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 20 dba Vivato Technologies

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

23 XR COMMUNICATIONS, LLC, dba
 24 VIVATO TECHNOLOGIES,

25 *Plaintiff,*

26 *v.*

27 EXTREME NETWORKS, INC.,

28 *Defendant.*

Case No. 2:17-cv-2953-AG(JCGx)

**SECOND AMENDED
 COMPLAINT FOR PATENT
 INFRINGEMENT**

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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. Extreme Networks, Inc. (“Extreme” or “Defendant”) is a corporation
11 organized and existing under the laws of Delaware with its principal place of
12 business at 6480 Via Del Oro, San Jose, California 95119. Extreme has a
13 registered agent for service of process at C T Corporation System, 818 W 7th St.
14 Ste. 930, Los Angeles, CA 90017.

15 4. This Court has personal jurisdiction over Extreme because Extreme
16 has its principal place of business in California.

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

23 **III. BACKGROUND OF THE TECHNOLOGY**

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

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1 of millions of mobile devices globally. Vivato was founded to leverage its talent to
2 generate intellectual property and deliver Wi-Fi/802.11 wireless connectivity
3 solutions to service the growing demand for bandwidth.

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

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

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

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

21 10. Defendant has directly infringed and continues to directly infringe
22 numerous claims of the ’296 Patent, including at least claim 33, by manufacturing,
23 using, selling, offering to sell, and/or importing into the United States WiFi access
24 points and routers supporting MU-MIMO, including without limitation access
25 points and routers utilizing the IEEE 802.11ac-2013 standard (e.g. Defendant’s
26 Wireless AP 3912, Wireless AP 3916, Wireless AP 3935, Wireless AP 3965,
27 WiNG AP 8533, and WiNG AP 8432) (collectively the “Accused Products”).
28 Defendant is liable for infringement of the ’296 Patent pursuant to 35 U.S.C.

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1 § 271(a).

2 11. Each of the Accused Products comprises an apparatus for use in a
3 wireless communication system. For example, the Wireless AP 3965 is an
4 apparatus for use in a wireless communication system.

5 12. Each of the Accused Products comprises at least one smart antenna.
6 For example, the Wireless AP 3965 has at least one smart antenna.

7 13. Each of the Accused Products comprises at least one transceiver
8 operatively coupled to said smart antenna and configured to send and receive
9 electromagnetic signals using said smart antenna. For example, the Wireless AP
10 3965 has a WiFi radio coupled to the smart antenna to send and receive signals.
11 *See, e.g.*, IEEE 802.11ac-2013 (“802.11ac Standard”) Clauses 22.3.4.5(j),
12 22.3.4.6(g), 22.3.4.7(h), 22.3.4.8(p), 22.3.4.9.1(q), 22.3.4.9.2(q), 22.3.4.10.4(e)
13 (“Analog and RF: Up-convert the resulting complex baseband waveform
14 associated with each transmit chain to an RF signal according to the center
15 frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4, 22.3.8; *id.*
16 Clause 22.3.3 and Figure 22-7:

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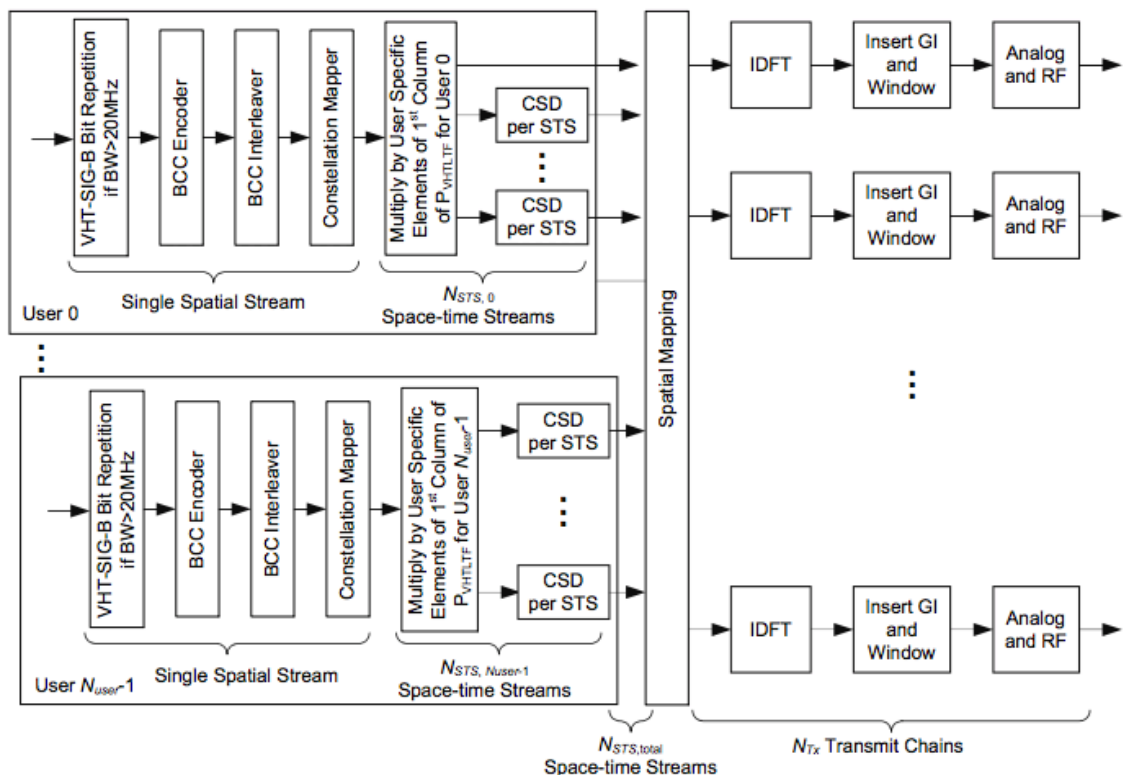


