

RUSS, AUGUST & KABAT

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 19 XR COMMUNICATIONS, LLC,  
 20 dba VIVATO TECHNOLOGIES

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

23 XR COMMUNICATIONS, LLC, dba  
 24 VIVATO TECHNOLOGIES,

25 *Plaintiff,*

26 *v.*

27 ARUBA NETWORKS, INC.,

28 *Defendant.*

Case No. 2:17-cv-2945-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. Aruba Networks, Inc. (“Aruba” or “Defendant”) is a corporation  
11 organized and existing under the laws of Delaware with its principal place of  
12 business at 1344 Crossman Avenue, Sunnyvale, California 94089. Aruba 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. Hewlett Packard Enterprise Company (“HPE”) is a public corporation  
16 organized and existing under the laws of Delaware with its principal place of  
17 business at 3000 Hanover Street, Palo Alto, California, 94304. HPE has a  
18 registered agent for service of process at CT Corporation System, 818 W 7th St  
19 Ste. 930, Los Angeles, CA 90017. Aruba is a wholly owned subsidiary of HPE.

20 5. This Court has personal jurisdiction over Aruba because it has its  
21 principal place of business in California.

22 6. Venue is proper in this federal district pursuant to 28 U.S.C.  
23 §§ 1391(b)-(d) and 1400(b) in that Aruba is subject to jurisdiction in this District,  
24 has done business in this District, has regular and established places of business in  
25 this District, has committed acts of infringement in this District, and continues to  
26 commit acts of infringement in this District, entitling Plaintiff to relief.

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1 **III. BACKGROUND OF THE TECHNOLOGY**

2 7. Vivato was founded in 2000 as a \$80+million venture-backed  
3 company with several key innovators in the wireless communication field  
4 including Siavash Alamouti, Ken Biba, William Crilly, James Brennan, Edward  
5 Casas, and Vahid Tarokh among many others. Wi-Fi/802.11 has become the  
6 ubiquitous wireless connection to the Internet and is now integrated into hundreds  
7 of millions of mobile devices globally. Vivato was founded to leverage its talent to  
8 generate intellectual property and deliver Wi-Fi/802.11 wireless connectivity  
9 solutions to service the growing demand for bandwidth.

10 8. Over the years, Vivato has developed proven technology, with over  
11 400 deployments globally, including private, public and government, and has  
12 become a recognized provider of extended range Wi-Fi network infrastructure  
13 solutions. Vivato's wireless base stations integrate beamforming phased array  
14 antenna design with packet steering technology to deliver high-bandwidth  
15 extended range connections to serve multiple users and multiple devices.

16 9. Vivato’s patent portfolio includes over 17 issued patents and pending  
17 patent applications. The patents-in-suit are directed to specific aspects of wireless  
18 communication including adaptively steered antenna technology and beam  
19 switching technology.

20 **IV. COUNT ONE: INFRINGEMENT OF UNITED STATES**

21 **PATENT NO. 7,062,296**

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

27 11. Defendant has directly infringed and continues to directly infringe  
28 numerous claims of the ’296 Patent, including at least claim 33, by manufacturing,

1 using, selling, offering to sell, and/or importing into the United States WiFi access  
2 points and routers supporting MU-MIMO, including without limitation access  
3 points and routers utilizing the IEEE 802.11ac-2013 standard (e.g. Defendant’s  
4 Aruba 300 Series (e.g., AP-304, AP-305, IAP-304, IAP-305, APIN0304, and  
5 APIN0305), Aruba 310 Series (e.g., AP-314, AP-315, IAP-314, IAP-315,  
6 APIN0314, and APIN0315), Aruba 320 Series (e.g., AP-324, AP-325, IAP-324,  
7 IAP-325, APIN0324, and APIN0325), Aruba 330 Series (e.g., AP-334, AP-335,  
8 IAP-334, IAP-335, APIN0334, and APIN0335), Aruba 360 Series (e.g., AP-365,  
9 AP-367, APEX0365, and APEX0367), and Aruba AP-303H Series (e.g., AP-  
10 303H, AP-303HR, APINH303) access points) (collectively the “Accused  
11 Products”). Defendant is liable for infringement of the ’296 Patent pursuant to 35  
12 U.S.C. § 271(a).

13 12. Each of the Accused Products comprises an apparatus for use in a  
14 wireless communication system. For example, the Aruba AP-325 is an apparatus  
15 for use in a wireless communication system.

