

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

REDWOOD TECHNOLOGIES, LLC,

Plaintiff,

v.

QUALCOMM INCORPORATED AND
QUALCOMM TECHNOLOGIES, INC.,

Defendants.

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JURY TRIAL DEMANDED

C.A. NO. 6:23-cv-696

PLAINTIFF’S COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Redwood Technologies, LLC (“Redwood”) files this Complaint against Defendants Qualcomm Incorporated and Qualcomm Technologies, Inc. (“Qualcomm” or “Defendants”) for infringement of U.S. Patent No. 7,664,130 (the “’130 patent”), U.S. Patent No. 7,917,102 (the “’102 patent”), U.S. Patent No. 7,688,901 (the “’901 patent”), U.S. Patent No. 7,974,371 (the “’371 patent”), U.S. Patent No. 8,155,224 (the “’224 patent”), U.S. Patent No. 8,744,005 (the “’005 patent”), U.S. Patent No. 8,873,517 (the “’517 patent”), and U.S. Patent No. 9,628,300 (the “’300 patent”), collectively, the “Asserted Patents.”

THE PARTIES

1. Redwood Technologies, LLC is a Texas limited liability company, with a principal place of business at 812 West McDermott Dr. #1038, Allen, TX 75013.

2. On information and belief, Qualcomm Incorporated is a corporation organized and existing under the laws of Delaware, having places of business at 9600 N. MoPac, Suite 900, Stonebridge Plaza II, Austin, Texas 78759 and 13929 Center Lake Drive, Parmer Building 1, Austin, Texas 78753.

3. On information and belief, Qualcomm Technologies, Inc. (“QTI”) is a corporation organized and existing under the laws of Delaware, having places of business at 9600 N. MoPac, Suite 900, Stonebridge Plaza II, Austin, Texas 78759 and 13929 Center Lake Drive, Parmer Building 1, Austin, Texas 78753.

4. QTI is a wholly-owned subsidiary of Qualcomm Incorporated and operates, along with its other subsidiaries, substantially all of Qualcomm’s engineering, research and development functions, and substantially all of its products and services businesses. *See* <https://www.qualcomm.com/company>.

5. QTI includes its other subsidiaries, including at least Qualcomm CDMA Technologies and Qualcomm CDMA Technologies Asia Pacific Pte. Ltd.

6. Qualcomm Incorporated and QTI together comprise one of the world’s largest manufacturers of integrated circuits for the wireless industry. Qualcomm Inc. and QTI are part of the same corporate structure. Qualcomm’s website states that “[r]eferences to ‘Qualcomm’ may mean Qualcomm Incorporated, or subsidiaries or business units within the Qualcomm corporate structure, as applicable.” *Id.* Qualcomm’s website further states that “Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of our engineering, research and development functions, and substantially all of our products and services businesses, including our QCT semiconductor business.” *Id.*

7. Qualcomm Incorporated, QTI, and their subsidiaries and related companies share the same management, common ownership, advertising platforms, facilities, distribution and sales channels, and accused product lines and products. Qualcomm Incorporated, QTI, and their subsidiaries and related companies operate as a unitary business venture and are jointly and severally liable for the acts of patent infringement alleged herein.

8. Qualcomm Incorporated, QTI, and their subsidiaries and related companies together are doing business, either directly or through their agents, on an ongoing basis in this district and elsewhere in the United States and have a regular and established place of business in this district.

9. Prior to the filing of the Complaint, Redwood sent a letter received by Qualcomm on November 5, 2021, where Redwood attempted to engage Qualcomm in licensing discussions related to the Asserted Patents for reasonable and non-discriminatory terms for a license to be taken in the absence of litigation. Indeed, Qualcomm has known about each of the Asserted Patents since at least November 5, 2021, when Qualcomm received notice of its infringement of the Asserted Patents via the letter sent by Redwood.

10. Prior to the filing of the Complaint, Redwood sent several emails to Qualcomm, including an email received by Qualcomm on May 12, 2022, where Redwood again attempted to engage Qualcomm in licensing discussions related to the Asserted Patents for reasonable and non-discriminatory terms for a license to be taken in the absence of litigation. Indeed, Qualcomm has known about each of the Asserted Patents since at least May 12, 2022, when Qualcomm received the second notice of its infringement of the Asserted Patents via the email sent by Redwood.