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

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 Wireless AP 3965 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

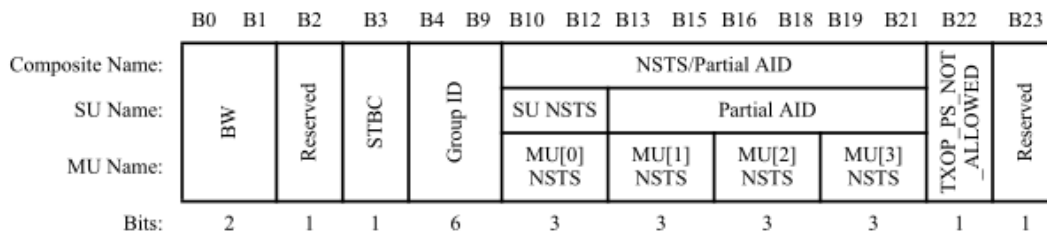
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1 1-bit Membership Status subfield for each group ID is set as follows: — Set to 0 if
 2 the STA is not a member of the group — Set to 1 if STA is a member of the group
 3 The Membership Status subfields for group ID 0 (transmissions to AP) and group
 4 ID 63 (downlink SU transmissions) are reserved.”); *id.* Clause 8.4.1.52 (“The User
 5 Position Array field is used in the Group ID Management frame (see 8.5.23.3). The
 6 length of the field is 16 octets. A 16 octet User Position Array field (indexed by the
 7 Group ID) consists of a 2-bit User Position subfield for each of the 64 group IDs,
 8 as shown in Figure 8-80g. * * * If the Membership Status subfield for a particular
 9 group ID is 1, then the corresponding User Position subfield is encoded as shown
 10 in Table 8-53l.”); *id.* Table 8-53l:

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

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

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



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

26 *Id.* Clause 22.3.11.4:

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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
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.

5 A STA is also able to identify the space-time streams intended for other STAs that act as interference. VHT-
6 LTF symbols in the VHT MU PPDU are used to measure the channel for the space-time streams intended
7 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.

8 *Id.* Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require
9 knowledge of the channel state to compute a steering matrix that is applied to the
10 transmitted signal to optimize reception at one or more receivers. The STA
11 transmitting using the steering matrix is called the VHT beamformer and a STA for
12 which reception is optimized is called a VHT beamformee. An explicit feedback
13 mechanism is used where the VHT beamformee directly measures the channel
14 from the training symbols transmitted by the VHT beamformer and sends back a
15 transformed estimate of the channel state to the VHT beamformer. The VHT
16 beamformer then uses this estimate, perhaps combining estimates from multiple
17 VHT beamformees, to derive the steering matrix.”); *id.* Clause 9.31.5.2 (“A VHT
18 beamformer shall initiate a sounding feedback sequence by transmitting a VHT
19 NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT
20 beamformer shall include in the VHT NDP Announcement frame one STA Info
21 field for each VHT beamformee that is expected to prepare VHT Compressed
22 Beamforming feedback and shall identify the VHT beamformee by including the
23 VHT beamformee’s AID in the AID subfield of the STA Info field. The VHT NDP
24 Announcement frame shall include at least one STA Info field.”); *id.* (“A non-AP
25 VHT beamformee that receives a VHT NDP Announcement frame... shall
26 transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
27 Beamforming Report Poll with RA matching its MAC address and a non-
28 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 Wireless AP 3965
 8 determines information from a VHT Compressed Beamforming frame received
 9 from a client device through its smart antenna. *See, e.g.*, 802.11ac Standard
 10 Clauses 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5.1, 9.31.5.2; IEEE 802.11-2012 Clause
 11 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 Wireless AP 3965 determines, based on
 16 the information received in a VHT Compressed Beamforming frame, if the client
 17 device should operatively associate with a different beam downlink transmittable
 18 using the smart antenna. *See, e.g.*, 802.11ac Standard Clauses 8.4.1.24, 8.4.1.49,
 19 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
 28 $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ 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.

