

RUSS, AUGUST & KABAT

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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 NETGEAR, INC.,

28 *Defendant.*

Case No. 2:17-cv-02959-AG(JCGx)

**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. Defendant Netgear, Inc. (“Netgear” or “Defendant”) is a corporation
11 organized and existing under the laws of Delaware with its principal place of
12 business at 350 E. Plumeria Drive, San Jose, CA 95134. Netgear has a registered
13 agent for service of process at CT Corporation System, 818 W 7th St., Ste. 930,
14 Los Angeles, CA 90017.

15 4. This Court has personal jurisdiction over Netgear because Netgear has
16 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 Netgear is subject to jurisdiction in this District,
19 has done business in this District, has committed acts of infringement in this
20 District, and continues to commit acts of infringement in this District, entitling
21 Plaintiff to relief.

22 **III. BACKGROUND OF THE TECHNOLOGY**

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

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 Orbi, AD7200-Nighthawk® X10 Smart WiFi Router Model R9000, AC5300-
26 AC5300 Nighthawk X8 Tri-Band WiFi Router Model R8500, AC2600-Nighthawk
27 X4S Smart WiFi Gaming Router Model R7800, AC2350-Nighthawk X4 AC2350
28 Dual Band WiFi Router Model R7500, AC2300-Nighthawk Smart WiFi Router

1 with MU-MIMO Model R7000P, AC5000-Nighthawk X8—AC5000 Smart WiFi
2 Router Model R8300, AC1900-WiFi Range Extender - Essentials Edition Model
3 EX6400, AC2200-Nighthawk X4 WiFi Range Extender Model EX7300, AC1200-
4 Dual Band WiFi Range Extender Model EX6200, AC1200-WiFi Range Extender
5 Model EX6150, WAC510-AC WiFi Business Access Point (WAC510) Model
6 WAC510, and WAC740-ProSAFE 4 x 4 Wave 2 Wireless-AC Model WAC740)
7 (collectively the “Accused Products”). Defendant is liable for infringement of the
8 ’296 Patent pursuant to 35 U.S.C. § 271(a).

9 11. Each of the Accused Products comprises an apparatus for use in a
10 wireless communication system. For example, the AD7200-Nighthawk X10 Smart
11 WiFi Router Model R9000 is an apparatus for use in a wireless communication
12 system.

13 12. Each of the Accused Products comprises at least one smart antenna.
14 For example, the AD7200-Nighthawk X10 Smart WiFi Router Model R9000 has
15 at least one smart antenna.

16 13. Each of the Accused Products comprises at least one transceiver
17 operatively coupled to said smart antenna and configured to send and receive
18 electromagnetic signals using said smart antenna. For example, the AD7200-
19 Nighthawk X10 Smart WiFi Router Model R9000 has a Qualcomm QCA9984
20 WiFi radio coupled to the smart antenna to send and receive signals. *See, e.g.,*
21 IEEE 802.11ac-2013 (“802.11ac Standard”) Clauses 22.3.4.5(j), 22.3.4.6(g),
22 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) (“Analog and
23 RF: Up-convert the resulting complex baseband waveform associated with each
24 transmit chain to an RF signal according to the center frequency of the desired
25 channel and transmit.”); *id.* Clauses 22.3.7.4, 22.3.8; *id.* Clause 22.3.3 and Figure
26 22-7:

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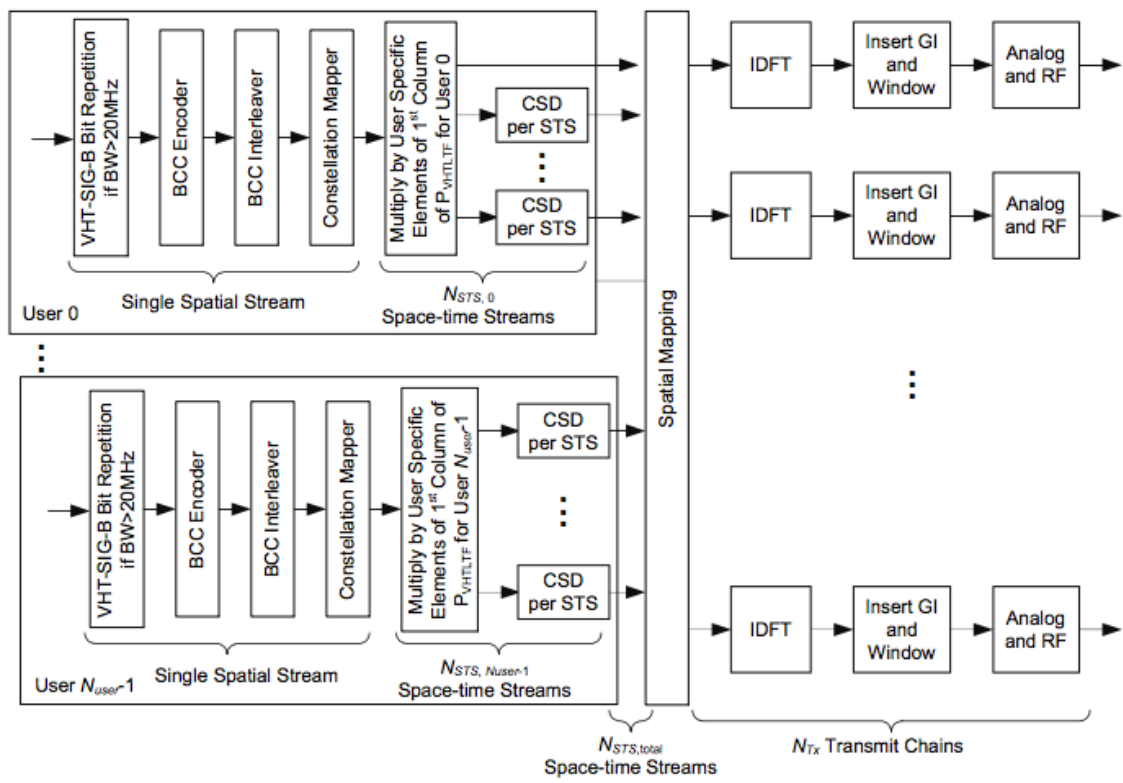


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

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 AD7200-Nighthawk X10 Smart WiFi Router Model R9000 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

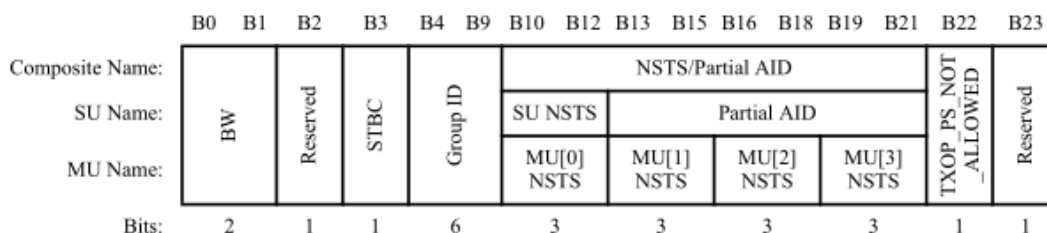
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1 octet Membership Status Array field, the 1-bit Membership Status subfield for
 2 each group ID is set as follows: — Set to 0 if the STA is not a member of the
 3 group — Set to 1 if STA is a member of the group The Membership Status
 4 subfields for group ID 0 (transmissions to AP) and group ID 63 (downlink SU
 5 transmissions) are reserved.”); *id.* Clause 8.4.1.52 (“The User Position Array field
 6 is used in the Group ID Management frame (see 8.5.23.3). The length of the field
 7 is 16 octets. A 16 octet User Position Array field (indexed by the Group ID)
 8 consists of a 2-bit User Position subfield for each of the 64 group IDs, as shown in
 9 Figure 8-80g. * * * If the Membership Status subfield for a particular group ID is
 10 1, then the corresponding User Position subfield is encoded as shown in Table 8-
 11 53l.”); *id.* Table 8-53l:

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

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

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



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

23 *Id.* Clause 22.3.11.4:

