UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

XR COMMUNICATIONS, LLC, dba VIVATO TECHNOLOGIES, Plaintiff, v. MICROSOFT CORPORATION, Defendant.	Case No. 6:23-cv-00124 **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT AGAINST
MICROSOFT CORPORATION

This is an action for patent infringement arising under the Patent Laws of the United States of America, 35 U.S.C. § 1 *et seq.*, in which Plaintiff XR Communications LLC d/b/a Vivato Technologies ("Plaintiff" or "Vivato") makes the following allegations against Defendant Microsoft Corporation ("Defendant"):

INTRODUCTION

1. This complaint arises from Defendant's unlawful infringement of the following United States patent owned by Vivato, which generally relates to wireless communications technology: United States Patent No. 10,715,235 (the "'235 Patent") (the "Asserted Patent").

2. Countless electronic devices today connect to the Internet wirelessly. Beyond just connecting our devices together, wireless networks have become an inseparable part of our lives in our homes, our offices, and our neighborhood coffee shops. In even our most crowded spaces, today's wireless technology allows all of us to communicate with each other, on our own devices, at virtually the same time. Our connected world would be unrecognizable without the ubiquity of

sophisticated wireless networking technology.

3. Just a few decades ago, wireless technology of this kind could only be found in science fiction. The underlying science behind wireless communications can be traced back to the development of "wireless telegraphy" in the nineteenth century. Guglielmo Marconi is credited with developing the first practical radio, and in 1896, Guglielmo Marconi was awarded British patent 12039, *Improvements in transmitting electrical impulses and signals and in apparatus there-for*, the first patent to issue for a Herzian wave-based wireless telegraphic system. Marconi would go on to win the Nobel Prize in Physics in 1909 for his contributions to the field.

4. One of Marconi's preeminent contemporaries was Dr. Karl Ferdinand Braun, who shared the 1909 Nobel Prize in Physics with Marconi. In his Nobel lecture dated December 11, 1909, Braun explained that he was inspired to work on wireless technology by Marconi's own experiments. Braun had observed that the signal strength in Marconi's radio was limited beyond a certain distance, and wondered why increasing the voltage on Marconi's radio did not result in a stronger transmission at greater distances. Braun thus dedicated himself to developing wireless devices with a stronger, more effective transmission capability.

5. In 1905, Braun invented the first phased array antenna. This phased array antenna featured three antennas carefully positioned relative to one another with a specific phase relationship so that the radio waves output from each antenna could add together to increase radiation in a desired direction. This design allowed Braun's phased array antenna to transmit a directed signal.

6. Building on the fundamental breakthrough that radio transmissions can be *directed* according to a specific radiation pattern through the use of a phased array antenna, directed wireless communication technology has developed many applications over the years. Braun's

invention of the phased array antenna led to the development of radar, smart antennas, and, eventually, to a technology known as "MIMO," or "multiple-input, multiple-output," which would ultimately allow a single radio channel to receive and transmit multiple data signals simultaneously. Along the way, engineers have worked tirelessly to overcome limitations and roadblocks directed wireless communication technology.

7. At the beginning of the twenty-first century, the vast majority of wireless networks still did not yet take advantage of directed wireless communications. Instead, "omnidirectional" access points were ubiquitous. Omnidirectional access points transmit radio waves uniformly around the access point in every direction and do not steer the signal in particular directions. Omnidirectional antennas access points do typically achieve 360 degrees of coverage around the access point, but with a reduced coverage distance. Omnidirectional access points also lack sophisticated approaches to overcome certain types of interference in the environment. As only one example, the presence of solid obstructions, such as a concrete wall, ceiling, or pillar, can limit signal penetration. As another example, interference arises when radio waves are reflected, refracted, or diffracted based on obstacles present between the transmitter and receiver. The multiple paths that radio waves can travel between the transmitter and receiver often result in signal interference that decreases performance, and omnidirectional access points lack advanced solutions to overcome these "multipath" effects.

8. Moving from omnidirectional networks to modern networks has required an additional series of advancements that harness the capabilities of directed wireless technology. These advancements range from conceiving various ways to steer and modify radiation patterns, to enhancing the transmission signal power in a desired direction, to suppressing radiation in undesired directions, to minimizing signal "noise," and then applying these new approaches into

communications networks with multiple, heterogenous transmitters and receivers.

