5.2; IEEE 802.11-
17 2012 Clause 20.3.12.3.6.

18 34. Each of the Accused Products comprises an access point that includes
19 the phased array antenna and the transceiver that is configured to determine from
20 the uplink transmission if the receiving device should operatively associate with a
21 different beam downlink transmission. For example, the RTA1300M ARTEMIS is
22 configured to determine from information contained in the VHT Compressed
23 Beamforming Feedback frame if the receiving device that sent the VHT
24 Compressed Beamforming Feedback frame should operatively associate with a
25 different beam downlink transmission. *See, e.g.*, 802.11ac Standard Clauses 3.2,
26 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.11.2:
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1 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 2 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 3 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 4 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,u)$ and $\psi(k,u)$, are quantized
 according to Table 8-53e. The number of bits for quantization is chosen by the beamformee, based on the
 indication from the beamformer as to whether the feedback is requested for SU-MIMO beamforming or DL-
 MU-MIMO beamforming. The compressed beamforming feedback using 20.3.12.3.6 is the only Clause 22
 beamforming feedback format defined.

5 The beamformee shall generate the beamforming feedback matrices with the number of rows (N_r) equal to
 6 the N_{STS} of the NDP.

7 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 8 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 matrix Q_k . For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix
 $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ ($0 \leq u \leq N_{user} - 1$) in order to suppress crosstalk
 9 between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k
 is implementation specific.

10 35. Each of the Accused Products comprises an access point that includes
 11 the phased array antenna and the transceiver that is configured to at least one of: (i)
 12 allow the receiving device to operatively associate with the different beam
 13 downlink if determined that the receiving device should operatively associate with
 14 the different beam downlink; (ii) force the receiving device to operatively associate
 15 with the different beam downlink if determined that the receiving device should be
 16 operatively associated with the different beam downlink. For example, the
 17 RTA1300M ARTEMIS is configured to transmit a Group ID Management frame
 18 or VHT MU PPDU VHT-SIG-A or combination thereof to allow the receiving
 19 device to operatively associate with the different beam downlink if determined that
 20 the receiving device should operatively associate with the different beam
 21 downlink; (ii) force the receiving device to operatively associate with the different
 22 beam downlink if determined that the receiving device should be operatively
 23 associated with the different beam downlink. *See, e.g.*, 802.11ac Standard Clause
 24 10.40 (“An AP determines the possible combinations of STAs that can be
 25 addressed by a VHT MU PPDU by assigning STAs to groups and to specific user
 26 positions within those groups. Assignments or changes of user positions
 27 corresponding to one or more Group IDs shall be performed using a Group ID
 28 Management frame defined in 8.5.23.3...A VHT MU PPDU shall be transmitted to
 a STA based on the content of the Group ID Management frame most recently

1 transmitted to the STA and for which an acknowledgement was received.”); *id.*
 2 Clause 8.5.23.3 (“The Group ID Management frame is an Action frame of category
 3 VHT. It is transmitted by the AP to assign or change the user position of a STA for
 4 one or more group IDs. The Action field of a Group ID Management frame
 5 contains the information shown in Table 8-281aj”); *id.* Clause 8.4.1.51 (“The
 6 Membership Status Array field is used in the Group ID Management frame (see
 7 8.5.23.3). The length of the field is 8 octets. An 8 octet Membership Status Array
 8 field (indexed by the group ID) consists of a 1-bit Membership Status subfield for
 9 each of the 64 group IDs, as shown in Figure 8-80f. * * * Within the 8 octet
 10 Membership Status Array field, the 1-bit Membership Status subfield for each
 11 group ID is set as follows: — Set to 0 if the STA is not a member of the group —
 12 Set to 1 if STA is a member of the group The Membership Status subfields for
 13 group ID 0 (transmissions to AP) and group ID 63 (downlink SU transmissions)
 14 are reserved.”); *id.* Clause 8.4.1.52 (“The User Position Array field is used in the
 15 Group ID Management frame (see 8.5.23.3). The length of the field is 16 octets. A
 16 16 octet User Position Array field (indexed by the Group ID) consists of a 2-bit
 17 User Position subfield for each of the 64 group IDs, as shown in Figure 8-80g. * *
 18 * If the Membership Status subfield for a particular group ID is 1, then the
 19 corresponding User Position subfield is encoded as shown in Table 8-53l.”); *id.*
 20 Table 8-53l:

21 **Table 8-53l—Encoding of User Position subfield**

| User Position subfield value | User position |
|------------------------------|---------------|
| 00 | 0 |
| 01 | 1 |
| 10 | 2 |
| 11 | 3 |

22
 23
 24
 25
 26
 27 *Id.* Clause 22.3.8.3.3 (“The VHT-SIG-A field carries information required to
 28 interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part

(VHT-SIG-A1) is shown in Figure 22-18 and for the second part (VHT-SIG-A2) is shown in Figure 22-19.”); *id.* Figure 22-18:

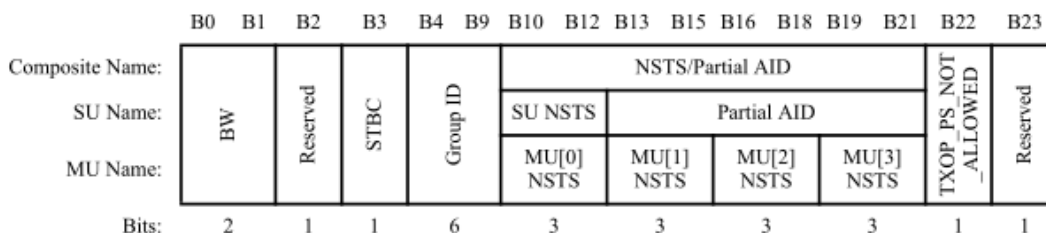


Figure 22-18—VHT-SIG-A1 structure

Id. Clause 22.3.11.4:

When a STA receives a VHT MU PPDU where the Group ID field in VHT-SIG-A has the value k and where MembershipStatusInGroupID[k] is equal to 1, then the number of space-time streams for that STA is indicated in the MU[UserPositionInGroupID[k]] NSTS field in VHT-SIG-A. The space-time streams of different users are ordered in accordance to user position values, i.e., the space-time streams for the user in user position 0 come first, followed by the space-time streams for the user in position 1, followed by the space-time streams for the user in position 2, and followed by the space-time streams for the user in position 3.

A STA is also able to identify the space-time streams intended for other STAs that act as interference. VHT-LTF symbols in the VHT MU PPDU are used to measure the channel for the space-time streams intended for the STA and can also be used to measure the channel for the interfering space-time streams. To successfully demodulate the space-time streams intended for the STA, the STA may use the channel state information for all space-time streams to reduce the effect of interfering space-time streams.

Id. Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require knowledge of the channel state to compute a steering matrix that is applied to the transmitted signal to optimize reception at one or more receivers. The STA transmitting using the steering matrix is called the VHT beamformer and a STA for which reception is optimized is called a VHT beamformee. An explicit feedback mechanism is used where the VHT beamformee directly measures the channel from the training symbols transmitted by the VHT beamformer and sends back a transformed estimate of the channel state to the VHT beamformer. The VHT beamformer then uses this estimate, perhaps combining estimates from multiple VHT beamformees, to derive the steering matrix.”); *id.* Clause 9.31.5.2 (“A VHT beamformer shall initiate a sounding feedback sequence by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame one STA Info field for each VHT beamformee that is expected to prepare VHT Compressed

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1 Beamforming feedback and shall identify the VHT beamformee by including the
2 VHT beamformee's AID in the AID subfield of the STA Info field. The VHT NDP
3 Announcement frame shall include at least one STA Info field."); *id.* ("A non-AP
4 VHT beamformee that receives a VHT NDP Announcement frame... shall
5 transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
6 Beamforming Report Poll with RA matching its MAC address and a non-
7 bandwidth signaling TA obtained from the TA field matching the MAC address of
8 the VHT beamformer."); *id.* Clauses 8.5.23.2, 8.4.1.48, 8.4.1.49; *id.* Clauses
9 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a)
10 ("Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1."); *id.* Clauses
11 22.3.10.11.1, 22.3.11.2; IEEE 802.11-2012 Clause 20.3.12.3.6.