24 ///

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 AD7200-Nighthawk
 8 X10 Smart WiFi Router Model R9000 determines information from a VHT
 9 Compressed Beamforming frame received from a client device through its smart
 10 antenna. *See, e.g.*, 802.11ac Standard Clauses 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5.1,
 11 9.31.5.2; IEEE 802.11-2012 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 AD7200-Nighthawk X10 Smart WiFi
 16 Router Model R9000 determines, based on the information received in a VHT
 17 Compressed Beamforming frame, if the client device should operatively associate
 18 with a different beam downlink transmittable using the smart antenna. *See, e.g.*,
 19 802.11ac Standard Clauses 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5.1, 9.31.5.2; *id.*
 20 Clause 22.3.11.2:

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

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

26 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 27 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 28 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 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 AD7200-Nighthawk X10 Smart WiFi Router
6 Model R9000 allows a client device to operatively associate with a beam that is
7 different from the beam with which the client was associated previously, and to
8 identify that the client device is not allowed to operatively associate with the prior
9 beam. *See, e.g.*, 802.11ac Standard Clause 10.40 (“An AP determines the possible
10 combinations of STAs that can be addressed by a VHT MU PPDU by assigning
11 STAs to groups and to specific user positions within those groups. Assignments or
12 changes of user positions corresponding to one or more Group IDs shall be
13 performed using a Group ID Management frame defined in 8.5.23.3...A VHT MU
14 PPDU shall be transmitted to a STA based on the content of the Group ID
15 Management frame most recently transmitted to the STA and for which an
16 acknowledgement was received.”); *id.* Clause 8.5.23.3 (“The Group ID
17 Management frame is an Action frame of category VHT. It is transmitted by the
18 AP to assign or change the user position of a STA for one or more group IDs. The
19 Action field of a Group ID Management frame contains the information shown in
20 Table 8-281aj”); *id.* Clause 8.4.1.51 (“The Membership Status Array field is used
21 in the Group ID Management frame (see 8.5.23.3). The length of the field is 8
22 octets. An 8 octet Membership Status Array field (indexed by the group ID)
23 consists of a 1-bit Membership Status subfield for each of the 64 group IDs, as
24 shown in Figure 8-80f. * * * Within the 8 octet Membership Status Array field, the
25 1-bit Membership Status subfield for each group ID is set as follows: — Set to 0 if
26 the STA is not a member of the group — Set to 1 if STA is a member of the group
27 The Membership Status subfields for group ID 0 (transmissions to AP) and group
28 ID 63 (downlink SU transmissions) are reserved.”); *id.* Clause 8.4.1.52 (“The User

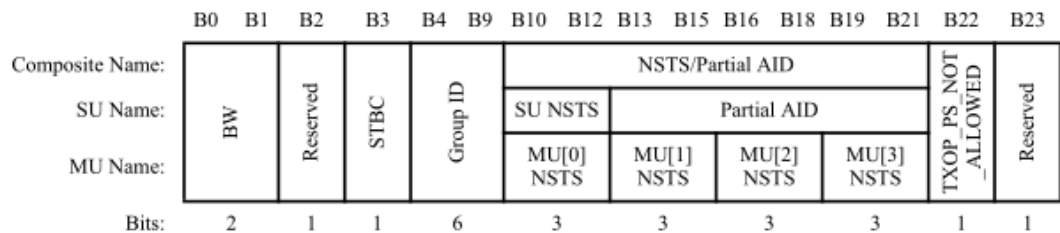
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1 Position Array field is used in the Group ID Management frame (see 8.5.23.3). The
 2 length of the field is 16 octets. A 16 octet User Position Array field (indexed by the
 3 Group ID) consists of a 2-bit User Position subfield for each of the 64 group IDs,
 4 as shown in Figure 8-80g. * * * If the Membership Status subfield for a particular
 5 group ID is 1, then the corresponding User Position subfield is encoded as shown
 6 in Table 8-531.”); *id.* 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 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, 2016, and May 3, 2016, 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, for example, on Amazon.com, the Accused Products to customers despite
17 its knowledge of the '296 Patent. Defendant manufactured and imported into the
18 United States, and continues to do so, the Accused Products for sale and
19 distribution to its customers, despite its knowledge of the '296 Patent. Through its
20 continued manufacture, importation, and sales of its Accused Products, Defendant
21 specifically intended for its customers to infringe claims of the '296 Patent.
22 Further, Defendant was aware that these normal and customary activities would
23 infringe the '296 Patent. Defendant performed, and continues to perform, acts that
24 constitute induced infringement, and that would induce actual infringement, with
25 knowledge of the '296 Patent and with the knowledge or willful blindness that the
26 induced acts would constitute direct 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

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 24. 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 25. 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 26. 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 27. 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).