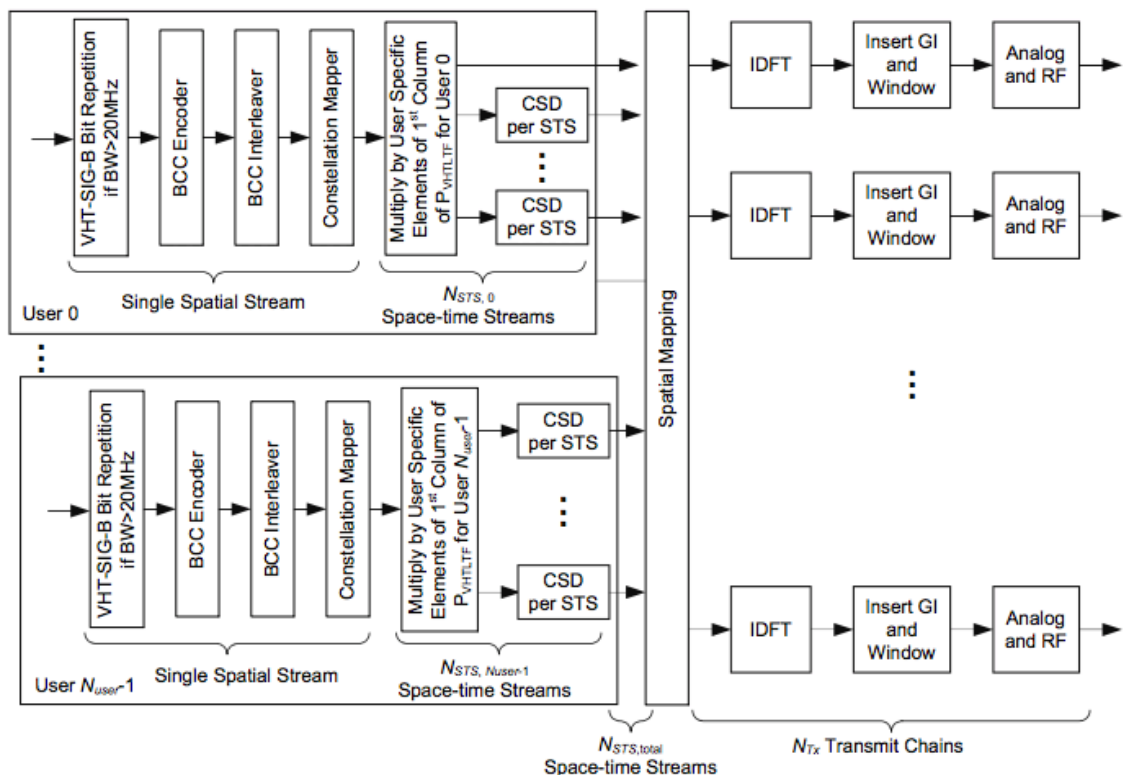
16 13. Each of the Accused Products comprises at least one smart antenna.  
17 For example, the Aruba AP-325 has at least one smart antenna

18 14. Each of the Accused Products comprises at least one transceiver  
19 operatively coupled to said smart antenna and configured to send and receive  
20 electromagnetic signals using said smart antenna. For example, the Aruba AP-325  
21 has a Qualcomm QCA9990 WiFi radio coupled to the smart antenna to send and  
22 receive signals. *See, e.g.*, IEEE 802.11ac-2013 (“802.11ac Standard”) Clauses  
23 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),  
24 22.3.4.10.4(e) (“Analog and RF: Up-convert the resulting complex baseband  
25 waveform associated with each transmit chain to an RF signal according to the  
26 center frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4,  
27 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**

15. 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 Aruba AP-325 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

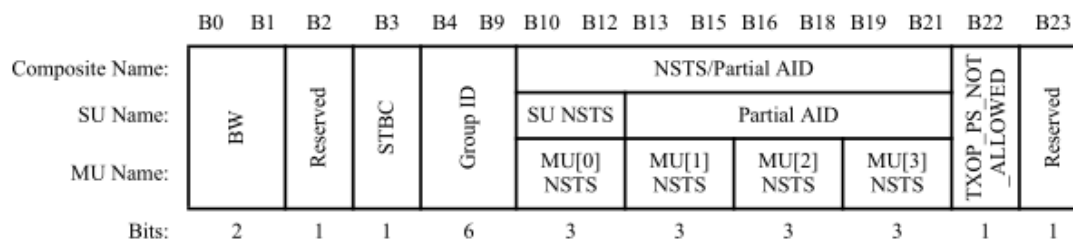
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1 1-bit Membership Status subfield for each group ID is set as follows: — Set to 0 if  
 2 the STA is not a member of the group — Set to 1 if STA is a member of the group  
 3 The Membership Status subfields for group ID 0 (transmissions to AP) and 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  
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 16. 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 Aruba AP-325  
 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 17. 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 Aruba AP-325 determines, based on the  
 16 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,  $\phi(k,u)$  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.

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           18. 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 Aruba AP-325 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

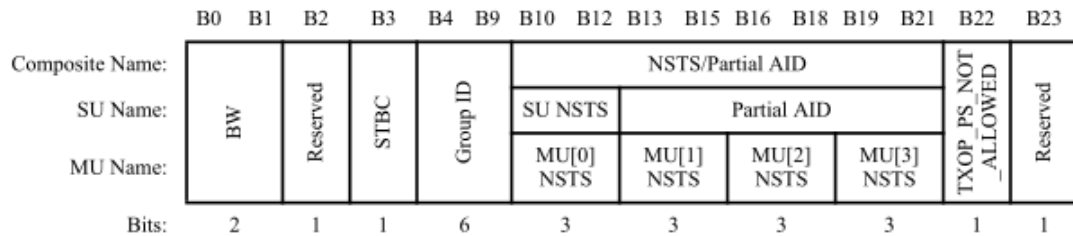
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1 Group ID Management frame (see 8.5.23.3). The length of the field is 16 octets. A  
 2 16 octet User Position Array field (indexed by the Group ID) consists of a 2-bit  
 3 User Position subfield for each of the 64 group IDs, as shown in Figure 8-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