11. To date, Qualcomm has not agreed to license the Asserted Patents for reasonable and non-discriminatory terms. Redwood and Qualcomm conducted five calls between December 15, 2021 and April 12, 2023, during which technical and non-technical discussions took place. Redwood and Qualcomm conducted a sixth call on June 9, 2023, where Redwood provided Qualcomm with a lump sum offer pursuant to reasonable and non-discriminatory terms for a license to Redwood's patent portfolio. Qualcomm abruptly and unilaterally made the decision to end the call despite Redwood's readiness to continue with negotiations. On that same day,

Redwood emailed Qualcomm advising them that Redwood's offer would be valid for 60 days and notifying Qualcomm that Redwood considered any RAND obligations to the IEEE fulfilled because of Qualcomm's apparent termination of the negotiations. Subsequently, Qualcomm failed to provide any response to Redwood during this 60 day time period. Redwood sent an email on August 8, 2023 notifying Qualcomm that no communications had been received and that Redwood must interpret Qualcomm's silence as a disinterest in pursuing further discussions.

12. Furthermore, as a member of the relevant standards-setting bodies, on information and belief, Qualcomm is on notice of standard essential patents issued to other members of the standards bodies.

13. Qualcomm's past and continuing making, using, selling, offering for sale, and/or importing, and/or inducing subsidiaries, affiliates, retail partners, distributors, manufacturers of end user devices, customers, and other third parties in the making, using, selling, offering for sale, and/or importing the accused Wi-Fi compliant devices throughout the United States i) willfully infringe each of the Asserted Patents and ii) impermissibly take the significant benefits of Redwood's patented technologies without fair compensation to Redwood.

14. Qualcomm is engaged in making, using, selling, offering for sale, and/or importing, and/or induces subsidiaries, affiliates, retail partners, distributors, manufacturers of end user devices, customers, and other third parties in the making, using, selling, offering for sale, and/or importing throughout the United States, including within this District, Wi-Fi products, such as Wi-Fi components as well as access points and mobile devices that include Qualcomm's Wi-Fi components, accused of infringement.

JURISDICTION AND VENUE

15. This action arises under the patent laws of the United States, namely 35 U.S.C. §§ 271, 281, and 284-285, among others.

16. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

17. This Court has personal jurisdiction over Qualcomm in accordance with due process and/or the Texas Long Arm Statute because, among other things, Qualcomm does business in this State by, among other things, maintaining offices in this District, including maintaining its offices located at 9600 N. MoPac, Suite 900, Stonebridge Plaza II, Austin, Texas 78759 and 13929 Center Lake Drive, Parmer Building 1, Austin, Texas 78753.

18. Further, this Court has personal jurisdiction over Qualcomm because it has engaged, and continues to engage, in continuous, systematic, and substantial activities within this State, including the substantial marketing, making, using, and sale of products and services within this State and this District. Indeed, this Court has personal jurisdiction over Qualcomm because it has committed acts giving rise to Redwood's claims for patent infringement within and directed to this District, has derived substantial revenue from its goods and services provided to individuals in this State and this District, and maintains regular and established places of business in this District, including its places of business at 9600 N. MoPac, Suite 900, Stonebridge Plaza II, Austin, Texas 78759 and 13929 Center Lake Drive, Parmer Building 1, Austin, Texas 78753.

19. Relative to patent infringement, Qualcomm has committed and continues to commit acts in violation of 35 U.S.C. § 271, and has made, used, marketed, distributed, offered for sale, imported, and/or sold infringing products in this State, including in this District, and otherwise engaged in infringing conduct within and directed at, or from, this District. Such

products have been and continue to be offered for sale, distributed to, sold, and used in this District, and the infringing conduct has caused, and continues to cause, injury to Redwood, including injury suffered within this District. These are purposeful acts and transactions in this State and this District such that Qualcomm reasonably should know and expect that it could be haled into this Court because of such activities.

20. In addition, Qualcomm has knowingly induced and continues to knowingly induce infringement within this District by advertising, marketing, offering for sale, and/or selling infringing devices within this District, to consumers, customers, manufacturers, distributors, resellers, partners, and/or end users, and providing instructions, user manuals, advertising, marketing materials, hardware, software, and/or firmware which facilitate, direct or encourage the use of infringing functionality with knowledge thereof.

21. Venue is proper in this District under 28 U.S.C. §§ 1391 and 1400(b) because Qualcomm has regular and established places of business in this District and has committed acts of infringement in this District. Qualcomm's regular and established places of business in this District include, at least, its facilities at 9600 N. MoPac, Suite 900, Stonebridge Plaza II, Austin, Texas 78759 and 13929 Center Lake Drive, Parmer Building 1, Austin, Texas 78753.