27 28. Each of the Accused Products comprises a wireless communication
28 system. For example, the AD7200-Nighthawk X10 Smart WiFi Router Model

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1 R9000 is a wireless communication system comprising an access point for use in a
 2 Wi-Fi network.

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

6 30. Each of the Accused Products comprises a transceiver operatively
 7 coupled to the phased array antenna and configured to send and receive
 8 electromagnetic signals via the phased array antenna. For example, the AD7200-
 9 Nighthawk X10 Smart WiFi Router Model R9000 has a Qualcomm QCA9984
 10 WiFi radio that is configured to send and receive electromagnetic signals via the
 11 phased array antenna. *See, e.g.,* 802.11ac Standard Clauses 22.3.4.5(j), 22.3.4.6(g),
 12 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) (“Analog and
 13 RF: Up-convert the resulting complex baseband waveform associated with each
 14 transmit chain to an RF signal according to the center frequency of the desired
 15 channel and transmit.”); *id.* Clauses 22.3.7.4, 22.3.8; *id.* Clause 22.3.3 and Figure
 16 22-7:

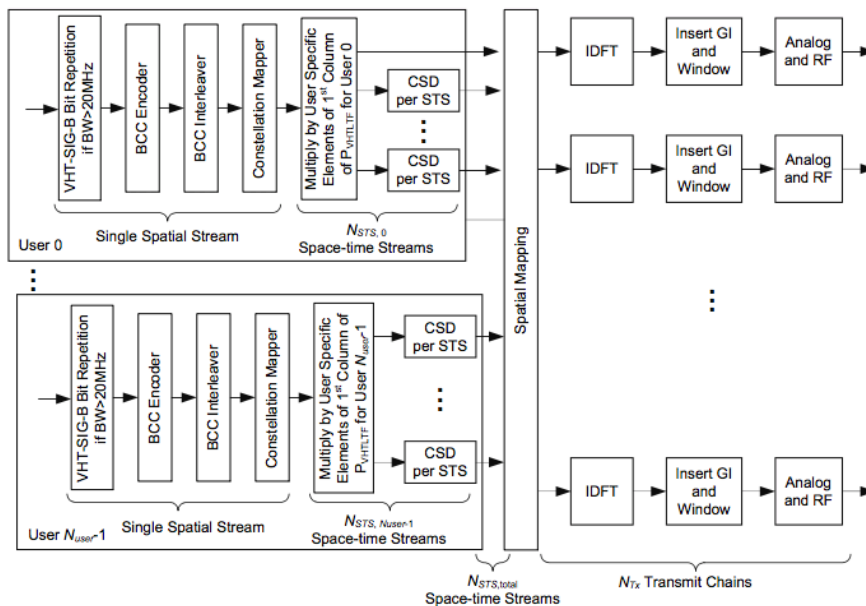


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

1 31. Each of the Accused Products comprises an access point that includes
2 the phased array antenna and the transceiver. For example, the AD7200-
3 Nighthawk X10 Smart WiFi Router Model R9000 comprises an access point that
4 includes a phased antenna array and a Qualcomm QCA9984 WiFi radio.

