

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 RUCKUS WIRELESS, INC.,

28 *Defendant.*

Case No. 2:17-cv-02961-AG(JCGx)

**SECOND AMENDED
 COMPLAINT FOR PATENT
 INFRINGEMENT**

1 **I. JURISDICTION AND VENUE**

2 1. This is an action for patent infringement. This Court has subject matter
3 jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a) because this action arises
4 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 under
8 the laws of Delaware with its principal place of business at 444 S. Cedros Ave.,
9 Solana Beach, CA 92075.

10 3. Ruckus Wireless, Inc. (“Ruckus” or “Defendant”) is a corporation
11 organized and existing under the laws of Delaware with its principal place of
12 business at 350 West Java Drive., Sunnyvale, CA 94089. Ruckus has a registered
13 agent for service of process at C T Corporation System, 818 W 7th St. Ste. 930, Los
14 Angeles, CA 90017.

15 4. Brocade Communication Systems, Inc. (“Brocade”) is a corporation
16 organized and existing under the laws of Delaware with its principal place of
17 business at 130 Holger Way, San Jose, CA 95134. Brocade has a registered agent
18 for service of process at C T Corporation System, 818 W 7th St. Ste. 930, Los
19 Angeles, CA 90017. At the time of this action’s filing, Ruckus was a wholly owned
20 subsidiary of Brocade and Ruckus was the alter ego of Brocade. For example, upon
21 information and belief, at the time of this action’s filing:

- 22 • Brocade and Ruckus failed to observe corporate formalities
23 including adequate capitalization;
- 24 • Brocade wholly owned Ruckus and substantially dominated its
25 management;
- 26 • Ruckus did not have regular board meetings;
- 27 • Ruckus had no functioning corporate directors;
- 28 • Ruckus had no board of directors;

- 1 • Ruckus and Brocade share some corporate officers according to
2 the California Secretary of State. For example, Ruckus's Chief
3 Executive Officer, Chief Financial Officer, and Secretary, as
4 reported to the California Secretary of State, were Brocade
5 executives;
- 6 • Ruckus had no employees; and
- 7 • Ruckus products were developed, managed, and sold only by
8 individuals who were employed by Brocade and whose salaries
9 were paid by Brocade only.

10 5. Brocade's disregard of Ruckus's separate corporate identity resulted in
11 fraud and injustice because Vivato and courts, for example, cannot determine
12 whether venue is proper in a district despite the fact that Ruckus has employees that
13 work from an office leased by Brocade. As another example, fraud and injustice has
14 resulted against Vivato, because without a determination of alter ego, Vivato would
15 not be able to hold Brocade liable for infringement by Ruckus's products. As a
16 specific example, Ruckus's counsel has represented that Ruckus Wireless, Inc. is no
17 longer in existence since the transfer of Ruckus (as a subsidiary of Brocade) from
18 Brocade to Arris, PLC) in December 2017. This would likely cost Vivato additional
19 resources and time to determine what party would be liable for Ruckus's past sales
20 of infringing Ruckus products, which would be an injustice. But also for example, if
21 alter ego is not found, Vivato may not ever collect on a judgment against Ruckus
22 Wireless, Inc., if it is dissolved, nor Brocade, because without piercing the veil it
23 would be considered a separate corporate entity. This would be a great injustice.

24 6. These facts show that there was such unity of interest and ownership,
25 at and around the time of the filing of the Complaint in April 2017, that the separate
26 personalities of Ruckus and Brocade did not exist and that their failure to disregard
27 their separate identities resulted in fraud or injustice.

28

1 7. This Court has personal jurisdiction over Ruckus because Ruckus has
2 its principal place of business in California.

3 8. Venue is proper in this federal district pursuant to 28 U.S.C. § 1400(b)
4 because at the time of this action’s filing, Ruckus has committed acts of infringement
5 in this District and has a regular and established place of business in this District.
6 Ruckus sells and offers to sell its infringing devices, including the ZoneFlex R710,
7 to customers in this District directly, as well as through resellers and distributors.
8 For example, Ruckus sells the ZoneFlex R710 to customers located in this District
9 through the website Amazon.com. Further, Ruckus has a physical office in this
10 District that it shares with Brocade. This physical office is located at 2875 Michelle
11 Drive, Suite 110, Irvine, CA 92606 (“Irvine Office”), as indicated on the office
12 directory on Brocade’s website, attached hereto as Exhibit D. More importantly,
13 Ruckus and Brocade have numerous agents or employees (including Brocade
14 employees) that reside in this District, regularly work out of the Irvine Office and
15 their home offices located in this District, and conduct Ruckus business in this
16 District, including an employee whose title is “Manager – Southern California.”¹ For
17 example, Ruckus and Brocade’s agents or employees have managed (e.g., working
18 with, selling, and supporting) Ruckus products, including Ruckus-branded ICX
19 products, from the Irvine Office. One such person who conducted Ruckus business
20 regularly from the Irvine Office was Dale Kording, who managed the Ruckus-
21 branded ICX products. Upon information and belief, other Ruckus and Brocade
22 agents or employees (including Brocade employees) have access to and regularly
23

24 _____
25 ¹ Plaintiff’s investigation has revealed that at least the following Ruckus and Brocade
26 agents or employees regularly work and conduct business in this District: Dave
27 Marrazzo, Manager – Southern California (Exhibit E); Israel Calvo, Systems
28 Engineer (Exhibit F); James Dunlap, Channel Sales Manager (Exhibit G); Juan
Santiago, Director – LTE Small Cell Business Unit (Exhibit H); Judith Aponte-
Randall, Distribution Manager (Exhibit I); Jeanette Lee, Senior Systems Engineer
(Exhibit J); Michael Fong, Software Engineer (Exhibit K); Kevin Wolfe, Systems
Engineer (Exhibit L); Dale Kording (Exhibit N); and Ernie Funari (Exhibit O).