9. Harnessing the capabilities of directed wireless technology resulted in a significant leap forward in the signal strength, reliability, concurrent users, and/or data transmission capability of a wireless network. One of the fundamental building blocks of this latest transition was the development of improvements to MIMO and "beamforming," which are the subject matter of patents in this infringement action. The patents in this action resulted from the investment of tens of millions of dollars and years of tireless effort by a group of engineers who built a technology company slightly ahead of its time. Their patented innovations laid the groundwork for today's networks, and are infringed by Defendant's accused products.

PARTIES

10. Plaintiff XR Communications, LLC, d/b/a Vivato Technologies ("Vivato" or "Plaintiff") is a limited liability company organized and existing under the laws of the State of Delaware with its principal place of business at 2809 Ocean Front Walk, Venice, California 90291. Vivato is the sole owner by assignment of all right, title, and interest in each Asserted Patent.

11. Vivato was founded in 2000 as a $80+ million venture-backed company with several key innovators in the wireless communication field including Siavash Alamouti, Ken Biba, William Crilly, James Brennan, Edward Casas, and Vahid Tarokh, among many others. At that time, and as remains the case today, "Wi-Fi" or "802.11" had become the ubiquitous means of wireless connection to the Internet, integrated into hundreds of millions of mobile devices globally. Vivato was founded to leverage its talent to generate intellectual property and deliver Wi-Fi/802.11 wireless connectivity solutions to service the growing demand for bandwidth.

12. Vivato has accomplished significant innovations in the field of wireless communications technology. One area of focus at Vivato was the development of advanced wireless systems with sophisticated antenna designs to improve wireless speed, coverage, and reliability. Vivato also focused on designing wireless systems that maximize the efficient use of spectrum and wireless resources for large numbers of connected mobile devices.

13. Among many fundamental breakthroughs achieved by Vivato are inventions that allow for intelligent and adaptive beamforming based on up-to-date information about the wireless medium. Through these and many other inventions, Vivato's engineers pioneered a wireless technology that provides for simultaneous transmission and reception, a significant leap forward over conventional wireless technology.

14. Over the years, Vivato has developed proven technology, with over 400

deployments globally, including private, public and government, and it has become a recognized provider of extended range Wi-Fi network infrastructure solutions. Vivato's wireless base stations integrate beamforming phased array antenna design with packet steering technology to deliver high-bandwidth extended range connections to serve multiple users and multiple devices.

15. Vivato's patent portfolio includes over 17 issued patents and pending patent applications. The patents at issue in this case are directed to specific aspects of wireless communication, including adaptively steered antenna technology and beam switching technology.

16. Defendant Microsoft Corporation is a Washington corporation with a principal place of business located at 1 Microsoft Way, Redmond, Washington 98052-8300.

17. Microsoft is registered to do business in Texas and can be served via its registered agent, Corporation Service Company dba CSC – Lawyers Incorporating Service Company at 211 East 7th Street, Suite 620, Austin, Texas 78701-3218.

18. Microsoft maintains a permanent physical presence within the Western District of Texas, conducting business from at least its locations at: 10900 Stonelake Boulevard, Suite 225, Austin, Texas 78759; Concord Park II 401 East Sonterra Boulevard, Suite 300, San Antonio, Texas 78258; as well as other locations in and around the Austin and San Antonio areas.

19. Defendant offers for sale, sells, designs and manufactures and/or has manufactured on their behalf abroad certain Accused Products that are then sold for importation into the United States, imported into the United States, and/or sold, offered for sale, and/or used within the United States after importation. By registering to conduct business in Texas and by having facilities where it regularly conducts business in this District, Defendant has a permanent and continuous presence in Texas and a regular and established place of business in the Western District of Texas.

JURISDICTION AND VENUE

20. This action arises under the patent laws of the United States, Title 35 of the United States Code § 1, *et seq*, including 35 U.S.C. §§ 271, 281, 283, 284, and 285. This Court has original subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

21. This Court has personal jurisdiction over Defendant in this action because Defendant has committed acts within this District giving rise to this action, and has established minimum contacts with this forum such that the exercise of jurisdiction over Defendant would not offend traditional notions of fair play and substantial justice. Defendant, directly and/or through subsidiaries or intermediaries, have committed and continue to commit acts of infringement in this District by, among other things, importing, offering to sell, and selling products that infringe the asserted patents, and inducing others to infringe the asserted patents in this District. Defendant is directly and through intermediaries making, using, selling, offering for sale, distributing, advertising, promoting, and otherwise commercializing their infringing products in this District. Defendant regularly conducts and solicits business in, engage in other persistent courses of conduct in, and/or derive substantial revenue from goods and services provided to the residents of this District and the State of Texas. Defendant is subject to jurisdiction pursuant to due process and/or the Texas Long Arm Statute due to its substantial business in this State and District including at least its infringing activities, regularly doing or soliciting business at its Austin facilities, and engaging in persistent conduct and deriving substantial revenues from goods and services provided to residents in the State of Texas including the Western District of Texas.