12 36. Each of the Accused Products comprises an access point that includes
13 the phased array antenna and the transceiver that is configured to actively probe the
14 receiving device by generating a signal to initiate that the phased array antenna
15 transmit at least one downlink transmittable message over the beam downlinks,
16 and gather signal parameter information from uplink transmittable messages
17 received from the receiving device through the phased array antenna. For example,
18 the RTA1300M ARTEMIS is configured to actively probe the receiving device by
19 generating a signal to initiate that the phased array antenna transmit a signal, e.g. a
20 VHT null data packet announcement frame over the beam downlinks, and to gather
21 signal parameter information from uplink transmittable messages received from the
22 receiving device through the phased array antenna, e.g. one or more VHT
23 Compressed Beamforming Feedback frames. *See, e.g.*, 802.11ac Standard Clause
24 9.31.5, 9.31.5.2 ("A VHT beamformer shall initiate a sounding feedback sequence
25 by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a
26 SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame
27 one STA Info field for each VHT beamformee that is expected to prepare VHT
28 Compressed Beamforming feedback and shall identify the VHT beamformee by

1 including the VHT beamformee's AID in the AID subfield of the STA Info field.
 2 The VHT NDP Announcement frame shall include at least one STA Info field.");
 3 *id.* ("A non-AP VHT beamformee that receives a VHT NDP Announcement
 4 frame... shall transmit its VHT Compressed Beamforming feedback a SIFS after
 5 receiving a Beamforming Report Poll with RA matching its MAC address and a
 6 non-bandwidth signaling TA obtained from the TA field matching the MAC
 7 address of the VHT beamformer."); *id.* Clause 8.4.1.24; IEEE 802.11-2012 Clause
 8 20.3.12.3.6; 802.11ac Standard Clause 8.5.23.2 (defining format and subfields
 9 within the VHT Compressed Beamforming frame); *id.* Clause 8.4.1.48 (including
 10 Tables 8-53(d)-(h)) ("Each SNR value per tone in stream i (before being averaged)
 11 corresponds to the SNR associated with the column i of the beamforming feedback
 12 matrix V determined at the beamformee"); *id.* Clause 8.4.1.49 (including Table 8-
 13 53i – MU Exclusive Beamforming Report information); *id.* Clauses 8.4.1.24,
 14 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.8.3.5; *id.* Clause 22.3.11.2.

15 37. Defendant has been and is now indirectly infringing at least one claim
 16 of the '728 Patent in accordance with 35 U.S.C. § 271(b) in this district and
 17 elsewhere in the United States. More specifically, Defendant have been and are
 18 now actively inducing direct infringement by other persons (e.g., Defendant's
 19 customers who use, sell or offer for sale the Accused Products).

20 38. By at least the filing of this complaint, Defendant had knowledge of
 21 the '728 Patent, and that its actions resulted in a direct infringement of the '728
 22 Patent, and knew or were willfully blind that their actions would induce direct
 23 infringement by others and intended that their actions would induce direct
 24 infringement by others.

25 39. Defendant actively induces such infringement by, among other things,
 26 providing user manuals and other instruction material for their devices that induce
 27 their customers to use Defendant's devices in their normal and customary way to
 28 infringe the '728 Patent. For example, Defendant's website provides instructions

1 for using the Accused Products on wireless communication systems, and to utilize
 2 their beamforming and MU-MIMO functionalities. Through its manufacture and
 3 sales of their devices, Defendant specifically intended for its customers to infringe
 4 claims of the ‘728 Patent. Further, Defendant was aware that these normal and
 5 customary activities would infringe the ‘728 Patent. Defendant performed the acts
 6 that constitute induced infringement, and that would induce actual infringement,
 7 with knowledge of the ‘728 Patent and with the knowledge or willful blindness that
 8 the induced acts would constitute direct infringement.

9 40. Accordingly, a reasonable inference is that Defendant specifically
 10 intended for others, such as their customers, to directly infringe one or more claims
 11 of the ‘728 Patent in the United States because Defendant had knowledge of the
 12 ‘728 Patent and actively induced others (e.g., its customers) to directly infringe the
 13 ‘728 Patent by using, selling, or offering to sell the Accused Products and the MU-
 14 MIMO functionality within the Accused Products.

15 41. Defendant also infringes other claims of the ‘728 Patent, directly and
 16 through inducing infringement, for similar reasons as explained above with respect
 17 to Claim 16.

18 42. The ‘728 Patent is valid and enforceable.