1 visit, use, and work out of the Irvine Office when conducting Ruckus business in the
2 city of Irvine and the surrounding area.

3 **III. BACKGROUND OF THE TECHNOLOGY**

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

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

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

22 **IV. COUNT ONE: INFRINGEMENT OF UNITED STATES** 23 **PATENT NO. 7,062,296**

24 12. On June 13, 2006, United States Patent No. 7,062,296 ("the '296
25 Patent") was duly and legally issued for inventions entitled "Forced Beam Switching
26 in Wireless Communication Systems Having Smart Antennas." Vivato owns the
27 '296 Patent and holds the right to sue and recover damages for infringement thereof.
28 A copy of the '296 Patent is attached hereto as Exhibit A.

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1 13. Defendant has directly infringed and continues to directly infringe
2 numerous claims of the '296 Patent, including at least claim 33, by manufacturing,
3 using, selling, offering to sell, and/or importing into the United States WiFi access
4 points and routers supporting MU-MIMO, including without limitation access points
5 and routers utilizing the IEEE 802.11ac-2013 standard (e.g. Defendant's ZoneFlex
6 R710, ZoneFlex R610, ZoneFlex R510, ZoneFlex H510, ZoneFlex T710, ZoneFlex
7 T610, and ZoneFlex C110) (collectively the "Accused Products"). Defendant is
8 liable for infringement of the '296 Patent pursuant to 35 U.S.C. § 271(a).

9 14. Each of the Accused Products comprises an apparatus for use in a
10 wireless communication system. For example, the ZoneFlex R710 is an apparatus
11 for use in a wireless communication system.

12 15. Each of the Accused Products comprises at least one smart antenna. For
13 example, the ZoneFlex R710 has at least one smart antenna.

14 16. Each of the Accused Products comprises at least one transceiver
15 operatively coupled to said smart antenna and configured to send and receive
16 electromagnetic signals using said smart antenna. For example, the ZoneFlex R710
17 has a Qualcomm QCA9994 WiFi radio coupled to the smart antenna to send and
18 receive signals. *See, e.g.*, IEEE 802.11ac-2013 ("802.11ac Standard") Clauses
19 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),
20 22.3.4.10.4(e) ("Analog and RF: Up-convert the resulting complex baseband
21 waveform associated with each transmit chain to an RF signal according to the center
22 frequency of the desired channel and transmit."); *id.* Clauses 22.3.7.4, 22.3.8; *id.*
23 Clause 22.3.3 and Figure 22-7:

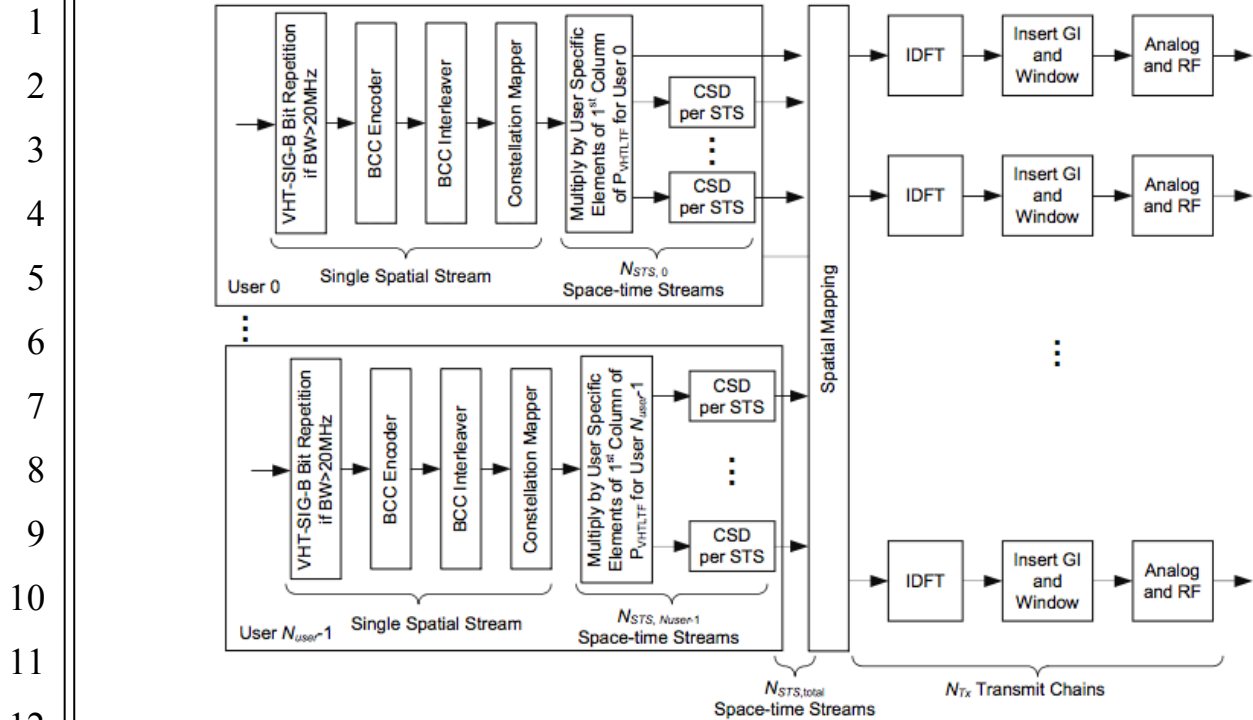


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

17. 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 ZoneFlex R710 allows a client device to operatively associate with a beam downlink transmittable to that client device using the smart antenna. *See, e.g.*, 802.11ac Standard Clause 8.5.23.3 (“The Group ID Management frame is an Action frame of category VHT. It is transmitted by the AP to assign or change the user position of a STA for one or more group IDs. The Action field of a Group ID Management frame contains the information shown in Table 8-281aj”); *id.* Clause 8.4.1.51 (“The Membership Status Array field is used in the Group ID Management frame (see 8.5.23.3). The length of the field is 8 octets. An 8 octet Membership Status Array field (indexed by the group ID) consists of a 1-bit Membership Status subfield for each of the 64 group IDs, as shown in Figure 8-80f. * * * Within the 8 octet Membership Status Array field, the 1-bit Membership Status subfield for each group ID is set as follows: — Set to 0 if the STA is not a member