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

28 ///

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:

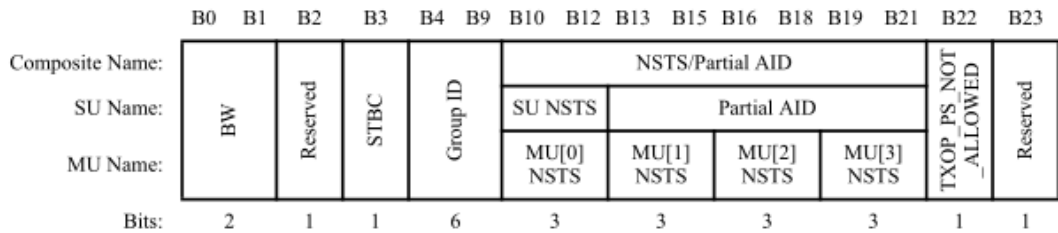


Figure 22-18—VHT-SIG-A1 structure

Id. Clause 22.3.11.4:

When a STA receives a VHT MU PDU where the Group ID field in VHT-SIG-A has the value k and where $\text{MembershipStatusInGroupID}[k]$ is equal to 1, then the number of space-time streams for that STA is indicated in the $\text{MU}[\text{UserPositionInGroupID}[k]]$ 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 PDU 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

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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 33. 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 AD7200-Nighthawk X10 Smart WiFi Router Model R9000 is
24 configured to receive a VHT Compressed Beamforming Feedback frame from a
25 “receiving device” such as a connected laptop or smartphone through its phased-
26 array antenna. *See, e.g.*, 802.11ac Standard Clauses 8.4.1.24, 8.4.1.49, 8.5.23.2,
27 9.31.5.1, 9.31.5.2; IEEE 802.11-2012 Clause 20.3.12.3.6.

28 ///

1 34. 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 AD7200-Nighthawk X10
 5 Smart WiFi Router Model R9000 is configured to determine from information
 6 contained in the VHT Compressed Beamforming Feedback frame if the receiving
 7 device that sent the VHT Compressed Beamforming Feedback frame should
 8 operatively associate with a different beam downlink transmission. *See, e.g.,*
 9 802.11ac Standard Clauses 3.2, 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5, 9.31.5.1,
 10 9.31.5.2; *id.* Clause 22.3.11.2:

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

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

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

27 35. Each of the Accused Products comprises an access point that includes
 28 the phased array antenna and the transceiver that is configured to at least one of: (i)
 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
 AD7200-Nighthawk X10 Smart WiFi Router Model R9000 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

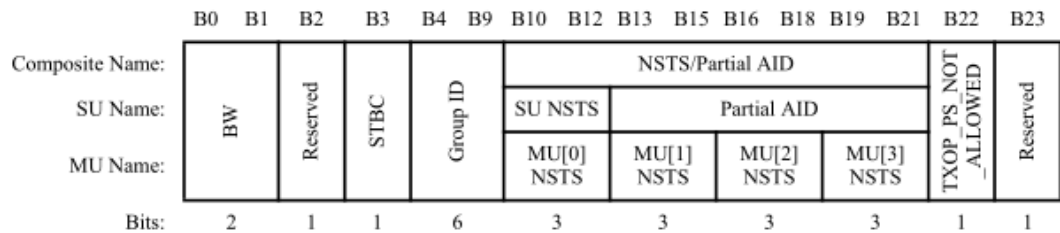
1 different beam downlink if determined that the receiving device should operatively
2 associate with the different beam downlink; (ii) force the receiving device to
3 operatively associate with the different beam downlink if determined that the
4 receiving device should be operatively associated with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

1 group ID is 1, then the corresponding User Position subfield is encoded as shown
 2 in Table 8-531.”); *id.* Table 8-531:

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

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

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



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

14 *Id.* Clause 22.3.11.4:

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

22 A STA is also able to identify the space-time streams intended for other STAs that act as interference. VHT-
 23 LTF symbols in the VHT MU PPDU are used to measure the channel for the space-time streams intended
 24 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.