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 Wireless AP 3965 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

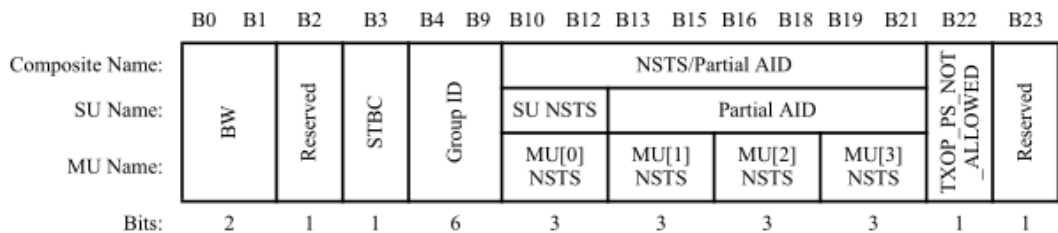
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1 Group ID Management frame (see 8.5.23.3). The length of the field is 16 octets. A
 2 16 octet User Position Array field (indexed by the Group ID) consists of a 2-bit
 3 User Position subfield for each of the 64 group IDs, as shown in Figure 8-
 4 80g. * * * 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 PPDUs. 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 has been and is now

1 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 and service of the original Complaint on April
4 19, 2017, and May 3, 2017, respectively, Defendant had knowledge of the '296
5 Patent, and that its actions resulted in a direct infringement of the '296 Patent.
6 Defendant also knew or was willfully blind that its actions would induce direct
7 infringement by others and intended that its actions would induce direct
8 infringement by others.

9 20. Defendant actively induced, and continues to induce, such
10 infringement by, among other things, providing user manuals and other instruction
11 material for its Accused Products that induce its customers to use the Accused
12 Products in their normal and customary way to infringe the '296 Patent. For
13 example, Defendant's website provided, and continues to provide, instructions for
14 using the Accused Products on wireless communication systems, and to utilize
15 their beamforming and MU-MIMO functionalities. Defendant sold, and continues
16 to sell, the Accused Products to customers despite its knowledge of the '296
17 Patent. Defendant manufactured and imported into the United States, and continues
18 to do so, the Accused Products for sale and distribution to its customers, despite its
19 knowledge of the '296 Patent. Through its continued manufacture, importation,
20 and sales of its Accused Products, Defendant specifically intended for its
21 customers to infringe claims of the '296 Patent. Further, Defendant was aware that
22 these normal and customary activities would infringe the '296 Patent. Defendant
23 performed, and continues to perform, acts that constitute induced infringement, and
24 that would induce actual infringement, with knowledge of the '296 Patent and with
25 the knowledge or willful blindness that the induced acts would constitute direct
26 infringement.

27 21. Accordingly, a reasonable inference is that Defendant specifically
28 intended for others, such as its customers, to directly infringe one or more claims

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1 of the '296 Patent in the United States because Defendant had knowledge of the
2 '296 Patent and actively induced others (e.g., its customers) to directly infringe the
3 '296 Patent by using, selling, or offering to sell the Accused Products and the MU-
4 MIMO functionality within the Accused Products.

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

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

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

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

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

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

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

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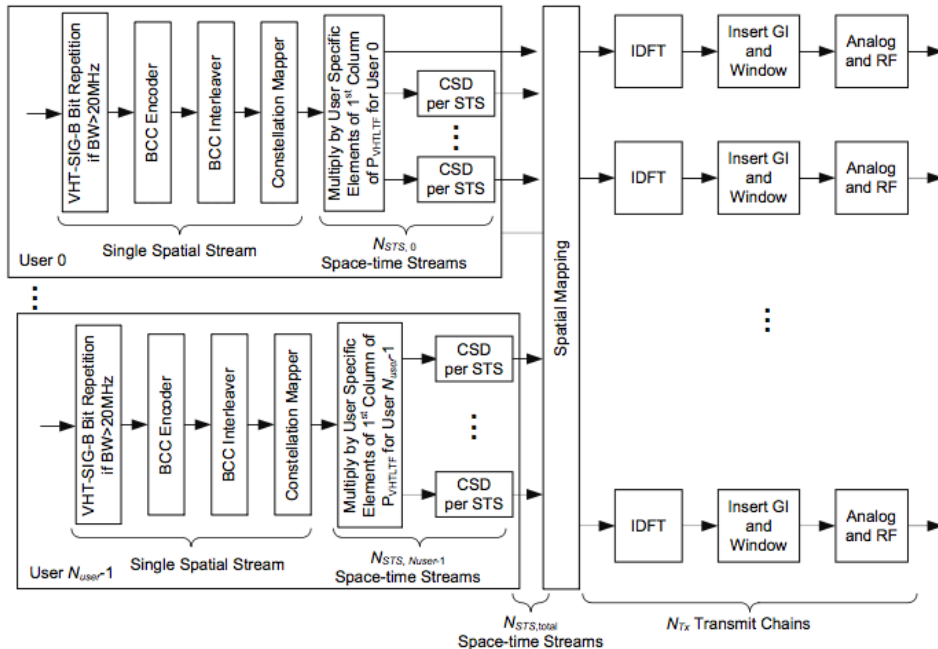
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1 27. Each of the Accused Products comprises a wireless communication
 2 system. For example, the Wireless AP 3965 is a wireless access point for use in a
 3 Wi-Fi network.