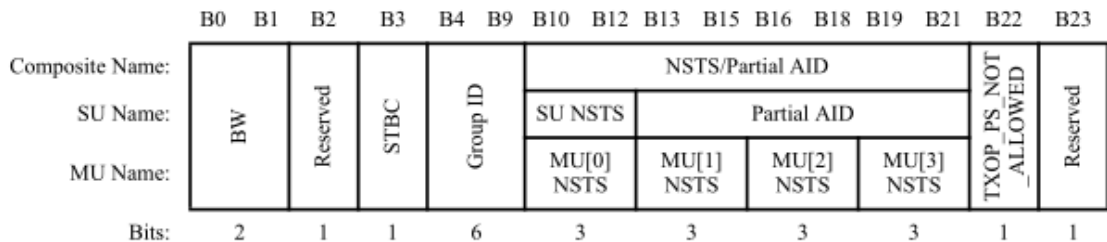
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1 of the group — Set to 1 if STA is a member of the group The Membership Status
 2 subfields for group ID 0 (transmissions to AP) and group ID 63 (downlink SU
 3 transmissions) are reserved.”); *id.* Clause 8.4.1.52 (“The User Position Array field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

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



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

25
 26 *Id.* Clause 22.3.11.4:
 27
 28

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

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

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

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

5 18. Each of the Accused Products comprises logic configured to determine
6 information from at least one uplink transmission receivable from said second device
7 through said smart antenna. For example, the ZoneFlex R710 determines
8 information from a VHT Compressed Beamforming frame received from a client
9 device through its smart antenna. *See, e.g.*, 802.11ac Standard Clauses 8.4.1.24,
10 8.4.1.49, 8.5.23.2, 9.31.5.1, 9.31.5.2; IEEE 802.11-2012 Clause 20.3.12.3.6.

11 19. Each of the Accused Products comprises logic configured to determine
12 if said associated second device should operatively associate with a different beam
13 downlink transmittable using said smart antenna based on said determined
14 information. For example, the ZoneFlex R710 determines, based on the information
15 received in a VHT Compressed Beamforming frame, if the client device should
16 operatively associate with a different beam downlink transmittable using the smart
17 antenna. *See, e.g.*, 802.11ac Standard Clauses 8.4.1.24, 8.4.1.49, 8.5.23.2, 9.31.5.1,
18 9.31.5.2; *id.* Clause 22.3.11.2:

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

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

7 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 8 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 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 20. Each of the Accused Products comprises logic configured to allow said
 11 second device to operatively associate with said different beam if said associated
 12 second device should operatively associate with a different beam and selectively
 13 identify that said second device is not allowed to operatively associate with said
 14 beam. For example, the ZoneFlex R710 allows a client device to operatively
 15 associate with a beam that is different from the beam with which the client was
 16 associated previously, and to identify that the client device is not allowed to
 17 operatively associate with the prior beam. *See, e.g.*, 802.11ac Standard Clause 10.40
 18 (“An AP determines the possible combinations of STAs that can be addressed by a
 19 VHT MU PPDU by assigning STAs to groups and to specific user positions within
 20 those groups. Assignments or changes of user positions corresponding to one or
 21 more Group IDs shall be performed using a Group ID Management frame defined
 22 in 8.5.23.3...A VHT MU PPDU shall be transmitted to a STA based on the content
 23 of the Group ID Management frame most recently transmitted to the STA and for
 24 which an acknowledgement was received.”); *id.* Clause 8.5.23.3 (“The Group ID
 25 Management frame is an Action frame of category VHT. It is transmitted by the AP
 26 to assign or change the user position of a STA for one or more group IDs. The Action
 27 field of a Group ID Management frame contains the information shown in Table 8-
 28 281aj”); *id.* Clause 8.4.1.51 (“The Membership Status Array field is used in the

1 Group ID Management frame (see 8.5.23.3). The length of the field is 8 octets. An
 2 8 octet Membership Status Array field (indexed by the group ID) consists of a 1-bit
 3 Membership Status subfield for each of the 64 group IDs, as shown in Figure 8-80f.
 4 * * * Within the 8 octet Membership Status Array field, the 1-bit Membership Status
 5 subfield for each group ID is set as follows: — Set to 0 if the STA is not a member
 6 of the group — Set to 1 if STA is a member of the group The Membership Status
 7 subfields for group ID 0 (transmissions to AP) and group ID 63 (downlink SU
 8 transmissions) are reserved.”); *id.* Clause 8.4.1.52 (“The User Position Array field
 9 is used in the Group ID Management frame (see 8.5.23.3). The length of the field is
 10 16 octets. A 16 octet User Position Array field (indexed by the Group ID) consists
 11 of a 2-bit User Position subfield for each of the 64 group IDs, as shown in Figure 8-
 12 80g. * * * If the Membership Status subfield for a particular group ID is 1, then the
 13 corresponding User Position subfield is encoded as shown in Table 8-53l.”); *id.*
 14 Table 8-53l:

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

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

16
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 18
 19
 20
 21 *Id.* Clause 22.3.8.3.3 (“The VHT-SIG-A field carries information required to
 22 interpret VHT PPDU. The structure of the VHT-SIG-A field for the first part (VHT-
 23 SIG-A1) is shown in Figure 22-18 and for the second part (VHT-SIG-A2) is shown
 24 in Figure 22-19.”); *id.* Figure 22-18:

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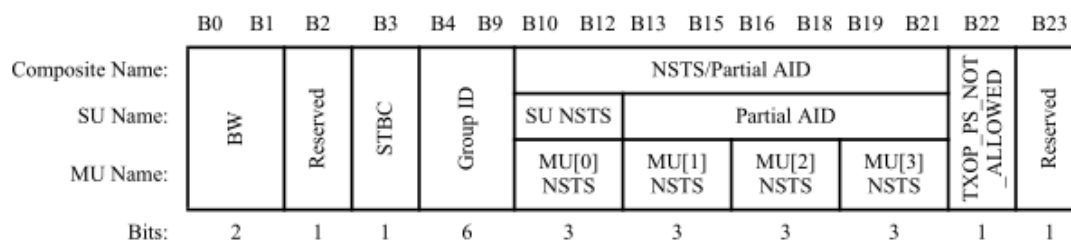


Figure 22-18—VHT-SIG-A1 structure

Id. Clause 22.3.11.4:

When a STA receives a VHT MU PPDU where the Group ID field in VHT-SIG-A has the value k and where $\text{MembershipStatusInGroupID}[k]$ 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 PPDU are used to measure the channel for the space-time streams intended for the STA and can also be used to measure the channel for the interfering space-time streams. To successfully demodulate the space-time streams intended for the STA, the STA may use the channel state information for all space-time streams to reduce the effect of interfering space-time streams.

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

1 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 transmit
4 its VHT Compressed Beamforming feedback a SIFS after receiving a Beamforming
5 Report Poll with RA matching its MAC address and a non-bandwidth signaling TA
6 obtained from the TA field matching the MAC address of the VHT beamformer.");
7 *id.* Clauses 8.5.23.2, 8.4.1.48, 8.4.1.49; *id.* Clauses 22.3.4.6(d), 22.3.4.7(e),
8 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a) ("Spatial mapping: Apply
9 the Q matrix as described in 22.3.10.11.1."); *id.* Clauses 22.3.10.11.1, 22.3.11.2;
10 IEEE 802.11-2012 Clause 20.3.12.3.6.

11 21. Defendant has been and is now indirectly infringing at least one claim
12 of the '296 Patent in accordance with 35 U.S.C. § 271(b) in this district and
13 elsewhere in the United States. More specifically, Defendant has been and is now
14 actively inducing direct infringement by other persons (e.g., Defendant's customers
15 who use, sell, or offer for sale the Accused Products).

16 22. By at least the filing and service of the original Complaint on April 19,
17 2017, and May 3, 2017, respectively, Defendant had knowledge of the '296 Patent,
18 and that its actions resulted in a direct infringement of the '296 Patent. Defendant
19 also knew or was willfully blind that its actions would induce direct infringement by
20 others and intended that its actions would induce direct infringement by others.

21 23. Defendant actively induced, and continues to induce, such infringement
22 by, among other things, providing user manuals and other instruction material for its
23 Accused Products that induce its customers to use the Accused Products in their
24 normal and customary way to infringe the '296 Patent. For example, Defendant's
25 website provided, and continues to provide, instructions for using the Accused
26 Products on wireless communication systems, and to utilize their beamforming and
27 MU-MIMO functionalities. Defendant sold, and continues to sell, for example, on
28 Amazon.com, the Accused Products to customers despite its knowledge of the '296

1 Patent. Defendant manufactured and imported into the United States, and continues
2 to do so, the Accused Products for sale and distribution to its customers, despite its
3 knowledge of the '296 Patent. Through its continued manufacture, importation, and
4 sales of its Accused Products, Defendant specifically intended for its customers to
5 infringe claims of the '296 Patent. Further, Defendant was aware that these normal
6 and customary activities would infringe the '296 Patent. Defendant performed, and
7 continues to perform, acts that constitute induced infringement, and that would
8 induce actual infringement, with knowledge of the '296 Patent and with the
9 knowledge or willful blindness that the induced acts would constitute direct
10 infringement.

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

17 25. Defendant also infringes other claims of the '296 Patent, directly and
18 through inducing infringement, for similar reasons as explained above with respect
19 to Claim 33.

20 26. The '296 Patent is valid and enforceable.

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

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

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

3 29. On June 1, 2010, United States Patent No. 7,729,728 (“the ’728
4 Patent”) was duly and legally issued for inventions entitled “Forced Beam Switching
5 in Wireless Communication Systems Having Smart Antennas.” Vivato owns the
6 ’728 Patent and holds the right to sue and recover damages for infringement thereof.
7 A copy of the ’728 Patent is attached hereto as Exhibit B.

8 30. Defendant has directly infringed and continues to directly infringe
9 numerous claims of the ’728 Patent, including at least claim 16, by manufacturing,
10 using, selling, offering to sell, and/or importing into the United States the Accused
11 Products. Defendant is liable for infringement of the ’728 Patent pursuant to 35
12 U.S.C. § 271(a).

13 31. Each of the Accused Products comprises a wireless communication
14 system. For example, the ZoneFlex R710 is a wireless access point for use in a Wi-
15 Fi network.

16 32. Each of the Accused Products comprises a phased array antenna
17 configured to transmit beam downlinks. *See, e.g.*: 802.11ac Standard Clause
18 8.4.2.58.6, Table 8-128.