25 *Id.* Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require
 26 knowledge of the channel state to compute a steering matrix that is applied to the
 27 transmitted signal to optimize reception at one or more receivers. The STA
 28 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 Each of the Accused Products comprises an access point that includes the
23 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 AD7200-Nighthawk X10 Smart WiFi Router Model R9000 is configured to

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

26 36. Defendant has been and is now indirectly infringing at least one claim
27 of the ’728 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 37. By at least the filing and service of the original Complaint on April
4 19, 2016, and May 3, 2016, respectively, Defendant had knowledge of the '728
5 Patent, and that its actions resulted in a direct infringement of the '728 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 38. 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 '728 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, for example, on Amazon.com, the Accused Products to customers despite
17 its knowledge of the '728 Patent. Defendant manufactured and imported into the
18 United States, and continues to do so, the Accused Products for sale and
19 distribution to its customers, despite its knowledge of the '728 Patent. Through its
20 continued manufacture, importation, and sales of its Accused Products, Defendant
21 specifically intended for its customers to infringe claims of the '728 Patent.
22 Further, Defendant was aware that these normal and customary activities would
23 infringe the '728 Patent. Defendant performed, and continues to perform, acts that
24 constitute induced infringement, and that would induce actual infringement, with
25 knowledge of the '728 Patent and with the knowledge or willful blindness that the
26 induced acts would constitute direct infringement.

27 39. 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 '728 Patent in the United States because Defendant had knowledge of the
2 '728 Patent and actively induced others (e.g., its customers) to directly infringe the
3 '728 Patent by using, selling, or offering to sell the Accused Products and the MU-
4 MIMO functionality within the Accused Products.

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

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

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

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

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

23 45. Defendant has directly infringed and continues to directly infringe
24 numerous claims of the '231 Patent, including at least claim 1, by manufacturing,
25 using, selling, offering to sell, and/or importing into the United States the Accused
26 Products. Defendant is liable for infringement of the '231 Patent pursuant to 35
27 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 AD7200-Nighthawk X10 Smart WiFi
3 Router Model R9000 is an apparatus for use in a wireless routing network.

4 47. Each of the Accused Products comprises an adaptive antenna. For
5 example, the AD7200-Nighthawk X10 Smart WiFi Router Model R9000 has at
6 least one adaptive antenna. *See, e.g.:* 802.11ac Standard Clause 8.4.2.58.6, Table 8-
7 128:

8 **8.4.2.58.6 Transmit Beamforming Capabilities**

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

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

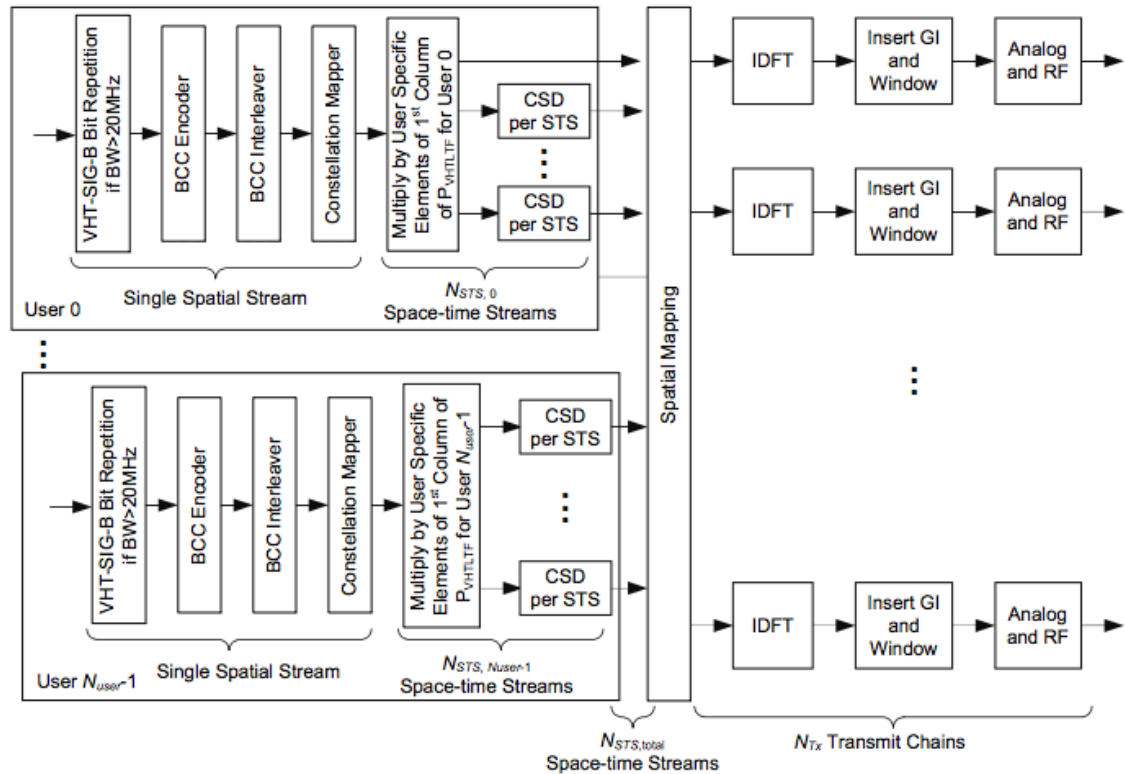
Subfield	Definition	Encoding
CSI Number of Beamformer Antennas Supported	Indicates the maximum number of beamformer antennas the HT beamformee can support when CSI feedback is required	Set to 0 for single Tx antenna sounding Set to 1 for 2 Tx antenna sounding Set to 2 for 3 Tx antenna sounding Set to 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 AD7200-Nighthawk X10 Smart
26 WiFi Router Model R9000 has a Qualcomm QCA9984 WiFi radio operatively
27 coupled to the adaptive antenna. *See, e.g.,* 802.11ac Standard Clauses 22.3.4.5(j),
28 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)