4 28. Each of the Accused Products comprises a phased array antenna
 5 configured to transmit beam downlinks. *See, e.g.:* 802.11ac Standard Clause
 6 8.4.2.58.6, Table 8-128.

7 29. Each of the Accused Products comprises a transceiver operatively
 8 coupled to the phased array antenna and configured to send and receive
 9 electromagnetic signals via the phased array antenna. For example, the Wireless
 10 AP 3965 has a WiFi radio that is configured to send and receive electromagnetic
 11 signals via the phased array antenna. *See, e.g.,* 802.11ac Standard Clauses
 12 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), 22.3.4.9.2(q),
 13 22.3.4.10.4(e) (“Analog and RF: Up-convert the resulting complex baseband
 14 waveform associated with each transmit chain to an RF signal according to the
 15 center frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4,
 16 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

1 30. Each of the Accused Products comprises an access point that includes
2 the phased array antenna and the transceiver. For example, the Wireless AP 3965
3 comprises an access point that includes a phased antenna array and a WiFi radio.

4 31. Each of the Accused Products comprises an access point that includes
5 the phased array antenna and the transceiver that is configured to selectively allow
6 a receiving device to operatively associate with a beam downlink transmitted to the
7 receiving device via the phased array antenna. *See, e.g.*, 802.11ac Standard Clause
8 8.5.23.3 (“The Group ID Management frame is an Action frame of category VHT.
9 It is transmitted by the AP to assign or change the user position of a STA for one
10 or more group IDs. The Action field of a Group ID Management frame contains
11 the information shown in Table 8-281aj”); *id.* Clause 8.4.1.51 (“The Membership
12 Status Array field is used in the Group ID Management frame (see 8.5.23.3). The
13 length of the field is 8 octets. An 8 octet Membership Status Array field (indexed
14 by the group ID) consists of a 1-bit Membership Status subfield for each of the 64
15 group IDs, as shown in Figure 8-80f. * * * Within the 8 octet Membership Status
16 Array field, the 1-bit Membership Status subfield for each group ID is set as
17 follows: — Set to 0 if the STA is not a member of the group — Set to 1 if STA is a
18 member of the group The Membership Status subfields for group ID 0
19 (transmissions to AP) and group ID 63 (downlink SU transmissions) are
20 reserved.”); *id.* Clause 8.4.1.52 (“The User Position Array field is used in the
21 Group ID Management frame (see 8.5.23.3). The length of the field is 16 octets. A
22 16 octet User Position Array field (indexed by the Group ID) consists of a 2-bit
23 User Position subfield for each of the 64 group IDs, as shown in Figure 8-
24 80g. * * * If the Membership Status subfield for a particular group ID is 1, then the
25 corresponding User Position subfield is encoded as shown in Table 8-531.”); *id.*
26 Table 8-531:

27 ///

28 ///

Table 8-53I—Encoding of User Position subfield

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

Id. Clause 22.3.8.3.3 (“The VHT-SIG-A field carries information required to 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:

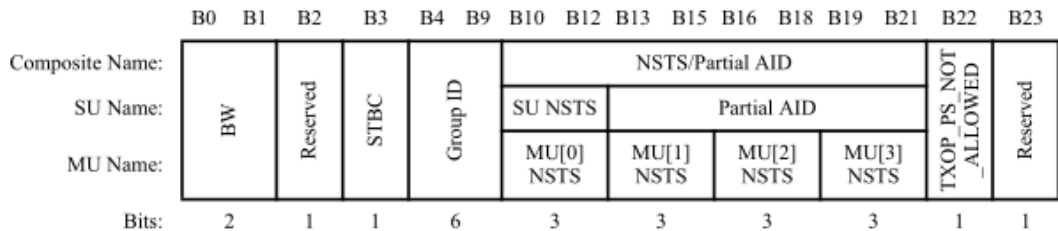


Figure 22-18—VHT-SIG-A1 structure

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

1 from the training symbols transmitted by the VHT beamformer and sends back a
2 transformed estimate of the channel state to the VHT beamformer. The VHT
3 beamformer then uses this estimate, perhaps combining estimates from multiple
4 VHT beamformees, to derive the steering matrix.”); *id.* 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.* Clauses 8.5.23.2, 8.4.1.48, 8.4.1.49; *id.* Clauses
17 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)
18 (“Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1.”); *id.* Clauses
19 22.3.10.11.1, 22.3.11.2; IEEE 802.11-2012 Clause 20.3.12.3.6.