19 33. Each of the Accused Products comprises a transceiver operatively
20 coupled to the phased array antenna and configured to send and receive
21 electromagnetic signals via the phased array antenna. For example, the ZoneFlex
22 R710 has a Qualcomm QCA9994 WiFi radio that is configured to send and receive
23 electromagnetic signals via the phased array antenna. *See, e.g.*, 802.11ac Standard
24 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),
25 22.3.4.9.2(q), 22.3.4.10.4(e) (“Analog and RF: Up-convert the resulting complex
26 baseband waveform associated with each transmit chain to an RF signal according
27 to the center frequency of the desired channel and transmit.”); *id.* Clauses 22.3.7.4,
28 22.3.8; *id.* Clause 22.3.3 and Figure 22-7:

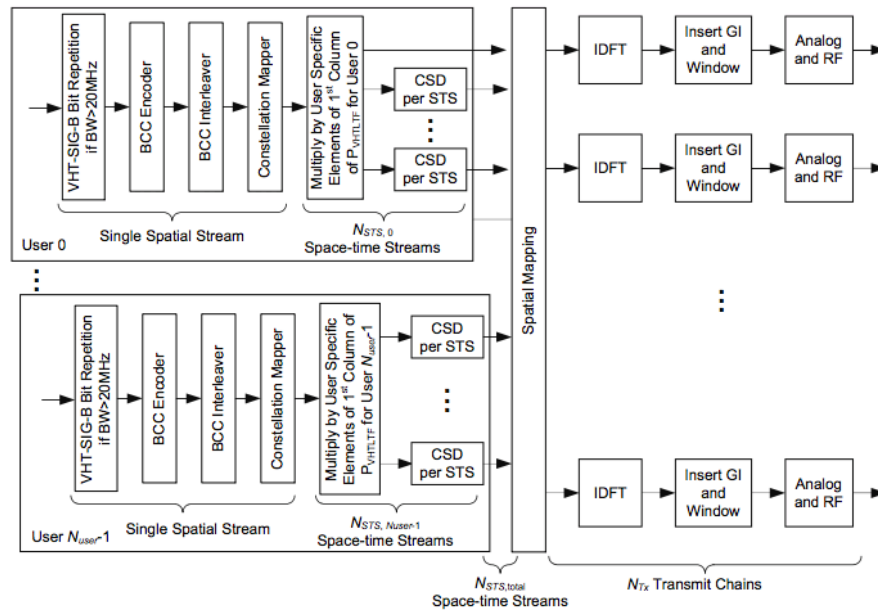


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

34. Each of the Accused Products comprises an access point that includes the phased array antenna and the transceiver. For example, the ZoneFlex R710 comprises an access point that includes a phased antenna array and a Qualcomm QCA9994 WiFi radio.

35. 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 Array field, the 1-bit Membership Status subfield for each group ID is set as follows: — Set to 0 if

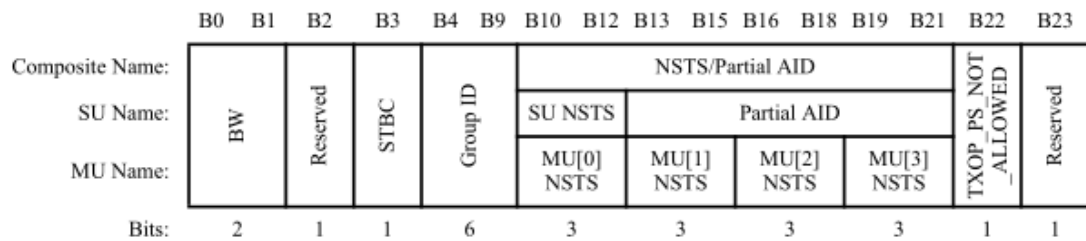
RUSS, AUGUST & KABAT

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

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

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

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



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

25 *Id.* Clause 22.3.11.4:

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

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

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

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

5 36. 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 ZoneFlex R710 is configured to receive a VHT Compressed
9 Beamforming Feedback frame from a “receiving device” such as a connected laptop
10 or smartphone through its phased-array antenna. *See, e.g.*, 802.11ac Standard
11 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
12 20.3.12.3.6.

13 37. 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 the
15 uplink transmission if the receiving device should operatively associate with a
16 different beam downlink transmission. For example, the ZoneFlex R710 is
17 configured to determine from information contained in the VHT Compressed
18 Beamforming Feedback frame if the receiving device that sent the VHT Compressed
19 Beamforming Feedback frame should operatively associate with a different beam
20 downlink transmission. *See, e.g.*, 802.11ac Standard Clauses 3.2, 8.4.1.24, 8.4.1.49,
21 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
 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 38. Each of the Accused Products comprises an access point that includes
 11 the phased array antenna and the transceiver that is configured to at least one of: (i)
 12 allow the receiving device to operatively associate with the different beam downlink
 13 if determined that the receiving device should operatively associate with the
 14 different beam downlink; (ii) force the receiving device to operatively associate with
 15 the different beam downlink if determined that the receiving device should be
 16 operatively associated with the different beam downlink. For example, the ZoneFlex
 17 R710 is configured to transmit a Group ID Management frame or VHT MU PPDU
 18 VHT-SIG-A or combination thereof to allow the receiving device to operatively
 19 associate with the different beam downlink if determined that the receiving device
 20 should operatively associate with the different beam downlink; (ii) force the
 21 receiving device to operatively associate with the different beam downlink if
 22 determined that the receiving device should be operatively associated with the
 23 different beam downlink. *See, e.g.*, 802.11ac Standard Clause 10.40 (“An AP
 24 determines the possible combinations of STAs that can be addressed by a VHT MU
 25 PPDU by assigning STAs to groups and to specific user positions within those
 26 groups. Assignments or changes of user positions corresponding to one or more
 27 Group IDs shall be performed using a Group ID Management frame defined in
 28 8.5.23.3...A VHT MU PPDU shall be transmitted to a STA based on the content of