22. With respect to the '130 patent and the '517 patent, the Accused Products are mesh devices that include, but are not limited to, Qualcomm's mesh devices and third party mesh devices that include one or more of Qualcomm's devices that are compliant with IEEE 802.11 (*e.g.*, Immersive Home 214 Platform, Immersive Home 216 Platform, Immersive Home 316 Platform, Immersive Home 318 Platform, Immersive Home 3210 Platform, Immersive Home 326 Platform, IPQ4018 SoC, IPQ4019 SoC, IPQ4028 SoC, IPQ4029 SoC, IPQ8064 SoC, IPQ8065 SoC, IPQ8066 SoC, IPQ8068 SoC, IPQ8069 SoC, IPQ8074, Mesh Networking Dev Kit for Amazon

AVS, Networking Pro 1200 Platform, Networking Pro 1210 Platform, Networking Pro 1220 Platform, Networking Pro 1610 Platform, Networking Pro 1620 Platform, Networking Pro 400 Platform, Networking Pro 600 Platform, Networking Pro 610 Platform, Networking Pro 620 Platform, Networking Pro 800 Platform, Networking Pro 810 Platform, Networking Pro 820 Platform, QCA9980, QCA9982 SoC, QCA9984 SoC, QCA9990 SoC, QCA9992 SoC, QCA9994 SoC), as well as, their components (*e.g.*, hardware, software, and/or firmware), and processes related to the same. With respect to the '102 patent, the Accused Products are devices that include, but are not limited to, Qualcomm's devices and third party devices that include one or more of Qualcomm's devices that are compliant with IEEE 802.11n and/or IEEE 802.11ac and/or IEEE 802.11ax and/or 802.11be (*e.g.*, 9207 LTE Modem, APQ8009, APQ8016E, APQ8053Pro, APQ8053Lite, APQ8074, APQ8094, APQ8096SG, AR6004 Chipset, CSR6030, CSRS3703, CSRS3713, CSRS3718, DragonBoard 410c, Dragonboard 845c, FastConnect 6100 Mobile Connectivity System, FastConnect 6200, FastConnect 6700, FastConnect 6800, FastConnect 6900, FastConnect 7800, Flight RB5 5G Platform, Home Hub 100 Dev Kit for Amazon AVS, Home Hub 100 Platform, Immersive Home 214 Platform, Immersive Home 216 Platform, Immersive Home 316 Platform, Immersive Home 318 Platform, Immersive Home 3210 Platform, Immersive Home 326 Platform, IPQ4018 SoC, IPQ4019 SoC, IPQ4028 SoC, IPQ4029 SoC, IPQ8064 SoC, IPQ8065 SoC, IPQ8066 SoC, IPQ8068 SoC, IPQ8069 SoC, IPQ8074, Mesh Networking Dev Kit for Amazon AVS, Networking Pro 1200 Platform, Networking Pro 1210 Platform, Networking Pro 1220 Platform, Networking Pro 1610 Platform, Networking Pro 1620 Platform, Networking Pro 400 Platform, Networking Pro 600 Platform, Networking Pro 610 Platform, Networking Pro 620 Platform, Networking Pro 800 Platform, Networking Pro 810 Platform, Networking Pro 820 Platform, QCA1062, QCA1064, QCA206x, QCA4002, QCA4004,

QCA4010, QCA4012, QCA4020, QCA4020 Product Development Kit, QCA4531, QCA6174A, QCA6175A, QCA6335, QCA6436, QCA6564AU, QCA6574AU, QCA6595AU, QCA6678AQ, QCA6696, QCA6698AQ, QCA9377, QCA9379, QCA9500, QCA9531, QCA9565, QCA9880, QCA9886 SoC, QCA9887 SoC, QCA9888 SoC, QCA9889 SoC, QCA9980, QCA9982 SoC, QCA9984 SoC, QCA9990 SoC, QCA9992 SoC, QCA9994 SoC, QCM2150, QCM2290, QCM4290, QCM4490, QCM5430, QCM6125, QCM6490, QCM8550, QCS2290, QCS403, QCS404, QCS405, QCS407, QCS410, QCS4290, QCS4490, QCS5430, QCS603, QCS605, QCS610, QCS6125, QCS6490, QCS7230, QCS8250, QCS8550, QRB5165, Qualcomm 205 Mobile Platform, Qualcomm 212 Mobile Platform, Qualcomm 215 Mobile Platform, QXF207x, QXM108x, QXM19xx, QXM80xx, Robotics RB1 Platform, Robotics RB2 Platform, Robotics RB3 Platform, Robotics RB5 Platform, Robotics RB5 Development Kit, Robotics RB6 Platform, SDA660, SDA845, SDM660, SDM845, Smart Audio Platform Development Kit, Smart Audio 200 Platform, Smart Audio 400 Platform, Snapdragon Auto 4G Modem, Smart Display 200 Platform, Snapdragon 1200 Wearable Platform, Snapdragon 200 Processor, Snapdragon 208 Processor, Snapdragon 210 Processor, Snapdragon 205 Mobile Platform, Snapdragon 212 Mobile Platform, Snapdragon 215 Mobile Platform, Snapdragon 4 Gen 1 Mobile Platform, Snapdragon 4 Gen 2 Mobile Platform, Snapdragon 400 Processor, Snapdragon 410 Processor, Snapdragon 412 Processor, Snapdragon 415 Processor, Snapdragon 425 Mobile Platform, Snapdragon 427 Mobile Platform, Snapdragon 429 Mobile Platform, Snapdragon 430 Mobile Platform, Snapdragon 435 Mobile Platform, Snapdragon 439 Mobile Platform, Snapdragon 450 Mobile Platform, Snapdragon 460 Mobile Platform, Snapdragon 480 5G Mobile Platform, Snapdragon 480+ 5G Mobile Platform, Snapdragon 6 Gen 1 Mobile Platform, Snapdragon 600 Processor, Snapdragon 602 Automotive Platform, Snapdragon 610 Processor, Snapdragon 615 Processor, Snapdragon