20 32. Each of the Accused Products comprises an access point that includes
21 the phased array antenna and the transceiver that is configured to receive an uplink
22 transmission from the receiving device through the phased array antenna. For
23 example, the Wireless AP 3965 is configured to receive a VHT Compressed
24 Beamforming Feedback frame from a “receiving device” such as a connected
25 laptop or smartphone through its phased-array antenna. *See, e.g.*, 802.11ac
26 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-
27 2012 Clause 20.3.12.3.6.

28 ///

1 33. Each of the Accused Products comprises an access point that includes
 2 the phased array antenna and the transceiver that is configured to determine from
 3 the uplink transmission if the receiving device should operatively associate with a
 4 different beam downlink transmission. For example, the Wireless AP 3965 is
 5 configured to determine from information contained in the VHT Compressed
 6 Beamforming Feedback frame if the receiving device that sent the VHT
 7 Compressed Beamforming Feedback frame should operatively associate with a
 8 different beam downlink transmission. *See, e.g.*, 802.11ac Standard Clauses 3.2,
 9 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:

10 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 11 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 12 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 13 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
 14 according to Table 8-53e. The number of bits for quantization is chosen by the beamformee, based on the
 15 indication from the beamformer as to whether the feedback is requested for SU-MIMO beamforming or DL-
 16 MU-MIMO beamforming. The compressed beamforming feedback using 20.3.12.3.6 is the only Clause 22
 17 beamforming feedback format defined.

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

20 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 21 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 22 matrix Q_k . For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix
 23 $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ ($0 \leq u \leq N_{user} - 1$) in order to suppress crosstalk
 24 between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k
 25 is implementation specific.

26 34. Each of the Accused Products comprises an access point that includes
 27 the phased array antenna and the transceiver that is configured to at least one of: (i)
 28 allow the receiving device to operatively associate with the different beam
 downlink if determined that the receiving device should operatively associate with
 the different beam downlink; (ii) force the receiving device to operatively associate
 with the different beam downlink if determined that the receiving device should be
 operatively associated with the different beam downlink. For example, the
 Wireless AP 3965 is configured to transmit a Group ID Management frame or
 VHT MU PPDU VHT-SIG-A or combination thereof to allow the receiving device
 to operatively associate with the different beam downlink if determined that the

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

in Table 8-531.”); *id.* Table 8-531:

Table 8-531—Encoding of User Position subfield

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

Id. Clause 22.3.8.3.3 (“The VHT-SIG-A field carries information required to 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:

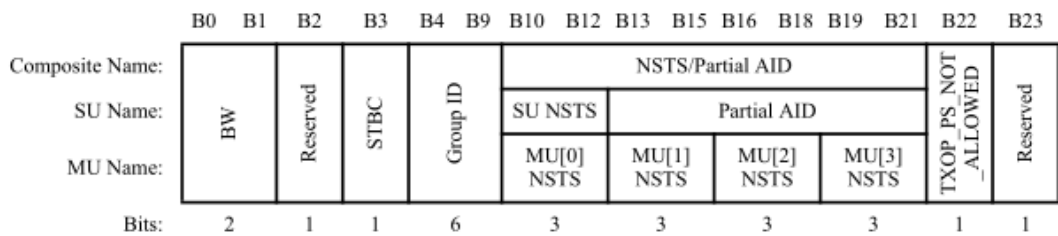


Figure 22-18—VHT-SIG-A1 structure

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

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

22 35. Each of the Accused Products comprises an access point that includes
23 the phased array antenna and the transceiver that is configured to actively probe the
24 receiving device by generating a signal to initiate that the phased array antenna
25 transmit at least one downlink transmittable message over the beam downlinks,
26 and gather signal parameter information from uplink transmittable messages
27 received from the receiving device through the phased array antenna. For example,
28 the Wireless AP 3965 is configured to actively probe the receiving device by

1 generating a signal to initiate that the phased array antenna transmit a signal, e.g. a
2 VHT null data packet announcement frame over the beam downlinks, and to gather
3 signal parameter information from uplink transmittable messages received from the
4 receiving device through the phased array antenna, e.g. one or more VHT
5 Compressed Beamforming Feedback frames. *See, e.g.*, 802.11ac Standard Clause
6 9.31.5, 9.31.5.2 (“A VHT beamformer shall initiate a sounding feedback sequence
7 by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a
8 SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame
9 one STA Info field for each VHT beamformee that is expected to prepare VHT
10 Compressed Beamforming feedback and shall identify the VHT beamformee by
11 including the VHT beamformee’s AID in the AID subfield of the STA Info field.
12 The VHT NDP Announcement frame shall include at least one STA Info field.”);
13 *id.* (“A non-AP VHT beamformee that receives a VHT NDP Announcement
14 frame... shall transmit its VHT Compressed Beamforming feedback a SIFS after
15 receiving a Beamforming Report Poll with RA matching its MAC address and a
16 non-bandwidth signaling TA obtained from the TA field matching the MAC
17 address of the VHT beamformer.”); *id.* Clause 8.4.1.24; IEEE 802.11-2012 Clause
18 20.3.12.3.6; 802.11ac Standard Clause 8.5.23.2 (defining format and subfields
19 within the VHT Compressed Beamforming frame); *id.* Clause 8.4.1.48 (including
20 Tables 8-53(d)-(h)) (“Each SNR value per tone in stream i (before being averaged)
21 corresponds to the SNR associated with the column i of the beamforming feedback
22 matrix V determined at the beamformee”); *id.* Clause 8.4.1.49 (including Table 8-
23 53i – MU Exclusive Beamforming Report information); *id.* Clauses 8.4.1.24,
24 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.8.3.5; *id.* Clause 22.3.11.2.