1 (“Analog and RF: Up-convert the resulting complex baseband waveform
 2 associated with each transmit chain to an RF signal according to the center
 3 frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4, 22.3.8; *id.*
 4 Clause 22.3.3 and Figure 22-7:



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

19 49. Each of the Accused Products comprises a control logic operatively
 20 coupled to said transmitter and configured to cause said at least one transmitter to
 21 output at least one transmission signal to said adaptive antenna to transmit
 22 corresponding outgoing multi-beam electromagnetic signals exhibiting a plurality
 23 of selectively placed transmission peaks and transmission nulls within a far field
 24 region of a coverage area based on routing information. For example, the AD7200-
 25 Nighthawk X10 Smart WiFi Router Model R9000 is configured to output at least
 26 one transmission signal to said adaptive antenna. For a further example, the
 27 AD7200-Nighthawk X10 Smart WiFi Router Model R9000 is configured to cause
 28 said at least one transmitter to output at least one transmission signal to said

1 adaptive antenna to transmit corresponding outgoing multi-beam electromagnetic
 2 signals exhibiting a plurality of selectively placed transmission peaks and
 3 transmission nulls within a far field region of a coverage area based on routing
 4 information. *See, e.g.*, 802.11ac Standard Clause 9.31.5.1 (“Transmit beamforming
 5 and DL-MU-MIMO require knowledge of the channel state to compute a steering
 6 matrix that is applied to the transmitted signal to optimize reception at one or more
 7 receivers. The STA transmitting using the steering matrix is called the VHT
 8 beamformer and a STA for which reception is optimized is called a VHT
 9 beamformee. An explicit feedback mechanism is used where the VHT beamformee
 10 directly measures the channel from the training symbols transmitted by the VHT
 11 beamformer and sends back a transformed estimate of the channel state to the VHT
 12 beamformer. The VHT beamformer then uses this estimate, perhaps combining
 13 estimates from multiple VHT beamformees, to derive the steering matrix.”); *id.*
 14 Clauses 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),
 15 22.3.4.10.4(a) (“Spatial mapping: Apply the Q matrix as described in
 16 22.3.10.11.1.”); *id.* Clause 22.3.10.11.1; IEEE 802.11-2012 Standard Clause
 17 20.3.12.3.6; 802.11ac Standard Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clause
 18 22.3.11.1:

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

23 *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
 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 50. Each of the Accused Products comprises search receiver logic
 11 operatively coupled to said control logic and said at least one receiver and
 12 configured to update said routing information based at least in part on cross-
 13 correlated signal information that is received by said receiver using said adaptive
 14 antenna. For example, the AD7200-Nighthawk X10 Smart WiFi Router Model
 15 R9000 updates the routing information based at least in part on cross-correlated
 16 signal information received in a VHT Compressed Beamforming frame. *See, e.g.*,
 17 802.11ac Standard Clause 9.31.5.2 (“A VHT beamformer shall initiate a sounding
 18 feedback sequence by transmitting a VHT NDP Announcement frame followed by
 19 a VHT NDP after a SIFS. The VHT beamformer shall include in the VHT NDP
 20 Announcement frame one STA Info field for each VHT beamformee that is
 21 expected to prepare VHT Compressed Beamforming feedback and shall identify
 22 the VHT beamformee by including the VHT beamformee’s AID in the AID
 23 subfield of the STA Info field. The VHT NDP Announcement frame shall include
 24 at least one STA Info field.”); *id.* (“A non-AP VHT beamformee that receives a
 25 VHT NDP Announcement frame... shall transmit its VHT Compressed
 26 Beamforming feedback a SIFS after receiving a Beamforming Report Poll with RA
 27 matching its MAC address and a non-bandwidth signaling TA obtained from the
 28 TA field matching the MAC address of the VHT beamformer.”); *id.* Clause

1 8.5.23.2 (defining format and subfields within the VHT Compressed Beamforming
 2 frame); *id.* Clause 8.4.1.48 (including Tables 8-53(d)-(h)) (“Each SNR value per
 3 tone in stream i (before being averaged) corresponds to the SNR associated with
 4 the column i of the beamforming feedback matrix V determined at the
 5 beamformee”); *id.* Clause 8.4.1.49 (including Table 8-53i – MU Exclusive
 6 Beamforming Report information); *id.* Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.*
 7 Clause 22.3.8.3.5; *id.* Clause 22.3.11.2:

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

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

14 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 15 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 16 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.

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

22 52. By at least the filing and service of the original Complaint on April
 23 19, 2016, and May 3, 2016, respectively, Defendant had knowledge of the '231
 24 Patent and that its actions resulted in a direct infringement of the '231 Patent.
 25 Defendant also knew or was willfully blind that its actions would induce direct
 26 infringement by others and intended that its actions would induce direct
 27 infringement by others.

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1 53. Defendant actively induced, and continues to induce, such
2 infringement by, among other things, providing user manuals and other instruction
3 material for its Accused Products that induce its customers to use the Accused
4 Products in their normal and customary way to infringe the '231 Patent. For
5 example, Defendant's website provided, and continues to provide, instructions for
6 using the Accused Products on wireless communication systems, and to utilize
7 their beamforming and MU-MIMO functionalities. Defendant sold, and continues
8 to sell, for example, on Amazon.com, the Accused Products to customers despite
9 its knowledge of the '231 Patent. Defendant manufactured and imported into the
10 United States, and continues to do so, the Accused Products for sale and
11 distribution to its customers, despite its knowledge of the '231 Patent. Through its
12 continued manufacture, importation, and sales of the Accused Products, Defendant
13 specifically intended for its customers to infringe claims of the '231 Patent.
14 Further, Defendant was aware that these normal and customary activities would
15 infringe the '231 Patent. Defendant performed, and continues to perform, acts that
16 constitute induced infringement, and that would induce actual infringement, with
17 knowledge of the '231 Patent and with the knowledge or willful blindness that the
18 induced acts would constitute direct infringement.

19 54. Accordingly, a reasonable inference is that Defendant specifically
20 intended for others, such as its customers, to directly infringe one or more claims
21 of the '231 Patent in the United States because Defendant had knowledge of the
22 '231 Patent and actively induced others (e.g., its customers) to directly infringe the
23 '231 Patent by using, selling, or offering to sell the Accused Products and the MU-
24 MIMO functionality within the Accused Products.

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

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

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

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

7 **PRAYER FOR RELIEF**

8 WHEREFORE, Vivato prays for the following relief:

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

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

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

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

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

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RUSS, AUGUST & KABAT

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DEMAND FOR JURY TRIAL

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

DATED: June 23, 2017

Respectfully submitted,

RUSS AUGUST & KABAT

By: /s/ Reza Mirzaie
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RUSS, AUGUST & KABAT