19 43. Defendant’s infringement of the ‘728 Patent has damaged Vivato, and
 20 Defendant is liable to Vivato in an amount to be determined at trial that
 21 compensates Vivato for the infringement, which by law can be no less than a
 22 reasonable royalty.

23 44. As a result of Defendant’s infringement of the ‘728 Patent, Vivato has
 24 suffered irreparable harm and will continue to suffer loss and injury.

25 **VI. COUNT THREE: INFRINGEMENT OF UNITED STATES**
 26 **PATENT NO. 6,611,231**

27 45. On August 26, 2003, United States Patent No. 6,611,231 (“the ‘231
 28 Patent”) was duly and legally issued for inventions entitled “Wireless Packet

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1 Switched Communication Systems and Networks Using Adaptively Steered
2 Antenna Arrays.” Vivato owns the ‘231 Patent and holds the right to sue and
3 recover damages for infringement thereof. A copy of the ‘231 Patent is attached
4 hereto as Exhibit C.

5 46. Defendant has directly infringed and continues to directly infringe
6 numerous claims of the ‘231 Patent, including at least claim 1, by manufacturing,
7 using, selling, offering to sell, and/or importing into the United States the Accused
8 Products. Defendant is liable for infringement of the ‘231 Patent pursuant to 35
9 U.S.C. § 271(a).

10 47. Each of the Accused Products comprises an apparatus for use in a
11 wireless routing network. For example, the RTA1300M ARTEMIS is an apparatus
12 for use in a wireless routing network.

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1 48. Each of the Accused Products comprises an adaptive antenna. For
 2 example, the RTA1300M ARTEMIS has at least one adaptive antenna. *See, e.g.:*
 3 802.11ac Standard Clause 8.4.2.58.6, Table 8-128:

4 **8.4.2.58.6 Transmit Beamforming Capabilities**

5 *Change the following rows in Table 8-128:*

6 **Table 8-128—Subfields of the Transmit Beamforming Capabilities field**

| Subfield | Definition | Encoding |
|--|---|---|
| CSI Number of Beamformer Antennas Supported | Indicates the maximum number of beamformer antennas the HT beamformee can support when CSI feedback is required | Set to 0 for single Tx antenna sounding Set to 1 for 2 Tx antenna sounding Set to 2 for 3 Tx antenna sounding Set to 3 for 4 Tx antenna sounding |
| Noncompressed Steering Number of Beamformer Antennas Supported | Indicates the maximum number of beamformer antennas the HT beamformee can support when noncompressed beamforming feedback matrix is required | Set to 0 for single Tx antenna sounding Set to 1 for 2 Tx antenna sounding Set to 2 for 3 Tx antenna sounding Set to 3 for 4 Tx antenna sounding |
| Compressed Steering Number of Beamformer Antennas Supported | Indicates the maximum number of beamformer antennas the HT beamformee can support when compressed beamforming feedback matrix is required | Set to 0 for single Tx antenna sounding Set to 1 for 2 Tx antenna sounding Set to 2 for 3 Tx antenna sounding Set to 3 for 4 Tx antenna sounding |
| CSI Max Number of Rows Beamformer Supported | Indicates the maximum number of rows of CSI explicit feedback from the HT beamformee or calibration responder or transmit ASEL responder that an HT beamformer or calibration initiator or transmit ASEL initiator can support when CSI feedback is required. | Set to 0 for a single row of CSI Set to 1 for 2 rows of CSI Set to 2 for 3 rows of CSI Set to 3 for 4 rows of CSI |

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 18
 19 49. Each of the Accused Products comprises at least one transmitter
 20 operatively coupled to said adaptive antenna and at least one receiver operatively
 21 coupled to said adaptive antenna. For example, the RTA1300M ARTEMIS has a
 22 Qualcomm IPQ4018 WiFi SoC operatively coupled to the adaptive antenna. *See,*
 23 *e.g.,* 802.11ac Standard Clauses 22.3.4.5(j), 22.3.4.6(g), 22.3.4.7(h), 22.3.4.8(p),
 24 22.3.4.9.1(q), 22.3.4.9.2(q), 22.3.4.10.4(e) (“Analog and RF: Up-convert the
 25 resulting complex baseband waveform associated with each transmit chain to an
 26 RF signal according to the center frequency of the desired channel and transmit.”);
 27 *id.* Clauses 22.3.7.4, 22.3.8; *id.* Clause 22.3.3 and Figure 22-7:
 28