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 19. 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 20. Defendant had knowledge of Vivato's '296 Patent by at least its  
4 citation of the application that led to the '296 Patent during the prosecution of  
5 Defendant's U.S. Patent No. 9,326,313, "System, apparatus and method for  
6 managing client devices within a wireless network." On December 14, 2015,  
7 Defendant cited to the U.S. Patent and Trademark Office, U.S. Application  
8 Publication No. 2004/0204114A1 to Brennan, which is the application that led to  
9 Vivato's '296 Patent. Vivato's '296 Patent, however, had already issued on June  
10 13, 2006. Accordingly, a reasonable inference is that Defendant had knowledge of  
11 the '296 Patent, and its issued claims, by at least as early as December 14, 2015.  
12 Further, by at least the filing and service of the original Complaint on April 19,  
13 2017, and May 3, 2017, respectively, Defendant had knowledge of the '296 Patent.

14 21. Based on this knowledge of Vivato's '296 Patent, Defendant also  
15 knew that its actions resulted in a direct infringement of the '296 Patent. Defendant  
16 also knew or was willfully blind that its actions would induce direct infringement  
17 by others and intended that its actions would induce direct infringement by others.

18 22. Defendant actively induced, and continues to induce, such  
19 infringement by, among other things, providing user manuals and other instruction  
20 material for its Accused Products that induce its customers to use the Accused  
21 Products in their normal and customary way to infringe the '296 Patent. For  
22 example, Defendant's website provided, and continues to provide, instructions for  
23 using the Accused Products on wireless communication systems, and to utilize  
24 their beamforming and MU-MIMO functionalities. Defendant sold, and continues  
25 to sell, the Accused Products to customers despite its knowledge of the '296  
26 Patent. Defendant manufactured and imported into the United States, and continues  
27 to do so, the Accused Products for sale and distribution to its customers, despite its  
28 knowledge of the '296 Patent. Through its continued manufacture, importation,

1 and sales of its Accused Products, Defendant specifically intended for its  
2 customers to infringe claims of the '296 Patent. Further, Defendant was aware that  
3 these normal and customary activities would infringe the '296 Patent. Defendant  
4 performed, and continues to perform, acts that constitute induced infringement, and  
5 that would induce actual infringement, with knowledge of the '296 Patent and with  
6 the knowledge or willful blindness that the induced acts would constitute direct  
7 infringement.

8 23. Accordingly, a reasonable inference is that Defendant specifically  
9 intended for others, such as its customers, to directly infringe one or more claims  
10 of the '296 Patent in the United States because Defendant had knowledge of the  
11 '296 Patent and actively induced others (e.g., its customers) to directly infringe the  
12 '296 Patent by using, selling, or offering to sell the Accused Products and the MU-  
13 MIMO functionality within the Accused Products.

14 24. Defendant also infringes other claims of the '296 Patent, directly and  
15 through inducing infringement, for similar reasons as explained above with respect  
16 to Claim 33.

17 25. The '296 Patent is valid and enforceable.

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

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

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

26 28. On June 1, 2010, United States Patent No. 7,729,728 ("the '728  
27 Patent") was duly and legally issued for inventions entitled "Forced Beam  
28 Switching in Wireless Communication Systems Having Smart Antennas." Vivato

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1 owns the '728 Patent and holds the right to sue and recover damages for  
2 infringement thereof. A copy of the '728 Patent is attached hereto as Exhibit B.

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

8 30. Each of the Accused Products comprises a wireless communication  
9 system. For example, the Aruba AP-325 is a wireless access point for use in a Wi-  
10 Fi network.

11 31. Each of the Accused Products comprises a phased array antenna  
12 configured to transmit beam downlinks. *See, e.g.:* 802.11ac Standard Clause  
13 8.4.2.58.6, Table 8-128.

14 32. Each of the Accused Products comprises a transceiver operatively  
15 coupled to the phased array antenna and configured to send and receive  
16 electromagnetic signals via the phased array antenna. For example, the Aruba AP-  
17 325 has a Qualcomm QCA9990 WiFi radio that is configured to send and receive  
18 electromagnetic signals via the phased array antenna. *See, e.g.,* 802.11ac Standard  
19 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),  
20 22.3.4.9.2(q), 22.3.4.10.4(e) (“Analog and RF: Up-convert the resulting complex  
21 baseband waveform associated with each transmit chain to an RF signal according  
22 to the center frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4,  
23 22.3.8; *id.* Clause 22.3.3 and Figure 22-7:

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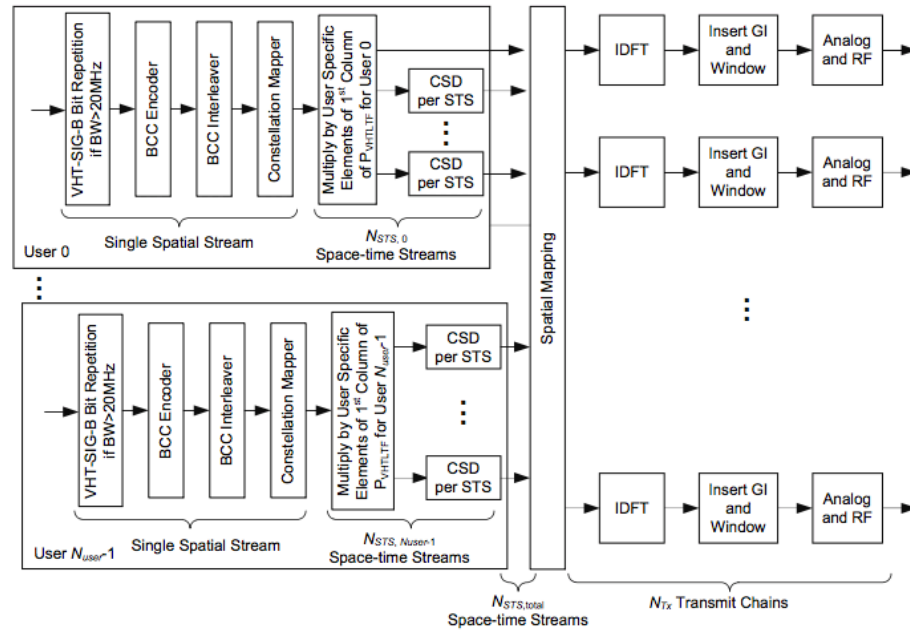


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

33. Each of the Accused Products comprises an access point that includes the phased array antenna and the transceiver. For example, the Aruba AP-325 comprises an access point that includes a phased antenna array and a Qualcomm QCA9990 WiFi radio.

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

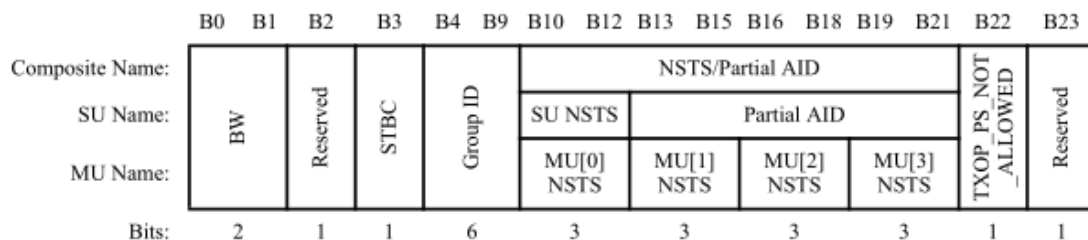
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1 Array field, the 1-bit Membership Status subfield for each group ID is set as  
 2 follows: — Set to 0 if the STA is not a member of the group — Set to 1 if STA is a  
 3 member of the group The Membership Status subfields for group ID 0  
 4 (transmissions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



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

27 *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  
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 35. Each of the Accused Products comprises an access point that includes  
6 the phased array antenna and the transceiver that is configured to receive an uplink  
7 transmission from the receiving device through the phased array antenna. For  
8 example, the Aruba AP-325 is configured to receive a VHT Compressed  
9 Beamforming Feedback frame from a “receiving device” such as a connected  
10 laptop or smartphone through its phased-array antenna. *See, e.g.*, 802.11ac  
11 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-  
12 2012 Clause 20.3.12.3.6.

13 36. Each of the Accused Products comprises an access point that includes  
14 the phased array antenna and the transceiver that is configured to determine from  
15 the uplink transmission if the receiving device should operatively associate with a  
16 different beam downlink transmission. For example, the Aruba AP-325 is  
17 configured to determine from information contained in the VHT Compressed  
18 Beamforming Feedback frame if the receiving device that sent the VHT  
19 Compressed Beamforming Feedback frame should operatively associate with a  
20 different beam downlink transmission. *See, e.g.*, 802.11ac Standard Clauses 3.2,  
21 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.11.2:

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

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

6 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  
 7 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  
 8 between participating beamformees. The method used by the beamformer to calculate the steering matrix  $Q_k$   
 is implementation specific.