22. Venue is proper in this District pursuant to 28 U.S.C. § 1391(b), (c), (d), and 1400(b) because Defendant has a permanent and continuous presence in, have committed acts of infringement in, and maintain regular and established places of business in this district. Defendant has committed acts of direct and indirect infringement in this judicial district including using and

purposefully transacting business involving the Accused Products in this judicial district such as by sales to one or more customers in the State of Texas including in the Western District of Texas, and maintaining regular and established places of business in this district. For example, Defendant maintain regular and established places of business at 10900 Stonelake Boulevard, Suite 225, Austin, Texas 78759; Concord Park II 401 East Sonterra Boulevard, Suite 300, San Antonio, Texas 78258; as well as other locations in and around the Austin and San Antonio areas.

COUNT I

INFRINGEMENT OF U.S. PATENT NO. 10,715,235

23. Vivato realleges and incorporates by reference the foregoing paragraphs as if fully set forth herein.

24. On July 14, 2020, United States Patent No. 10,715,235 duly and legally issued for inventions entitled “Directed Wireless Communication.” Vivato owns the ’235 Patent and holds the right to sue and recover damages for infringement thereof. A copy of the ’235 Patent is attached hereto as **Exhibit 1**.

25. Defendant has directly infringed and continues to directly infringe numerous claims of the ’235 Patent, including at least claim 1, by manufacturing, using, selling, offering to sell, and/or importing into the United States certain products supporting MIMO and/or MU-MIMO technologies (*e.g.*, Defendant’s Surface Go 3, Surface Pro 8, Surface Pro 9, Surface Laptop SE, Surface Laptop Go 2, Surface Laptop 5, and Surface Laptop Studio) (collectively, the “’235 Accused Products”). Defendant is liable for infringement of the ’235 Patent pursuant to 35 U.S.C. § 271(a).

26. The ’235 Accused Products satisfy all claim limitations of numerous claims of the ’235 Patent, including Claim 1. The following paragraphs compare limitations of Claim 1 to

an exemplary Accused Product, the Microsoft Surface Pro 9. *See*, *e.g.*, Surface Pro 9 Wi-Fi Alliance Certificate (**Exhibit 2**); Surface Pro 9 Full Tech Specs (https://www.microsoft.com/en-us/d/surface-pro-9/93vkd8np4fvk?activetab=pivot:techspecstab).

27. Each Accused Product includes a receiver for use in a wireless communications system, the receiver comprising an antenna, wherein the antenna comprises a first antenna element and a second antenna element; a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and a processor operatively coupled to the transceiver. For example, as with each Accused Product, the Microsoft Surface Pro 9 Ultra sends and receives a signal transmission to and from a remote station, such as a Wi-Fi Access Point, via first and second antenna elements of an antenna by means of one or more transceiver and processor, such as when the Microsoft Surface Pro 9 Ultra receives first and second signals with its first and second antenna elements that contain training fields of a null data packet used for MU-MIMO sounding and channel estimation procedures. Some of these functionalities are embodied in specific Wi-Fi chipsets within the Surface Pro 9 and the other Accused Products. *See*, *e.g.*, Surface Pro 9 Wi-Fi Alliance Certificate (listing "AX211" Wi-Fi chipset corresponding with Intel's Wi-Fi 6E chipset and identifying both UL MU-MIMO and DL MU-MIMO support); Microsoft Surface Pro 9 review: Convertible now with significantly more CPU power, https://www.notebookcheck.net/Microsoft-Surface-Pro-9-review-Convertible-now-with-significantly-more-CPU-power.685190.0.html ("At least the WLAN module has been updated and the modern WiFi 6E standard is now supported thanks to the AX211 module from Intel. We were able to connect to the 6 GHZ network of our Asus reference router without issue, with transfer rates proving to be very high and stable."); Surface Pro 9 Full Tech Specs ("Wi-Fi 6E: 802.11ax compatible"). *See*, *e.g.*, IEEE 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 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."); *See*, *e.g.*, 802.11ac Standard Clause 9.31.5.2 ("A VHT beamformer shall initiate a sounding feedback sequence by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame one STA Info field for each VHT beamformee that is expected to prepare VHT Compressed Beamforming feedback and shall identify the VHT beamformee by including the VHT beamformee's AID in the AID subfield of the STA Info field. The VHT NDP 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 the VHT beamformer."); *id*. Clause 8.5.23.2 (defining format and subfields within the VHT Compressed Beamforming frame); *id*. Clause 8.4.1.48 (including Tables 8-53(d)-(h)) ("Each SNR value per tone in stream i (before being averaged) corresponds to the SNR associated with the column i of the beamforming feedback matrix V determined at the beamformee"); *id*. Clause 8.4.1.49 (including Table 8-53i – MU Exclusive Beamforming Report information); *id*. Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clauses 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a) ("Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1."); *id.* Clause 22.3.10.11.1; IEEE 802.11-2012 Standard Clause 20.3.12.3.6; 802.11ac Standard Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.11.1:

> The DL-MU-MIMO steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \ldots, Q_{k,N_{user}-1}]$ can be determined by the beamformer using the beamforming feedback matrices for subcarrier k from beamformee u, $V_{k,u,}$ and SNR information for subcarrier k from beamformee u, $SNR_{k,u}$, where $u = 0, 1, \ldots, N_{user} - 1$. The steering matrix 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).

; *id.* Clause 22.3.11.2:

> Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in 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 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,\upsilon)$ 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.
>
> The beamformee shall generate the beamforming feedback matrices with the number of rows (Nr) equal to the N_{STS} of the NDP.
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> After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering matrix Q_k. For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \ldots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ $(0 \le u \le N_{user} - 1)$ in order to suppress crosstalk between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k is implementation specific.

28. Each Accused Product includes a processor configured to receive a first signal transmission from a remote station via the first antenna element and a second signal transmission from the remote station via the second antenna element simultaneously, determine first signal information for the first signal transmission, determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information, and determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the

transceiver to construct one or more beam-formed transmission signals. For example, as with each Accused Product, the Microsoft Surface Pro 9 Ultra determines different signal information for the first signal transmission than it does for the second signal transmission, by using the training fields for MU-MIMO sounding and channel estimation to determine, *e.g.*, channel information corresponding to the first spatial stream and the second spatial stream. The Surface Pro 9 determines a set of weighting values based on the first signal information and the second signal information, e.g., through the process for generating an estimate of the channel state, e.g., a transformed estimate of the channel state to be transmitted in a compressed beamforming report, e.g., the parameters in the beamforming feedback matrix. For example, the Surface Pro 9 constructs the beamforming feedback signal using the weighting values. As another example, the Surface Pro 9 uses the derived estimates of the channel state, which includes the set of weighting values, by configuring the set of weighting values to be used by the transceiver to construct one or more beam-formed transmission signals. The transceiver constructs beam-formed transmission signals corresponding to at least the first space-time stream and the second space-time stream. The Microsoft Surface Pro 9 satisfies limitation 1[g] through its support for transmit beamforming with multiple downlink spatial streams (e.g., 2x2 or more streams with DL MU-MIMO transmit beamforming and channel estimation). It would also satisfy 1[g] by supporting multiple uplink spatial streams, including in the context of UL MU-MIMO. *See*, *e.g.*, Surface Pro 9 Wi-Fi Alliance Certificate (listing "AX211" Wi-Fi chipset corresponding with Intel's Wi-Fi 6E chipset and identifying both UL MU-MIMO and DL MU-MIMO support); Surface Pro 9 Full Tech Specs ("Wi-Fi 6E: 802.11ax compatible"). *See*, *e.g.*, IEEE 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 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."); *See*, *e.g.*, 802.11ac Standard Clause 9.31.5.2 ("A VHT beamformer shall initiate a sounding feedback sequence by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame one STA Info field for each VHT beamformee that is expected to prepare VHT Compressed Beamforming feedback and shall identify the VHT beamformee by including the VHT beamformee's AID in the AID subfield of the STA Info field. The VHT NDP 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 the VHT beamformer."); *id*. Clause 8.5.23.2 (defining format and subfields within the VHT Compressed Beamforming frame); *id*. Clause 8.4.1.48 (including Tables 8-53(d)-(h)) ("Each SNR value per tone in stream i (before being averaged) corresponds to the SNR associated with the column i of the beamforming feedback matrix V determined at the beamformee"); *id*. Clause 8.4.1.49 (including Table 8-53i – MU Exclusive Beamforming Report information); *id*. Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clauses 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a) ("Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1."); *id.* Clause 22.3.10.11.1; IEEE 802.11-2012 Standard Clause

20.3.12.3.6; 802.11ac Standard Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.11.1:

> The DL-MU-MIMO steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \ldots, Q_{k,N_{user}-1}]$ can be determined by the beamformer using the beamforming feedback matrices for subcarrier k from beamformee u, $V_{k,u,}$ and SNR information for subcarrier k from beamformee u, $SNR_{k,u}$, where $u = 0, 1, \ldots, N_{user} - 1$. The steering matrix 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).