25 36. Defendant has been and is now indirectly infringing at least one claim
26 of the ’728 Patent in accordance with 35 U.S.C. § 271(b) in this district and
27 elsewhere in the United States. More specifically, Defendant has been and is now
28 actively inducing direct infringement by other persons (e.g., Defendant’s

1 customers who use, sell or offer for sale the Accused Products).

2 37. By at least the filing and service of the original Complaint on April
3 19, 2017, and May 3, 2017, respectively, Defendant had knowledge of the '728
4 Patent, and that its actions resulted in a direct infringement of the '728 Patent.
5 Defendant also knew or was willfully blind that its actions would induce direct
6 infringement by others and intended that its actions would induce direct
7 infringement by others.

8 38. Defendant actively induced, and continues to induce, such
9 infringement by, among other things, providing user manuals and other instruction
10 material for its Accused Products that induce its customers to use the Accused
11 Products in their normal and customary way to infringe the '728 Patent. For
12 example, Defendant's website provided, and continues to provide, instructions for
13 using the Accused Products on wireless communication systems, and to utilize
14 their beamforming and MU-MIMO functionalities. Defendant sold, and continues
15 to sell, the Accused Products to customers despite its knowledge of the '728
16 Patent. Defendant manufactured and imported into the United States, and continues
17 to do so, the Accused Products for sale and distribution to its customers, despite its
18 knowledge of the '728 Patent. Through its continued manufacture, importation,
19 and sales of its Accused Products, Defendant specifically intended for its
20 customers to infringe claims of the '728 Patent. Further, Defendant was aware that
21 these normal and customary activities would infringe the '728 Patent. Defendant
22 performed, and continues to perform, acts that constitute induced infringement, and
23 that would induce actual infringement, with knowledge of the '728 Patent and with
24 the knowledge or willful blindness that the induced acts would constitute direct
25 infringement.

26 39. Accordingly, a reasonable inference is that Defendant specifically
27 intended for others, such as its customers, to directly infringe one or more claims
28 of the '728 Patent in the United States because Defendant had knowledge of the

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1 '728 Patent and actively induced others (e.g., its customers) to directly infringe the
2 '728 Patent by using, selling, or offering to sell the Accused Products and the MU-
3 MIMO functionality within the Accused Products.

4 40. Defendant also infringes other claims of the '728 Patent, directly and
5 through inducing infringement, for similar reasons as explained above with respect
6 to Claim 16.

7 41. The '728 Patent is valid and enforceable.

8 42. Defendant's infringement of the '728 Patent has damaged Vivato, and
9 Defendant is liable to Vivato in an amount to be determined at trial that
10 compensates Vivato for the infringement, which by law can be no less than a
11 reasonable royalty.

12 43. As a result of Defendant's infringement of the '728 Patent, Vivato has
13 suffered irreparable harm and will continue to suffer loss and injury.

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

16 44. On August 26, 2003, United States Patent No. 6,611,231 ("the '231
17 Patent") was duly and legally issued for inventions entitled "Wireless Packet
18 Switched Communication Systems and Networks Using Adaptively Steered
19 Antenna Arrays." Vivato owns the '231 Patent and holds the right to sue and
20 recover damages for infringement thereof. A copy of the '231 Patent is attached
21 hereto as Exhibit C.

22 45. Defendant has directly infringed and continues to directly infringe
23 numerous claims of the '231 Patent, including at least claim 1, by manufacturing,
24 using, selling, offering to sell, and/or importing into the United States the Accused
25 Products. Defendant is liable for infringement of the '231 Patent pursuant to 35
26 U.S.C. § 271(a).

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1 46. Each of the Accused Products comprises an apparatus for use in a
2 wireless routing network. For example, the Wireless AP 3965 is an apparatus for
3 use in a wireless routing network.