9 37. Each of the Accused Products comprises an access point that includes  
 10 the phased array antenna and the transceiver that is configured to at least one of:  
 11 (i) allow the receiving device to operatively associate with the different beam  
 12 downlink if determined that the receiving device should operatively associate with  
 13 the different beam downlink; (ii) force the receiving device to operatively associate  
 14 with the different beam downlink if determined that the receiving device should be  
 15 operatively associated with the different beam downlink. For example, the Aruba  
 16 AP-325 is configured to transmit a Group ID Management frame or VHT MU  
 17 PPDU VHT-SIG-A or combination thereof to allow the receiving device to  
 18 operatively associate with the different beam downlink if determined that the  
 19 receiving device should operatively associate with the different beam downlink;  
 20 (ii) force the receiving device to operatively associate with the different beam  
 21 downlink if determined that the receiving device should be operatively associated  
 22 with the different beam downlink. *See, e.g.*, 802.11ac Standard Clause 10.40 (“An  
 23 AP determines the possible combinations of STAs that can be addressed by a VHT  
 24 MU PPDU by assigning STAs to groups and to specific user positions within those  
 25 groups. Assignments or changes of user positions corresponding to one or more  
 26 Group IDs shall be performed using a Group ID Management frame defined in  
 27 8.5.23.3...A VHT MU PPDU shall be transmitted to a STA based on the content of  
 28 the Group ID Management frame most recently transmitted to the STA and for

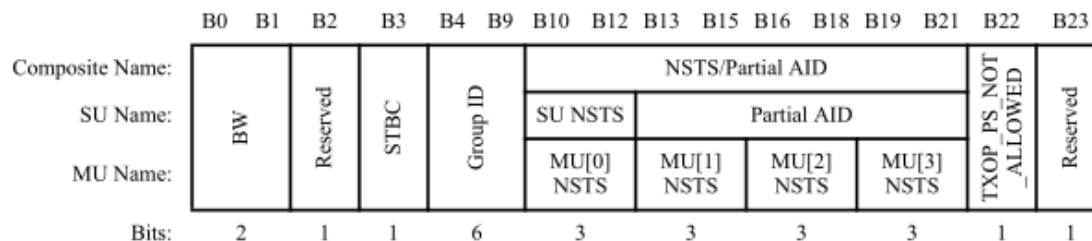
1 which an acknowledgement was received.”); *id.* Clause 8.5.23.3 (“The Group ID  
 2 Management frame is an Action frame of category VHT. It is transmitted by the  
 3 AP to assign or change the user position of a STA for one or more group IDs. The  
 4 Action field of a Group ID Management frame contains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

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

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

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

1 shown in Figure 22-19.”); *id.* Figure 22-18:



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

7 *Id.* Clause 22.3.11.4:

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

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

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

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

11 39. Each of the Accused Products comprises an access point that includes  
12 the phased array antenna and the transceiver that is configured to actively probe the  
13 receiving device by generating a signal to initiate that the phased array antenna  
14 transmit at least one downlink transmittable message over the beam downlinks,  
15 and gather signal parameter information from uplink transmittable messages  
16 received from the receiving device through the phased array antenna. For example,  
17 the Aruba AP-325 is configured to actively probe the receiving device by  
18 generating a signal to initiate that the phased array antenna transmit a signal, e.g. a  
19 VHT null data packet announcement frame over the beam downlinks, and to gather  
20 signal parameter information from uplink transmittable messages received from the  
21 receiving device through the phased array antenna, e.g. one or more VHT  
22 Compressed Beamforming Feedback frames. *See, e.g.,* 802.11ac Standard Clause  
23 9.31.5, 9.31.5.2 ("A VHT beamformer shall initiate a sounding feedback sequence  
24 by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a  
25 SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame  
26 one STA Info field for each VHT beamformee that is expected to prepare VHT  
27 Compressed Beamforming feedback and shall identify the VHT beamformee by  
28 including the VHT beamformee's AID in the AID subfield of the STA Info field.

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

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

19 41. By at least the filing and service of the original Complaint on April  
20 19, 2017, and May 3, 2017, respectively, Defendant had knowledge of the ’728  
21 Patent, and that its actions resulted in a direct infringement of the ’728 Patent.  
22 Defendant also knew or was willfully blind that its actions would induce direct  
23 infringement by others and intended that its actions would induce direct  
24 infringement by others.

25 42. Defendant actively induced, and continues to induce, such  
26 infringement by, among other things, providing user manuals and other instruction  
27 material for its Accused Products that induce its customers to use the Accused  
28 Products in their normal and customary way to infringe the ’728 Patent. For

1 example, Defendant's website provided, and continues to provide, instructions for  
2 using the Accused Products on wireless communication systems, and to utilize  
3 their beamforming and MU-MIMO functionalities. Defendant sold, and continues  
4 to sell, the Accused Products to customers despite its knowledge of the '728  
5 Patent. Defendant manufactured and imported into the United States, and continues  
6 to do so, the Accused Products for sale and distribution to its customers, despite its  
7 knowledge of the '728 Patent. Through its continued manufacture, importation,  
8 and sales of its Accused Products, Defendant specifically intended for its  
9 customers to infringe claims of the '728 Patent. Further, Defendant was aware that  
10 these normal and customary activities would infringe the '728 Patent. Defendant  
11 performed, and continues to perform, acts that constitute induced infringement, and  
12 that would induce actual infringement, with knowledge of the '728 Patent and with  
13 the knowledge or willful blindness that the induced acts would constitute direct  
14 infringement.

15 43. Accordingly, a reasonable inference is that Defendant specifically  
16 intended for others, such as its customers, to directly infringe one or more claims  
17 of the '728 Patent in the United States because Defendant had knowledge of the  
18 '728 Patent and actively induced others (e.g., its customers) to directly infringe the  
19 '728 Patent by using, selling, or offering to sell the Accused Products and the MU-  
20 MIMO functionality within the Accused Products.