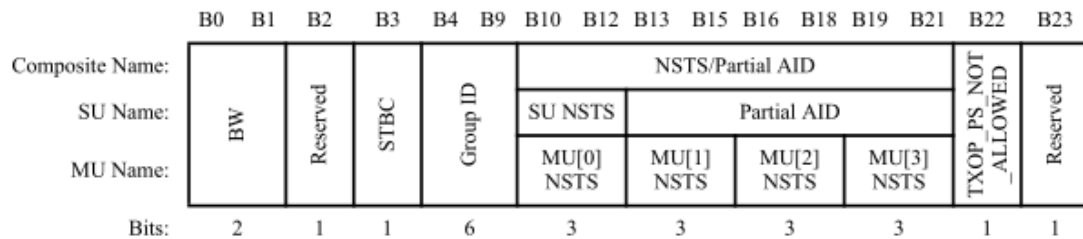
1 the Group ID Management frame most recently transmitted to the STA and for which
 2 an acknowledgement was received.”); *id.* Clause 8.5.23.3 (“The Group ID
 3 Management frame is an Action frame of category VHT. It is transmitted by the AP
 4 to assign or change the user position of a STA for one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

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

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

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

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



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

8 *Id.* Clause 22.3.11.4:

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

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

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

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

13 39. Each of the Accused Products comprises an access point that includes
14 the phased array antenna and the transceiver that is configured to actively probe the
15 receiving device by generating a signal to initiate that the phased array antenna
16 transmit at least one downlink transmittable message over the beam downlinks, and
17 gather signal parameter information from uplink transmittable messages received
18 from the receiving device through the phased array antenna. For example, the
19 ZoneFlex R710 is configured to actively probe the receiving device by generating a
20 signal to initiate that the phased array antenna transmit a signal, e.g. a VHT null data
21 packet announcement frame over the beam downlinks, and to gather signal
22 parameter information from uplink transmittable messages received from the
23 receiving device through the phased array antenna, e.g. one or more VHT
24 Compressed Beamforming Feedback frames. *See, e.g.*, 802.11ac Standard Clause
25 9.31.5, 9.31.5.2 (“A VHT beamformer shall initiate a sounding feedback sequence
26 by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a
27 SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame
28 one STA Info field for each VHT beamformee that is expected to prepare VHT

1 Compressed Beamforming feedback and shall identify the VHT beamformee by
2 including the VHT beamformee's AID in the AID subfield of the STA Info field.
3 The VHT NDP Announcement frame shall include at least one STA Info field."); *id.*
4 ("A non-AP VHT beamformee that receives a VHT NDP Announcement frame...
5 shall transmit its VHT Compressed Beamforming feedback a SIFS after receiving a
6 Beamforming Report Poll with RA matching its MAC address and a non-bandwidth
7 signaling TA obtained from the TA field matching the MAC address of the VHT
8 beamformer."); *id.* Clause 8.4.1.24; IEEE 802.11-2012 Clause 20.3.12.3.6; 802.11ac
9 Standard Clause 8.5.23.2 (defining format and subfields within the VHT
10 Compressed Beamforming frame); *id.* Clause 8.4.1.48 (including Tables 8-53(d)-
11 (h)) ("Each SNR value per tone in stream i (before being averaged) corresponds to
12 the SNR associated with the column i of the beamforming feedback matrix V
13 determined at the beamformee"); *id.* Clause 8.4.1.49 (including Table 8-53i – MU
14 Exclusive Beamforming Report information); *id.* Clauses 8.4.1.24, 9.31.5.1,
15 9.31.5.2; *id.* Clause 22.3.8.3.5; *id.* Clause 22.3.11.2.

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

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

26 42. Defendant actively induced, and continues to induce, such infringement
27 by, among other things, providing user manuals and other instruction material for its
28 Accused Products that induce its customers to use the Accused Products in their

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

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

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

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

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

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 recover
9 damages for infringement thereof. A copy of the ’231 Patent is attached hereto as
10 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 ZoneFlex R710 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 ZoneFlex R710 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 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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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 ZoneFlex R710 has a Qualcomm QCA9994 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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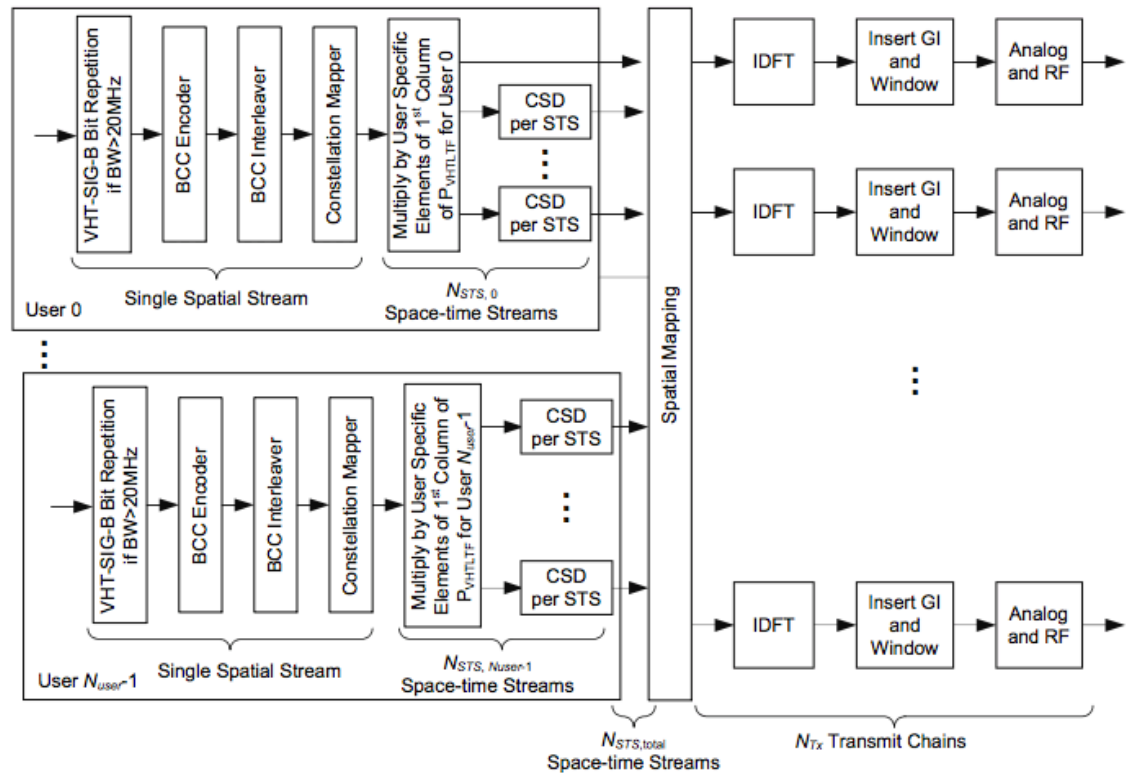