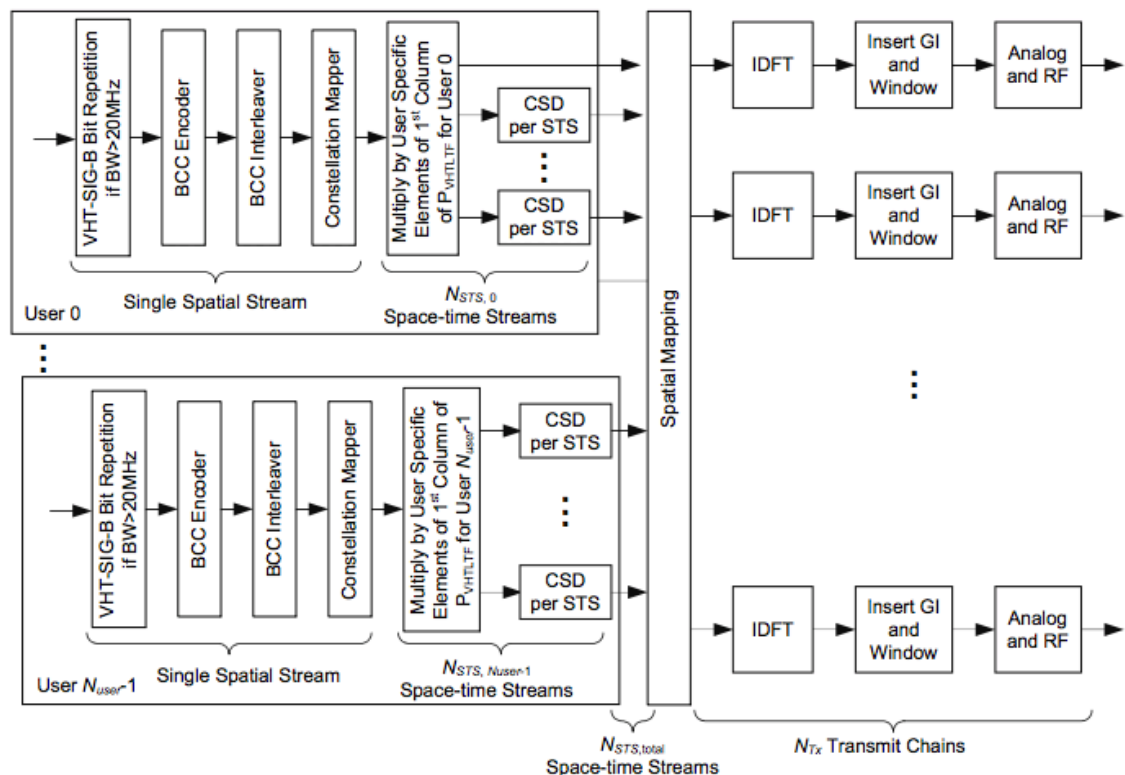


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

50. Each of the Accused Products comprises a control logic operatively coupled to said transmitter and configured to cause said at least one transmitter to output at least one transmission signal to said adaptive antenna to transmit corresponding outgoing multi-beam electromagnetic signals exhibiting a plurality of selectively placed transmission peaks and transmission nulls within a far field region of a coverage area based on routing information. For example, the RTA1300M ARTEMIS is configured to output at least one transmission signal to said adaptive antenna. For a further example, the RTA1300M ARTEMIS is configured to cause said at least one transmitter to output at least one transmission signal to said adaptive antenna to transmit corresponding outgoing multi-beam electromagnetic signals exhibiting a plurality of selectively placed transmission peaks and transmission nulls within a far field region of a coverage area based on routing information. *See, e.g.,* 802.11ac Standard Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require knowledge of the channel state to