21 44. Defendant also infringes other claims of the '728 Patent, directly and  
22 through inducing infringement, for similar reasons as explained above with respect  
23 to Claim 16.

24 45. The '728 Patent is valid and enforceable.

25 46. Defendant's infringement of the '728 Patent has damaged Vivato, and  
26 Defendant is liable to Vivato in an amount to be determined at trial that  
27 compensates Vivato for the infringement, which by law can be no less than a  
28 reasonable royalty.



RUSS, AUGUST & KABAT

1 47. As a result of Defendant’s infringement of the ’728 Patent, Vivato has  
2 suffered irreparable harm and will continue to suffer loss and injury.

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

5 48. On August 26, 2003, United States Patent No. 6,611,231 (“the ’231  
6 Patent”) was duly and legally issued for inventions entitled “Wireless Packet  
7 Switched Communication Systems and Networks Using Adaptively Steered  
8 Antenna Arrays.” Vivato owns the ’231 Patent and holds the right to sue and  
9 recover damages for infringement thereof. A copy of the ’231 Patent is attached  
10 hereto as Exhibit C.

11 49. Defendant has directly infringed and continues to directly infringe  
12 numerous claims of the ’231 Patent, including at least claim 1, by manufacturing,  
13 using, selling, offering to sell, and/or importing into the United States the Accused  
14 Products. Defendant is liable for infringement of the ’231 Patent pursuant to 35  
15 U.S.C. § 271(a).

16 50. Each of the Accused Products comprises an apparatus for use in a  
17 wireless routing network. For example, the Aruba AP-325 is an apparatus for use  
18 in a wireless routing network.

19 51. Each of the Accused Products comprises an adaptive antenna. For  
20 example, the Aruba AP-325 has at least one adaptive antenna. *See, e.g.:* 802.11ac  
21 Standard Clause 8.4.2.58.6, Table 8-128:

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8.4.2.58.6 Transmit Beamforming Capabilities

Change the following rows in Table 8-128:

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<br>Set to 1 for 2 Tx antenna sounding<br>Set to 2 for 3 Tx antenna sounding<br>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<br>Set to 1 for 2 Tx antenna sounding<br>Set to 2 for 3 Tx antenna sounding<br>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<br>Set to 1 for 2 Tx antenna sounding<br>Set to 2 for 3 Tx antenna sounding<br>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<br>Set to 1 for 2 rows of CSI<br>Set to 2 for 3 rows of CSI<br>Set to 3 for 4 rows of CSI                                |

52. Each of the Accused Products comprises at least one transmitter operatively coupled to said adaptive antenna and at least one receiver operatively coupled to said adaptive antenna. For example, the Aruba AP-325 has a Qualcomm QCA9990 WiFi radio operatively coupled to the adaptive antenna. *See, e.g.*, 802.11ac Standard Clauses 22.3.4.5(j), 22.3.4.6(g), 22.3.4.7(h), 22.3.4.8(p), 22.3.4.9.1(q), 22.3.4.9.2(q), 22.3.4.10.4(e) (“Analog and RF: Up-convert the resulting complex baseband waveform associated with each transmit chain to an RF signal according to the center frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4, 22.3.8; *id.* Clause 22.3.3 and Figure 22-7:

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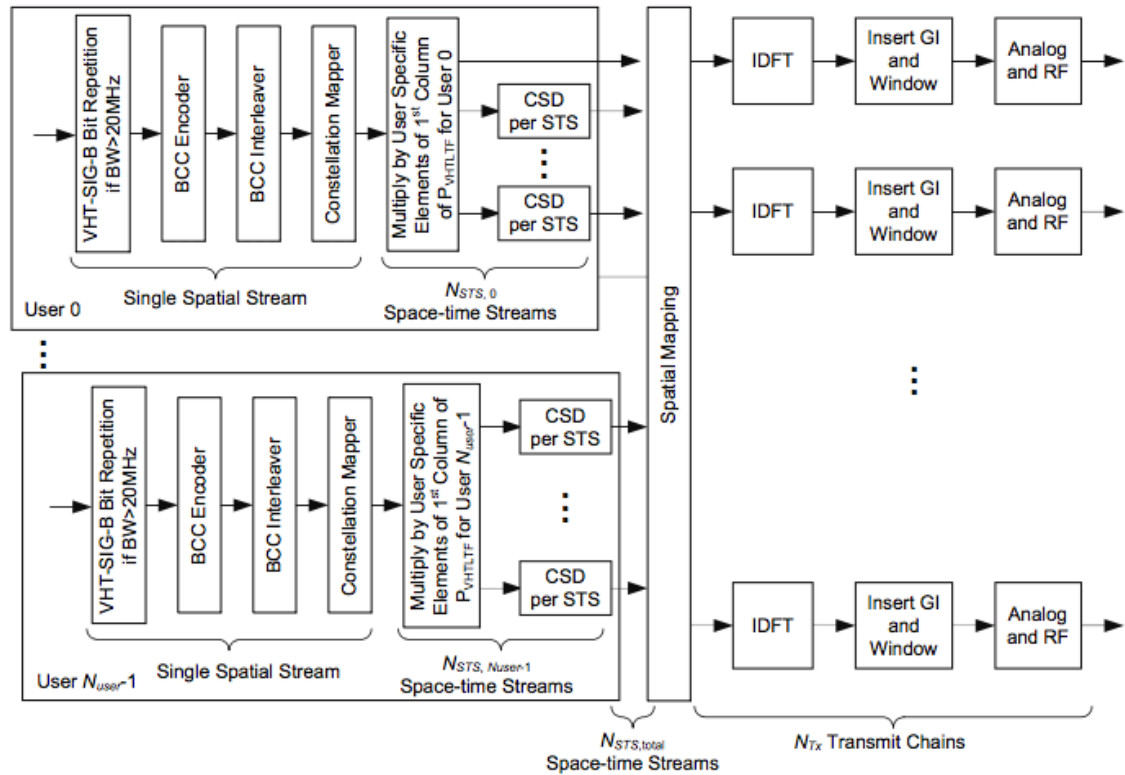
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RUSS, AUGUST & KABAT