4 47. Each of the Accused Products comprises an adaptive antenna. For
5 example, the Wireless AP 3965 has at least one adaptive antenna. *See, e.g.:*
6 802.11ac Standard Clause 8.4.2.58.6, Table 8-128:

7 **8.4.2.58.6 Transmit Beamforming Capabilities**

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

9 **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

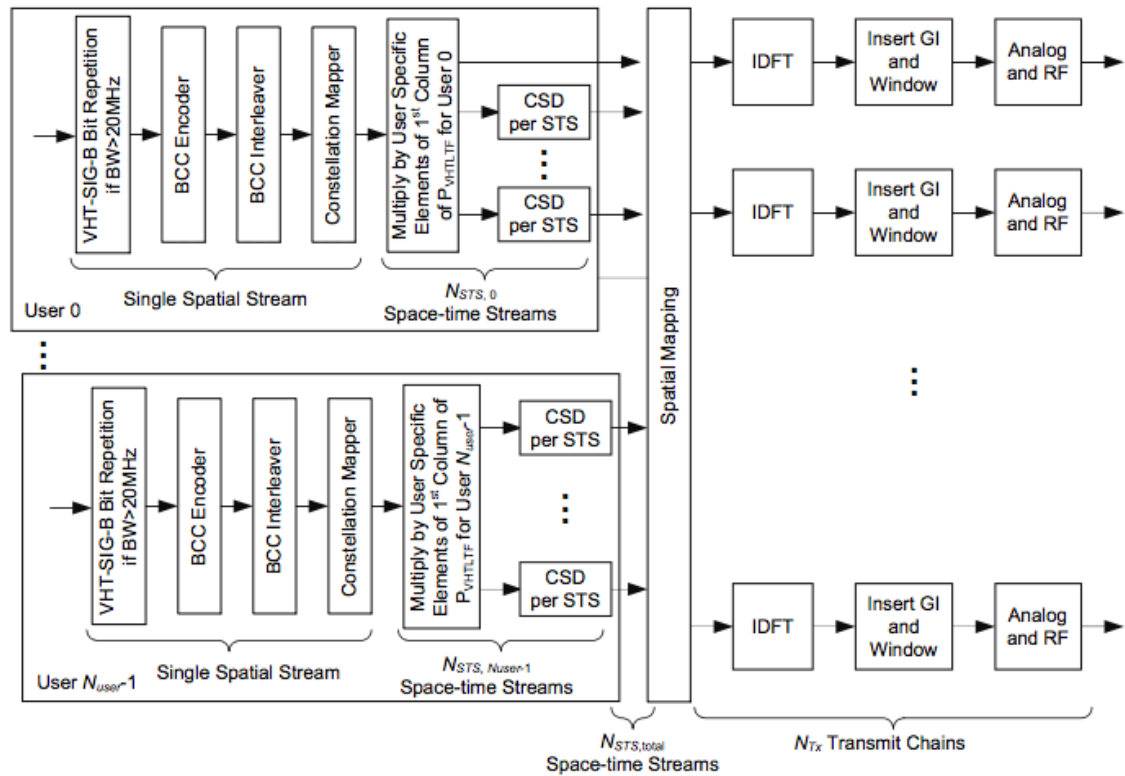
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23 48. Each of the Accused Products comprises at least one transmitter
24 operatively coupled to said adaptive antenna and at least one receiver operatively
25 coupled to said adaptive antenna. For example, the Wireless AP 3965 has a WiFi
26 radio operatively coupled to the adaptive antenna. *See, e.g.,* 802.11ac Standard
27 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),
28 22.3.4.9.2(q), 22.3.4.10.4(e) (“Analog and RF: Up-convert the resulting complex

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1 baseband waveform associated with each transmit chain to an RF signal according
 2 to the center frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4,
 3 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

18 49. Each of the Accused Products comprises a control logic operatively
 19 coupled to said transmitter and configured to cause said at least one transmitter to
 20 output at least one transmission signal to said adaptive antenna to transmit
 21 corresponding outgoing multi-beam electromagnetic signals exhibiting a plurality
 22 of selectively placed transmission peaks and transmission nulls within a far field
 23 region of a coverage area based on routing information. For example, the Wireless
 24 AP 3965 is configured to output at least one transmission signal to said adaptive
 25 antenna. For a further example, the Wireless AP 3965 is configured to cause said at
 26 least one transmitter to output at least one transmission signal to said adaptive
 27 antenna to transmit corresponding outgoing multi-beam electromagnetic signals
 28 exhibiting a plurality of selectively placed transmission peaks and transmission

1 nulls within a far field region of a coverage area based on routing information. *See*,
 2 *e.g.*, 802.11ac Standard Clause 9.31.5.1 (“Transmit beamforming and DL-MU-
 3 MIMO require knowledge of the channel state to compute a steering matrix that is
 4 applied to the transmitted signal to optimize reception at one or more receivers.
 5 The STA transmitting using the steering matrix is called the VHT beamformer and
 6 a STA for which reception is optimized is called a VHT beamformee. An explicit
 7 feedback mechanism is used where the VHT beamformee directly measures the
 8 channel from the training symbols transmitted by the VHT beamformer and sends
 9 back a transformed estimate of the channel state to the VHT beamformer. The
 10 VHT beamformer then uses this estimate, perhaps combining estimates from
 11 multiple VHT beamformees, to derive the steering matrix.”); *id.* Clauses
 12 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)
 13 (“Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1.”); *id.* Clause
 14 22.3.10.11.1; IEEE 802.11-2012 Standard Clause 20.3.12.3.6; 802.11ac Standard
 15 Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.11.1:

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

23 *Id.* Clause 22.3.11.2:

24 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 25 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 26 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 27 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
 28 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.