1 compute a steering matrix that is applied to the transmitted signal to optimize
 2 reception at one or more receivers. The STA transmitting using the steering matrix
 3 is called the VHT beamformer and a STA for which reception is optimized is
 4 called a VHT beamformee. An explicit feedback mechanism is used where the
 5 VHT beamformee directly measures the channel from the training symbols
 6 transmitted by the VHT beamformer and sends back a transformed estimate of the
 7 channel state to the VHT beamformer. The VHT beamformer then uses this
 8 estimate, perhaps combining estimates from multiple VHT beamformees, to derive
 9 the steering matrix.”); *id.* Clauses 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l),
 10 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a) (“Spatial mapping: Apply the Q matrix
 11 as described in 22.3.10.11.1.”); *id.* Clause 22.3.10.11.1; IEEE 802.11-2012
 12 Standard Clause 20.3.12.3.6; 802.11ac Standard Clauses 8.4.1.24, 9.31.5.1,
 13 9.31.5.2; *id.* Clause 22.3.11.1:

14 The DL-MU-MIMO steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ can be determined by the
 15 beamformer using the beamforming feedback matrices for subcarrier k from beamformee u , $V_{k,u}$, and SNR
 16 information for subcarrier k from beamformee u , $SNR_{k,u}$, where $u = 0, 1, \dots, N_{user} - 1$. The steering matrix
 17 that is computed (or updated) using new beamforming feedback matrices and new SNR information from
 18 some or all of participating beamformees might replace the existing steering matrix Q_k for the next DL-MU-
 19 MIMO data transmission. The beamformee group for the MU transmission is signaled using the Group ID
 20 field in VHT-SIG-A (see 22.3.8.3.3 and 22.3.11.4).

21 *Id.* Clause 22.3.11.2:

22 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 23 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 24 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 25 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,u)$ and $\psi(k,u)$, are quantized
 26 according to Table 8-53e. The number of bits for quantization is chosen by the beamformee, based on the
 27 indication from the beamformer as to whether the feedback is requested for SU-MIMO beamforming or DL-
 28 MU-MIMO beamforming. The compressed beamforming feedback using 20.3.12.3.6 is the only Clause 22
 beamforming feedback format defined.

The beamformee shall generate the beamforming feedback matrices with the number of rows (Nr) equal to
 the N_{STS} of the NDP.

After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 matrix Q_k . For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix
 $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ ($0 \leq u \leq N_{user} - 1$) in order to suppress crosstalk
 between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k
 is implementation specific.

Each of the Accused Products comprises search receiver logic operatively
 coupled to said control logic and said at least one receiver and configured to update
 said routing information based at least in part on cross-correlated signal

1 information that is received by said receiver using said adaptive antenna. For
2 example, the RTA1300M ARTEMIS updates the routing information based at least
3 in part on cross-correlated signal information received in a VHT Compressed
4 Beamforming frame. *See, e.g.*, 802.11ac Standard Clause 9.31.5.2 (“A VHT
5 beamformer shall initiate a sounding feedback sequence by transmitting a VHT
6 NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT
7 beamformer shall include in the VHT NDP Announcement frame one STA Info
8 field for each VHT beamformee that is expected to prepare VHT Compressed
9 Beamforming feedback and shall identify the VHT beamformee by including the
10 VHT beamformee’s AID in the AID subfield of the STA Info field. The VHT NDP
11 Announcement frame shall include at least one STA Info field.”); *id.* (“A non-AP
12 VHT beamformee that receives a VHT NDP Announcement frame... shall
13 transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
14 Beamforming Report Poll with RA matching its MAC address and a non-
15 bandwidth signaling TA obtained from the TA field matching the MAC address of
16 the VHT beamformer.”); *id.* Clause 8.5.23.2 (defining format and subfields within
17 the VHT Compressed Beamforming frame); *id.* Clause 8.4.1.48 (including Tables
18 8-53(d)-(h)) (“Each SNR value per tone in stream i (before being averaged)
19 corresponds to the SNR associated with the column i of the beamforming feedback
20 matrix V determined at the beamformee”); *id.* Clause 8.4.1.49 (including Table 8-
21 53i – MU Exclusive Beamforming Report information); *id.* Clauses 8.4.1.24,
22 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.8.3.5; *id.* Clause 22.3.11.2:

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1 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 2 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 3 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 4 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,u)$ and $\psi(k,u)$, are quantized
 according to Table 8-53e. The number of bits for quantization is chosen by the beamformee, based on the
 indication from the beamformer as to whether the feedback is requested for SU-MIMO beamforming or DL-
 MU-MIMO beamforming. The compressed beamforming feedback using 20.3.12.3.6 is the only Clause 22
 beamforming feedback format defined.