616 Processor, Snapdragon 617 Processor, Snapdragon 625 Mobile Platform, Snapdragon 626 Mobile Platform, Snapdragon 630 Mobile Platform, Snapdragon 632 Mobile Platform, Snapdragon 636 Mobile Platform, Snapdragon 650 Mobile Platform, Snapdragon 652 Mobile Platform, Snapdragon 653 Mobile Platform, Snapdragon 660 Mobile Platform, Snapdragon 662 Mobile Platform, Snapdragon 665 Mobile Platform, Snapdragon 670 Mobile Platform, Snapdragon 675 Mobile Platform, Snapdragon 678 Mobile Platform, Snapdragon 680 4G Mobile Platform, Snapdragon 685 4G Mobile Platform, Snapdragon 690 5G Mobile Platform, Snapdragon 695 5G Mobile Platform, Snapdragon 7 Gen 1 Mobile Platform, Snapdragon 7+ Gen 2 Mobile Platform, Snapdragon 710 Mobile Platform, Snapdragon 712 Mobile Platform, Snapdragon 720G Mobile Platform, Snapdragon 730 Mobile Platform, Snapdragon 730G Mobile Platform, Snapdragon 732G Mobile Platform, Snapdragon 750G 5G Mobile Platform, Snapdragon 765 5G Mobile Platform, Snapdragon 765G 5G Mobile Platform, Snapdragon 768G 5G Mobile Platform, Snapdragon 778G 5G Mobile Platform, Snapdragon 778G+ 5G Mobile Platform, Snapdragon 780G 5G Mobile Platform, Snapdragon 782G Mobile Platform, Snapdragon 7c Compute Platform, Snapdragon 7c Gen 2 Compute Platform, Snapdragon 7c+ Gen 3 Compute Platform, Snapdragon 8 Gen 1 Mobile Platform, Snapdragon 8 Gen 2 Mobile Platform, Snapdragon 8+ Gen 1 Mobile Platform, Snapdragon 800 Processor, Snapdragon 801 Processor, Snapdragon 805 Processor, Snapdragon 808 Processor, Snapdragon 810 Processor, Snapdragon 820 Mobile Platform, Snapdragon 821 Mobile Platform, Snapdragon 835 Mobile PC Platform, Snapdragon 835 Mobile Platform, Snapdragon 845 Mobile Platform, Snapdragon 850 Mobile Compute Platform, Snapdragon 855 Mobile Platform, Snapdragon 855+/860 Mobile Platform, Snapdragon 865 5G Mobile Platform, Snapdragon 865+ 5G Mobile Platform, Snapdragon 870 5G Mobile Platform, Snapdragon 888 5G Mobile Platform, Snapdragon 888+ 5G Mobile Platform, Snapdragon 8c