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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**

53. Each of the Accused Products comprises a control logic operatively coupled to said transmitter and configured to cause said at least one transmitter to output at least one transmission signal to said adaptive antenna to transmit corresponding outgoing multi-beam electromagnetic signals exhibiting a plurality of selectively placed transmission peaks and transmission nulls within a far field region of a coverage area based on routing information. For example, the Aruba AP-325 is configured to output at least one transmission signal to said adaptive antenna. For a further example, the Aruba AP-325 is configured to cause said at least one transmitter to output at least one transmission signal to said adaptive antenna to transmit corresponding outgoing multi-beam electromagnetic signals exhibiting a plurality of selectively placed transmission peaks and transmission nulls within a far field region of a coverage area based on routing information. *See, e.g.,* 802.11ac Standard Clause 9.31.5.1 (“Transmit beamforming and DL-MU-MIMO require knowledge of the channel state to compute a steering matrix that is

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

13 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  
 14 beamformer using the beamforming feedback matrices for subcarrier  $k$  from beamformee  $u$ ,  $V_{k,u}$ , and SNR  
 15 information for subcarrier  $k$  from beamformee  $u$ ,  $SNR_{k,u}$ , where  $u = 0, 1, \dots, N_{user} - 1$ . The steering matrix  
 16 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).

17 *Id.* Clause 22.3.11.2:

18 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in  
 19 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.  
 The beamforming feedback matrix,  $V_{k,u}$ , found by the beamformee  $u$  for subcarrier  $k$  shall be compressed in  
 20 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  
 21 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.

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

23 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  
 24 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  
 25 between participating beamformees. The method used by the beamformer to calculate the steering matrix  $Q_k$   
 is implementation specific.

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

1 correlated signal information that is received by said receiver using said adaptive  
2 antenna. For example, the Aruba AP-325 updates the routing information based at  
3 least in part on cross-correlated signal information received in a VHT Compressed  
4 Beamforming frame. *See, e.g.*, 802.11ac Standard Clause 9.31.5.2 (“A VHT  
5 beamformer shall initiate a sounding feedback sequence by transmitting a VHT  
6 NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT  
7 beamformer shall include in the VHT NDP Announcement frame one STA Info  
8 field for each VHT beamformee that is expected to prepare VHT Compressed  
9 Beamforming feedback and shall identify the VHT beamformee by including the  
10 VHT beamformee’s AID in the AID subfield of the STA Info field. The VHT NDP  
11 Announcement frame shall include at least one STA Info field.”); *id.* (“A non-AP  
12 VHT beamformee that receives a VHT NDP Announcement frame... shall  
13 transmit its VHT Compressed Beamforming feedback a SIFS after receiving a  
14 Beamforming Report Poll with RA matching its MAC address and a non-  
15 bandwidth signaling TA obtained from the TA field matching the MAC address of  
16 the VHT beamformer.”); *id.* Clause 8.5.23.2 (defining format and subfields within  
17 the VHT Compressed Beamforming frame); *id.* Clause 8.4.1.48 (including Tables  
18 8-53(d)-(h)) (“Each SNR value per tone in stream  $i$  (before being averaged)  
19 corresponds to the SNR associated with the column  $i$  of the beamforming feedback  
20 matrix  $V$  determined at the beamformee”); *id.* Clause 8.4.1.49 (including Table 8-  
21 53i – MU Exclusive Beamforming Report information); *id.* Clauses 8.4.1.24,  
22 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.8.3.5; *id.* Clause 22.3.11.2:

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

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

11 After receiving the angle information,  $\phi(k,u)$  and  $\psi(k,u)$ , the beamformer reconstructs  $V_{k,u}$  using Equation  
 12 (20-79). For SU-MIMO beamforming, the beamformer can use this  $V_{k,0}$  matrix to determine the steering  
 13 matrix  $Q_k$ . For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix  
 14  $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$  using  $V_{k,u}$  and  $SNR_{k,u}$  ( $0 \leq u \leq N_{user} - 1$ ) in order to suppress crosstalk  
 15 between participating beamformees. The method used by the beamformer to calculate the steering matrix  $Q_k$   
 16 is implementation specific.