5 The beamformee shall generate the beamforming feedback matrices with the number of rows (N_r) equal to
 6 the N_{STS} of the NDP.

7 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 8 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 matrix Q_k . For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix
 $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ ($0 \leq u \leq N_{user} - 1$) in order to suppress crosstalk
 9 between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k
 is implementation specific.

10 51. Defendant has been and is now indirectly infringing at least one claim
 11 of the '231 Patent in accordance with 35 U.S.C. § 271(b) in this district and
 12 elsewhere in the United States. More specifically, Defendant have been and are
 13 now actively inducing direct infringement by other persons (e.g., Defendant's
 14 customers who use, sell or offer for sale the Accused Products).

15 52. By at least the filing of this complaint, Defendant had knowledge of
 16 the '231 Patent, and that its actions resulted in a direct infringement of the '231
 17 Patent, and knew or were willfully blind that their actions would induce direct
 18 infringement by others and intended that their actions would induce direct
 infringement by others.

19 53. Defendant actively induce such infringement by, among other things,
 20 providing user manuals and other instruction material for their devices that induce
 21 their customers to use Defendant's devices in their normal and customary way to
 22 infringe the '231 Patent. For example, Defendant's website provides instructions
 23 for using the Accused Products on wireless communication systems, and to utilize
 24 their beamforming and MU-MIMO functionalities. Through its manufacture and
 25 sales of their devices, Defendant specifically intended for its customers to infringe
 26 claims of the '231 Patent. Further, Defendant was aware that these normal and
 27 customary activities would infringe the '231 Patent. Defendant performed the acts
 28 that constitute induced infringement, and that would induce actual infringement,

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1 with knowledge of the ‘231 Patent and with the knowledge or willful blindness that
2 the induced acts would constitute direct infringement.

3 54. Accordingly, a reasonable inference is that Defendant specifically
4 intended for others, such as their customers, to directly infringe one or more claims
5 of the ‘231 Patent in the United States because Defendant had knowledge of the
6 ‘231 Patent and actively induced others (e.g., its customers) to directly infringe the
7 ‘231 Patent by using, selling, or offering to sell the Accused Products and the MU-
8 MIMO functionality within the Accused Products.

9 55. Defendant also infringes other claims of the ‘231 Patent, directly and
10 through inducing infringement, for similar reasons as explained above with respect
11 to Claim 1.

12 56. The ‘231 Patent is valid and enforceable.

13 57. Defendant’s infringement of the ‘231 Patent has damaged Vivato, and
14 Defendant is liable to Vivato in an amount to be determined at trial that
15 compensates Vivato for the infringement, which by law can be no less than a
16 reasonable royalty.

17 58. As a result of Defendant’s infringement of the ‘231 Patent, Vivato has
18 suffered irreparable harm and will continue to suffer loss and injury.

19 **PRAYER FOR RELIEF**

20 WHEREFORE, Vivato prays for the following relief:

21 (a) A judgment in favor of Vivato that Defendant has infringed and is
22 infringing U.S. Patent Nos. 7,062,296, 7,729,728, and 6,611,231;

23 (b) An award of damages to Vivato arising out of Defendant’s
24 infringement of U.S. Patent Nos. 7,062,296, 7,729,728, and 6,611,231, including
25 enhanced damages pursuant to 35 U.S.C. § 284, together with prejudgment and
26 post-judgment interest, in an amount according to proof;

27 (c) An award of an ongoing royalty for Defendant’s post-judgment
28 infringement in an amount according to proof;

1 (d) Declaring that Defendant’s infringement is willful and that this is an
2 exceptional case under 35 U.S.C. § 285 and awarding attorneys’ fees and costs in
3 this action.

4 (e) Granting Vivato its costs and further relief as the Court may deem just
5 and proper.

6 **DEMAND FOR JURY TRIAL**

7 Vivato demands a trial by jury of any and all issues triable of right before a
8 jury.

9
10 DATED: April 19, 2017

Respectfully submitted,

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13
14 By: /s/ Reza Mirzaie
15 Reza Mirzaie
16 Marc A. Fenster
17 Philip X. Wang
18 Kent N. Shum
Christian Conkle
James N. Pickens

19 *Attorneys for Plaintiff*
20 XR COMMUNICATIONS, LLC,
21 dba VIVATO TECHNOLOGIES
22
23
24
25
26
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