The beamformee shall generate the beamforming feedback matrices with the number of rows (N_r) 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.

1 50. Each of the Accused Products comprises search receiver logic
2 operatively coupled to said control logic and said at least one receiver and
3 configured to update said routing information based at least in part on cross-
4 correlated signal information that is received by said receiver using said adaptive
5 antenna. For example, the Wireless AP 3965 updates the routing information based
6 at least in part on cross-correlated signal information received in a VHT
7 Compressed Beamforming frame. *See, e.g.*, 802.11ac Standard Clause 9.31.5.2 (“A
8 VHT beamformer shall initiate a sounding feedback sequence by transmitting a
9 VHT NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT
10 beamformer shall include in the VHT NDP Announcement frame one STA Info
11 field for each VHT beamformee that is expected to prepare VHT Compressed
12 Beamforming feedback and shall identify the VHT beamformee by including the
13 VHT beamformee’s AID in the AID subfield of the STA Info field. The VHT NDP
14 Announcement frame shall include at least one STA Info field.”); *id.* (“A non-AP
15 VHT beamformee that receives a VHT NDP Announcement frame... shall
16 transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
17 Beamforming Report Poll with RA matching its MAC address and a non-
18 bandwidth signaling TA obtained from the TA field matching the MAC address of
19 the VHT beamformer.”); *id.* Clause 8.5.23.2 (defining format and subfields within
20 the VHT Compressed Beamforming frame); *id.* Clause 8.4.1.48 (including Tables
21 8-53(d)-(h)) (“Each SNR value per tone in stream i (before being averaged)
22 corresponds to the SNR associated with the column i of the beamforming feedback
23 matrix V determined at the beamformee”); *id.* Clause 8.4.1.49 (including Table 8-
24 53i – MU Exclusive Beamforming Report information); *id.* Clauses 8.4.1.24,
25 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 (Nr) 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
 9 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.

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 has been and is now
 13 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 and service of the original Complaint on April
 16 19, 2017, and May 3, 2017, respectively, Defendant had knowledge of the '231
 17 Patent, and that its actions resulted in a direct infringement of the '231 Patent.
 18 Defendant also knew or was willfully blind that its actions would induce direct
 19 infringement by others and intended that its actions would induce direct
 20 infringement by others.

21 53. Defendant actively induced, and continues to induce, such
 22 infringement by, among other things, providing user manuals and other instruction
 23 material for its Accused Products that induce its customers to use the Accused
 24 Products in their normal and customary way to infringe the '231 Patent. For
 25 example, Defendant's website provided, and continues to provide, instructions for
 26 using the Accused Products on wireless communication systems, and to utilize
 27 their beamforming and MU-MIMO functionalities. Defendant sold, and continues
 28 to sell, the Accused Products to customers despite its knowledge of the '231

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1 Patent. Defendant manufactured and imported into the United States, and continues
2 to do so, the Accused Products for sale and distribution to its customers, despite its
3 knowledge of the '231 Patent. Through its continued manufacture, importation,
4 and sales of its Accused Products, Defendant specifically intended for its
5 customers to infringe claims of the '231 Patent. Further, Defendant was aware that
6 these normal and customary activities would infringe the '231 Patent. Defendant
7 performed, and continues to perform, acts that constitute induced infringement, and
8 that would induce actual infringement, with knowledge of the '231 Patent and with
9 the knowledge or willful blindness that the induced acts would constitute direct
10 infringement.

11 54. Accordingly, a reasonable inference is that Defendant specifically
12 intended for others, such as its customers, to directly infringe one or more claims
13 of the '231 Patent in the United States because Defendant had knowledge of the
14 '231 Patent and actively induced others (e.g., its customers) to directly infringe the
15 '231 Patent by using, selling, or offering to sell the Accused Products and the MU-
16 MIMO functionality within the Accused Products.

17 55. Defendant also infringes other claims of the '231 Patent, directly and
18 through inducing infringement, for similar reasons as explained above with respect
19 to Claim 1.

20 56. The '231 Patent is valid and enforceable.

21 57. Defendant's infringement of the '231 Patent has damaged Vivato, and
22 Defendant is liable to Vivato in an amount to be determined at trial that
23 compensates Vivato for the infringement, which by law can be no less than a
24 reasonable royalty.

25 58. As a result of Defendant's infringement of the '231 Patent, Vivato has
26 suffered irreparable harm and will continue to suffer loss and injury.

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PRAYER FOR RELIEF

WHEREFORE, Vivato prays for the following relief:

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

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

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

(d) A judgment in favor of Vivato against Defendant that this is an exceptional case under 35 U.S.C. § 285 and awarding attorneys’ fees and costs in this action.

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

DEMAND FOR JURY TRIAL

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

DATED: June 28, 2017

Respectfully submitted,

RUSS AUGUST & KABAT

By: /s/ Reza Mirzaie
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dba VIVATO TECHNOLOGIES

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