; *id.* Clause 22.3.11.2:

> Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in 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 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,\upsilon)$ 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.
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> The beamformee shall generate the beamforming feedback matrices with the number of rows (Nr) equal to the N_{STS} of the NDP.
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> After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering matrix Q_k. For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \ldots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ $(0 \le u \le N_{user} - 1)$ in order to suppress crosstalk between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k is implementation specific.

29. Each Accused Product further includes a processor configured to cause the transceiver to transmit a third signal to the remote station via the antenna, the third signal comprising content based on the set of weighting values. For example, as with each Accused Product, the Surface Pro 9 determines an estimate of the channel state (e.g., by measuring the channel using a training signal) that includes a set of weighting values based on the first signal information and the second signal information. A transformed estimate of the channel state will ultimately be sent in a compressed beamforming report, e.g., the parameters of the beamforming feedback matrix. *See*, *e.g.*, *See*, *e.g.*, Surface Pro 9 Wi-Fi Alliance Certificate (listing "AX211" Wi-Fi chipset corresponding with Intel's Wi-Fi 6E chipset and indicating both UL MU-MIMO

and DL MU-MIMO support); Surface Pro 9 Full Tech Specs ("Wi-Fi 6E: 802.11ax compatible"). *See*, *e.g.*, IEEE 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 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."); *See*, *e.g.*, 802.11ac Standard Clause 9.31.5.2 ("A VHT beamformer shall initiate a sounding feedback sequence by transmitting a VHT NDP Announcement frame followed by a VHT NDP after a SIFS. The VHT beamformer shall include in the VHT NDP Announcement frame one STA Info field for each VHT beamformee that is expected to prepare VHT Compressed Beamforming feedback and shall identify the VHT beamformee by including the VHT beamformee's AID in the AID subfield of the STA Info field. The VHT NDP 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 the VHT beamformer."); *id*. Clause 8.5.23.2 (defining format and subfields within the VHT Compressed Beamforming frame); *id*. Clause 8.4.1.48 (including Tables 8-53(d)-(h)) ("Each SNR value per tone in stream i (before being averaged) corresponds to the SNR associated with the column i of the beamforming feedback matrix V determined at the beamformee"); *id*. Clause 8.4.1.49

(including Table 8-53i – MU Exclusive Beamforming Report information); *id*. Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clauses 22.3.4.6(d), 22.3.4.7(e), 22.3.4.8(l), 22.3.4.9.1(m), 22.3.4.9.2(m), 22.3.4.10.4(a) ("Spatial mapping: Apply the Q matrix as described in 22.3.10.11.1."); *id.* Clause 22.3.10.11.1; IEEE 802.11-2012 Standard Clause 20.3.12.3.6; 802.11ac Standard Clauses 8.4.1.24, 9.31.5.1, 9.31.5.2; *id.* Clause 22.3.11.1:

> The DL-MU-MIMO steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \ldots, Q_{k,N_{user}-1}]$ can be determined by the beamformer using the beamforming feedback matrices for subcarrier k from beamformee u, $V_{k,u,}$ and SNR information for subcarrier k from beamformee u, $SNR_{k,u}$, where $u = 0, 1, \ldots, N_{user} - 1$. The steering matrix 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).

; *id.* Clause 22.3.11.2:

> Upon receipt of a VHT NDP sounding PPDU, the beamformee shall remove the space-time stream CSD in 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 the form of angles using the method described in 20.3.12.3.6. The angles, $\phi(k,\upsilon)$ 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.
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> The beamformee shall generate the beamforming feedback matrices with the number of rows (Nr) equal to the N_{STS} of the NDP.
>
> After receiving the angle information, $\phi(k,u)$ and $\psi(k,u)$, the beamformer reconstructs $V_{k,u}$ using Equation (20-79). For SU-MIMO beamforming, the beamformer can use this $V_{k,0}$ matrix to determine the steering matrix Q_k. For DL-MU-MIMO beamforming, the beamformer may calculate a steering matrix $Q_k = [Q_{k,0}, Q_{k,1}, \ldots, Q_{k,N_{user}-1}]$ using $V_{k,u}$ and $SNR_{k,u}$ $(0 \le u \le N_{user} - 1)$ in order to suppress crosstalk between participating beamformees. The method used by the beamformer to calculate the steering matrix Q_k is implementation specific.