Figure 22-7—Transmitter block diagram for the VHT-SIG-B field of a 20 MHz, 40 MHz, and 80 MHz VHT MU PPDU

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 ZoneFlex R710 is configured to output at least one transmission signal to said adaptive antenna. For a further example, the ZoneFlex R710 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 applied to the

1 transmitted signal to optimize reception at one or more receivers. The STA
 2 transmitting using the steering matrix is called the VHT beamformer and a STA for
 3 which reception is optimized is called a VHT beamformee. An explicit feedback
 4 mechanism is used where the VHT beamformee directly measures the channel from
 5 the training symbols transmitted by the VHT beamformer and sends back a
 6 transformed estimate of the channel state to the VHT beamformer. The VHT
 7 beamformer then uses this estimate, perhaps combining estimates from multiple
 8 VHT beamformees, to derive the steering matrix.”); *id.* Clauses 22.3.4.6(d),
 9 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) (“Spatial
 10 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:

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 14 The DL-MU-MIMO steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \dots, Q_{k,N_{user}-1}]$ can be determined by the
 15 beamformer using the beamforming feedback matrices for subcarrier k from beamformee u , $V_{k,u}$, and SNR
 16 information for subcarrier k from beamformee u , $SNR_{k,u}$, where $u = 0, 1, \dots, N_{user} - 1$. The steering matrix
 17 that is computed (or updated) using new beamforming feedback matrices and new SNR information from
 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).

18 *Id.* Clause 22.3.11.2:

19 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 20 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 21 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 22 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
 23 according to Table 8-53e. The number of bits for quantization is chosen by the beamformee, based on the
 24 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 (Nr) equal to
 26 the N_{STS} of the NDP.

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

1 54. Each of the Accused Products comprises search receiver logic
2 operatively coupled to said control logic and said at least one receiver and configured
3 to update said routing information based at least in part on cross-correlated signal
4 information that is received by said receiver using said adaptive antenna. For
5 example, the ZoneFlex R710 updates the routing information based at least in part
6 on cross-correlated signal information received in a VHT Compressed Beamforming
7 frame. *See, e.g.*, 802.11ac Standard Clause 9.31.5.2 (“A VHT beamformer shall
8 initiate a sounding feedback sequence by transmitting a VHT NDP Announcement
9 frame followed by a VHT NDP after a SIFS. The VHT beamformer shall include in
10 the VHT NDP Announcement frame one STA Info field for each VHT beamformee
11 that is expected to prepare VHT Compressed Beamforming feedback and shall
12 identify the VHT beamformee by including the VHT beamformee’s AID in the AID
13 subfield of the STA Info field. The VHT NDP Announcement frame shall include at
14 least one STA Info field.”); *id.* (“A non-AP VHT beamformee that receives a VHT
15 NDP Announcement frame... shall transmit its VHT Compressed Beamforming
16 feedback a SIFS after receiving a Beamforming Report Poll with RA matching its
17 MAC address and a non-bandwidth signaling TA obtained from the TA field
18 matching the MAC address of the VHT beamformer.”); *id.* Clause 8.5.23.2 (defining
19 format and subfields within the VHT Compressed Beamforming frame); *id.* Clause
20 8.4.1.48 (including Tables 8-53(d)-(h)) (“Each SNR value per tone in stream i
21 (before being averaged) corresponds to the SNR associated with the column i of the
22 beamforming feedback matrix V determined at the beamformee”); *id.* Clause
23 8.4.1.49 (including Table 8-53i – MU Exclusive Beamforming Report information);
24 *id.* Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.8.3.5; *id.* Clause 22.3.11.2:
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1 Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in
 2 Table 22-11 from the measured channel before computing a set of matrices for feedback to the beamformer.
 3 The beamforming feedback matrix, $V_{k,u}$, found by the beamformee u for subcarrier k shall be compressed in
 4 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,u)$ and $\psi(k,u)$, are quantized
 according to Table 8-53e. The number of bits for quantization is chosen by the beamformee, based on the
 indication from the beamformer as to whether the feedback is requested for SU-MIMO beamforming or DL-
 MU-MIMO beamforming. The compressed beamforming feedback using 20.3.12.3.6 is the only Clause 22
 beamforming feedback format defined.

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

7 After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation
 8 (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering
 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 55. Defendant has been and is now indirectly infringing at least one claim
 11 of the '231 Patent in accordance with 35 U.S.C. § 271(b) in this district and
 12 elsewhere in the United States. More specifically, Defendant has been and is now
 13 actively inducing direct infringement by other persons (e.g., Defendant's customers
 14 who use, sell, or offer for sale the Accused Products).