17 55. 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 56. By at least the filing and service of the original Complaint on April  
 23 19, 2017, and May 3, 2017, 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.

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

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

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

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

19 60. The '231 Patent is valid and enforceable.

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

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

## 26 **VII. WILLFUL INFRINGEMENT**

27 63. Defendant had knowledge of Vivato's '296 Patent by at least its  
28 citation of the application that led to the '296 Patent during the prosecution of

1 Defendant's U.S. Patent No. 9,326,313, "System, apparatus and method for  
2 managing client devices within a wireless network." On December 14, 2015,  
3 Defendant cited to the U.S. Patent and Trademark Office, U.S. Application  
4 Publication No. 2004/0204114A1 to Brennan, which is the application that led to  
5 Vivato's '296 Patent. Vivato's '296 Patent, however, had already issued on June  
6 13, 2006. Accordingly, a reasonable inference is that Defendant had knowledge of  
7 the '296 Patent, and its issued claims, by at least as early as December 14, 2015.  
8 Further, by at least the filing and service of the original Complaint on April 19,  
9 2017, and May 3, 2017, respectively, Defendant had knowledge of the '296 Patent.

10 64. Despite such knowledge, Defendant infringed and continues to  
11 infringe the '296 Patent with full and complete knowledge of the '296 Patent's  
12 applicability to Defendant's MU-MIMO WiFi access point and router products  
13 without taking a license and without a good faith belief that the '296 Patent is  
14 invalid and not infringed. Defendant's infringement of the '296 Patent occurred,  
15 and continues to occur, with knowledge of infringement and objective  
16 recklessness. Defendant's infringement was, and continues to be, willful,  
17 deliberate, and flagrant. Upon information and belief, Defendant's employees,  
18 contractors, and agents responsible for the research, development, and  
19 manufacturing of its Accused Products collaborated with Defendant's employees,  
20 contractors, agents, and attorneys responsible for the procurement and management  
21 of Defendant's U.S. Patent No. 9,326,313. As a result of this collaboration,  
22 Defendant deliberately and flagrantly copied and incorporated into its Accused  
23 Products the invention claimed in the '296 Patent. Defendant sold, and continues to  
24 sell its Accused Products (e.g., Aruba AP-325) to customers despite its knowledge  
25 of the '296 Patent. Defendant also manufactured and imported into the United  
26 States, and continues to do so, the Accused Products for sale and distribution to its  
27 customers, despite its knowledge of the '296 Patent.

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1           65. Defendant's infringement of the '296 Patent is egregious because  
2 despite its knowledge of the '296 Patent, Defendant deliberately and flagrantly  
3 copied the invention claimed in the '296 Patent and implemented that patented  
4 invention in its Accused Products. Further, despite Defendant's knowledge of the  
5 '296 Patent, Defendant sold, offered for sale, manufactured, and imported, the  
6 Accused Products—and continues to do so—without investigating the scope of the  
7 '296 Patent and without forming a good-faith belief that its Accused Products do  
8 not infringe or that the '296 Patent is invalid. Defendant has not taken any steps to  
9 remedy its infringement of the '296 Patent (e.g., by removing the Accused  
10 Products from its sales channels). Instead, Defendant continues to sell its Accused  
11 Products to customers, such as its continued sale of its Aruba AP-325. Defendant's  
12 behavior is egregious because it engaged, and continues to engage, in misconduct  
13 beyond that of typical infringement. For example, in a typical infringement, an  
14 infringer would investigate the scope of the asserted patents and develop a good-  
15 faith belief that it does not infringe the asserted patents or that the asserted patents  
16 are invalid before selling (and continuing to sell) its accused products. An infringer  
17 would also remove its accused products from its sales channels and discontinue  
18 further sales.

19           66. Thus, Defendant's infringement of the '296 Patent is willful,  
20 deliberate, and flagrant, entitling Vivato to increased damages under 35 U.S.C.  
21 § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35  
22 U.S.C. § 285.

### **PRAYER FOR RELIEF**

24           WHEREFORE, Vivato prays for the following relief:

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

27           (b) An award of damages to Vivato arising out of Defendant's  
28 infringement of U.S. Patent Nos. 7,062,296, 7,729,728, and 6,611,231, together

1 with prejudice and post-judgment interest, in an amount according to proof;

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

4 (d) Declaring that Defendant’s infringement of the ’296 Patent is willful  
5 and that this is an exceptional case under 35 U.S.C. § 285, and awarding enhanced  
6 damages pursuant to 35 U.S.C. § 284 and attorneys’ fees and costs in this action.

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

9 **DEMAND FOR JURY TRIAL**

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

12  
13 DATED: July 14, 2017

Respectfully submitted,

14 **RUSS AUGUST & KABAT**

15  
16  
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RUSS, AUGUST & KABAT