30. Defendant also has been and are now knowingly and intentionally inducing infringement of at least claim 8 of the '235 Patent in violation of 35 U.S.C. § 271(b). Through at least the filing and service of this Complaint, Defendant has had knowledge of the '235 Patent and the infringing nature of the '235 Accused Products.

31. Despite this knowledge of the '235 Patent, Defendant continues to actively encourage and instruct their customers and end users (for example, through user manuals and

online instruction materials on its website) to use the ’235 Accused Products in ways that directly infringe the ’235 Patent. For example, Defendant’s website provided, and continues to provide, instructions for using the ’235 Accused Products on wireless communications systems, to utilize their 802.11ac and/or 802.11ax beamforming and/or MIMO or MU-MIMO functionalities. Defendant did so knowing and intending that its customers and end users will commit these infringing acts. Defendant also continues to make, use, offer for sale, sell, and/or import the ’235 Accused Products, despite its knowledge of the ’235 Patent, thereby specifically intending for and inducing their customers to infringe the ’235 Patent through the customers’ normal and customary use of the ’235 Accused Products. Defendant also knew or was willfully blind that their actions would induce direct infringement by others and intended that its actions would induce direct infringement by others. Accordingly, a reasonable inference is that Defendant specifically intended for others, such as its customers, to directly infringe one or more claims of Vivato’s ’235 Patent in the United States because Defendant had knowledge of the ’235 Patent and actively induced others (*e.g.*, its customers) to directly infringe the ’235 Patent.

32. Defendant also contributorily infringes under 35 U.S.C. § 271(c) by making, using, selling, offering to sell, and/or importing the ’235 Accused Products, knowing they constitute a material part of the invention, are especially made or adapted for use in infringing, and that they are not staple articles of commerce capable of substantial non-infringing use.

33. By making, using, offering for sale, selling and/or importing into the United States the ’235 Accused Products, Defendant has injured Vivato and is liable for infringement of the ’235 Patent pursuant to 35 U.S.C. § 271.

34. Defendant also infringes numerous additional claims of the ’235 Patent, including Claim 12, for example, directly and through inducing infringement, for similar reasons as

explained above with respect to Claim 8.

35. Vivato's '235 Patent is valid and enforceable.

36. Vivato has complied with 35 U.S.C. § 287 where applicable (*i.e.,* as to non-method claims) because there are no unmarked patented articles subject to a duty to mark.

37. As a result of Defendant's infringement of the '235 Patent, Defendant has damaged Vivato, and Vivato is entitled to monetary damages in an amount to be determined at trial that is adequate to compensate for Defendant's infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendant, together with interest and costs as fixed by the Court.

38. Defendant's infringing activities have injured and will continue to injure Vivato, unless and until this Court enters an injunction prohibiting further infringement of the '235 Patent, and, specifically, enjoining further manufacture, use, sale, importation, and/or offers for sale that come within the scope of the patent claims.

PRAYER FOR RELIEF

WHEREFORE, Vivato respectfully requests that this Court enter:

a. A judgment in favor of Vivato that Defendant has infringed, either literally and/or under the doctrine of equivalents the '235 patent;

b. A permanent injunction prohibiting Defendant from further acts of infringement of the '235 patent;

c. A judgment and order requiring Defendant to pay Vivato its damages, costs, expenses, and pre-judgment and post-judgment interest for Defendant's infringement of the '235 patent;

d. A judgment and order requiring Defendant to provide an accounting and to pay supplemental damages to Vivato, including without limitation, pre-judgment and post-judgment interest and an award of an ongoing royalty for Defendant's post-judgment infringement in an amount according to proof;

e. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to Vivato its reasonable attorneys' fees and costs against Defendant, and enhanced damages pursuant to 35 U.S.C. § 284; and

f. Any and all other relief as the Court may deem appropriate and just under the circumstances.

DEMAND FOR JURY TRIAL

Vivato, under Rule 38 of the Federal Rules of Civil Procedure, requests a trial by jury of any issues so triable by right.

Dated: February 15, 2023

Respectfully submitted,

/s/ Reza Mirzaie

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