15 56. By at least the citation during the prosecution of U.S. Patent No.
 16 7,877,113 and the filing and service of the original Complaint on April 19, 2017,
 17 and May 3, 2017, respectively, Defendant had knowledge of the '231 Patent, and
 18 that its actions resulted in a direct infringement of the '231 Patent. Defendant also
 19 knew or was willfully blind that its actions would induce direct infringement by
 20 others and intended that its actions would induce direct infringement by others.

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

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

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

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

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

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

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VII. WILLFUL INFRINGEMENT

63. Defendant has knowledge of the patents-in-suit by at least the citation of the application that led to Vivato's '231 Patent during the prosecution of Defendant's U.S. Patent No. 7,877,113, "Transmission parameter control for an antenna apparatus with selectable elements." On October 17, 2008, Defendant cited to the U.S. Patent and Trademark Office, U.S. Application Publication No. 2002/0158801A1 to Crilly, which is the application that led to Vivato's '231 Patent. Vivato's '231 Patent, however, had already issued on August 26, 2003. Accordingly, a reasonable inference is that Defendant had knowledge of the '231 Patent, and its issued claims, by at least as early as October 17, 2008. Defendant also had knowledge of the '296 Patent because that patent was issued on June 13, 2006, before Defendant's citation of the '231 Patent, and was assigned to the same assignee (Vivato, Inc.) as the '231 Patent and covered the same beamforming and MU-MIMO technologies as the '231 Patent. Defendant also had knowledge of the '728 Patent because its patent application was published on October 26, 2006, before Defendant's citation of the '231 Patent, and was assigned to Vivato, Inc., and covered the same beamforming and MU-MIMO technologies as the '231 Patent. Because of this commonality between the '231 Patent and the '296 and '728 Patents, Defendants knew, or should have known, about Plaintiff's '296 and '728 Patents. Further, by at least the filing and service of the original Complaint on April 19, 2017, and May 3, 2017, respectively, Defendant had knowledge of the patents-in-suit.

64. Despite such knowledge, Defendant infringed and continues to infringe the patents-in-suit with full and complete knowledge of their applicability to Defendant's MU-MIMO products without taking a license and without a good faith belief that the patents-in-suit are invalid and not infringed. Defendant's infringement of the patents-in-suit occurred, and continues to occur, with knowledge of infringement and/or objective recklessness. Defendant's infringement was, and continues to be, willful and deliberate. For example, Defendant sold, and continues

1 to sell its Accused Products (e.g., its ZoneFlex R710 on Amazon.com, attached
2 hereto as Exhibit M) to customers despite Defendant's knowledge of the patents-in-
3 suit. Defendant also manufactured and imported into the United States, and
4 continues to do so, the Accused Products for sale and distribution to its customers,
5 despite its knowledge of the patents-in-suit.

6 65. Defendant also actively induced, and continues to induce, its customers
7 to infringe the patents-in-suit by, among other things, providing user manuals and
8 other instruction material for its Accused Products that induce its customers to use
9 the Accused Products in their normal and customary way to infringe the patents-in-
10 suit. For example, Defendant's website provided, and continues to provide,
11 instructions for using the Accused Products on wireless communication systems, and
12 to utilize their beamforming and MU-MIMO functionalities. Through its continued
13 manufacture, importation, and sales of its Accused Products, Defendant specifically
14 intended, and continues to intend, for its customers to infringe claims of the patents-
15 in-suit, despite Defendant's knowledge of the patents-in-suit.

16 66. Defendant's infringement of the patents-in-suit is egregious because
17 despite its knowledge of the '231 Patent, Defendant deliberately copied the
18 innovation claimed in the '231 Patent and implemented that patented innovation in
19 its Accused Products. Further, despite Defendant's knowledge of the patents-in-suit,
20 Defendant sold, offered for sale, manufactured, and imported, the Accused
21 Products—and continues to do so—without investigating the scope of the '231
22 Patent (or the other patents-in-suit) and without forming a good-faith belief that its
23 Accused Products do not infringe or that the patents-in-suit are invalid. Defendant
24 has not taken any steps to remedy its infringement of the patents-in-suit (e.g., by
25 removing the Accused Products from its sales channels); but instead, continues to
26 sell its Accused Products to customers, such as its continued sale of its ZoneFlex
27 R710 on Amazon.com. Defendant's behavior is egregious because it engaged in
28 misconduct beyond that of typical infringement. For example, in a typical

1 infringement, an infringer would investigate the scope of the asserted patents and
2 develop a good-faith belief that it does not infringe the asserted patents or that the
3 asserted patents are invalid before selling (or continuing to sell) its accused products.
4 An infringer would also remove its accused products from its sales channels and
5 discontinue further sales.

6 67. Thus, Defendant's infringement of the patents-in-suit is willful and
7 deliberate, entitling Vivato to increased damages under 35 U.S.C. § 284 and to
8 attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

9 **PRAYER FOR RELIEF**

10 WHEREFORE, Vivato prays for the following relief:

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

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

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

19 (d) Declaring that Defendant's infringement is willful and that this is an
20 exceptional case under 35 U.S.C. § 285 and awarding attorneys' fees and costs in
21 this action.

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

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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.

Respectfully submitted,

Dated: January 29, 2018

RUSS AUGUST & KABAT

By: /s/ Reza Mirzaie

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RUSS, AUGUST & KABAT

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CERTIFICATE OF SERVICE

I certify that I caused the foregoing document to be electronically filed with the Clerk of the Court for the United States District Court for the Central District of California using the CM/ECF System on February 6, 2018

I certify that all participants in the case are registered CM/ECF users and that service will be accomplished by the court's CM/ECF system.

/s/ Reza Mirzaie

Reza Mirzaie

RUSS AUGUST & KABAT