Compute Platform, Snapdragon 8cx Compute Platform, Snapdragon 8cx Gen 2 5G Compute Platform, Snapdragon 8cx Gen 3 Compute Platform, Snapdragon AR2 Gen 1 Platform, Snapdragon System-in-Package, Snapdragon W5+ Gen 1 Wearable Platform, Snapdragon Wear 1100 Platform, Snapdragon Wear 2100 Platform, Snapdragon Wear 2500 Platform, Snapdragon Wear 3100 Platform, Snapdragon Wear 4100+ Platform, Snapdragon XR1 Platform, Snapdragon XR2 5G Platform, Snapdragon XR2+ Gen 1 Platform, Video Collaboration VC1 Platform, Video Collaboration VC3 Platform, Video Collaboration VC3 Platform, Video Collaboration VC5 Platform, Vision Intelligence 100 Platform, Vision Intelligence 200 Platform, Vision Intelligence 300 Platform, Vision Intelligence 400 Platform), as well as, their components (*e.g.*, hardware, software, and/or firmware), and processes related to the same. With respect to the '901 patent, '371 patent, '224 patent, '005 patent, and '300 patent, the Accused Products are devices that include, but are not limited to, Qualcomm's devices and third party devices that include one or more of Qualcomm's devices that are compliant with IEEE 802.11n and/or IEEE 802.11ac and/or IEEE 802.11ax and/or 802.11be (*e.g.*, APQ8009, APQ8053Pro, APQ8053Lite, APQ8074, APQ8094, APQ8096SG, AR6004 Chipset, Dragonboard 845c, FastConnect 6100 Mobile Connectivity System, FastConnect 6200, FastConnect 6700, FastConnect 6800, FastConnect 6900, FastConnect 7800, Immersive Home 214 Platform, Immersive Home 216 Platform, Immersive Home 316 Platform, Immersive Home 318 Platform, Immersive Home 3210 Platform, Immersive Home 326 Platform, IPQ4018 SoC, IPQ4019 SoC, IPQ4028 SoC, IPQ4029 SoC, IPQ8064 SoC, IPQ8065 SoC, IPQ8066 SoC, IPQ8068 SoC, IPQ8069 SoC, IPQ8074, Mesh Networking Dev Kit for Amazon AVS, Networking Pro 1200 Platform, Networking Pro 1210 Platform, Networking Pro 1220 Platform, Networking Pro 1610 Platform, Networking Pro 1620 Platform, Networking Pro 400 Platform, Networking Pro 600 Platform, Networking Pro 610

Platform, Networking Pro 620 Platform, Networking Pro 800 Platform, Networking Pro 810 Platform, Networking Pro 820 Platform, QCA1062, QCA1064, QCA206x, QCA4531, QCA6174A, QCA6175A, QCA6574AU, QCA6595AU, QCA6678AQ, QCA6696, QCA6698AQ, QCA9379, QCA9500, QCA9531, QCA9880, QCA9886 SoC, QCA9888 SoC, QCA9980, QCA9982 SoC, QCA9984 SoC, QCA9990 SoC, QCA9992 SoC, QCA9994 SoC, QCM4490, QCM5430, QCM6490, QCM8550, QCS2290, QCS403, QCS404, QCS405, QCS407, QCS4490, QCS5430, QCS605, QCS6490, QCS7230, QCS8250, QCS8550, QRB5165, QXF207x, QXM108x, QXM19xx, QXM80xx, Robotics RB3 Platform, Robotics RB5 Platform, Robotics RB5 Development Kit, Robotics RB6 Platform, SDA660, SDA845, SDM660, SDM845, Smart Audio Platform Development Kit, Smart Audio 200 Platform, Smart Audio 400 Platform, Snapdragon Auto 4G Modem, Snapdragon 4 Gen 1 Mobile Platform, Snapdragon 480 5G Mobile Platform, Snapdragon 480+ 5G Mobile Platform, Snapdragon 6 Gen 1 Mobile Platform, Snapdragon 602 Automotive Platform, Snapdragon 660 Mobile Platform, Snapdragon 670 Mobile Platform, Snapdragon 675 Mobile Platform, Snapdragon 690 5G Mobile Platform, Snapdragon 695 5G Mobile Platform, Snapdragon 7 Gen 1 Mobile Platform, Snapdragon 7+ Gen 2 Mobile Platform, Snapdragon 710 Mobile Platform, Snapdragon 712 Mobile Platform, Snapdragon 720G Mobile Platform, Snapdragon 730 Mobile Platform, Snapdragon 730G Mobile Platform, Snapdragon 732G Mobile Platform, Snapdragon 750G 5G Mobile Platform, Snapdragon 765 5G Mobile Platform, Snapdragon 765G 5G Mobile Platform, Snapdragon 768G 5G Mobile Platform, Snapdragon 778G 5G Mobile Platform, Snapdragon 778G+ 5G Mobile Platform, Snapdragon 780G 5G Mobile Platform, Snapdragon 782G Mobile Platform, Snapdragon 7c Compute Platform, Snapdragon 7c Gen 2 Compute Platform, Snapdragon 7c+ Gen 3 Compute Platform, Snapdragon 8 Gen 1 Mobile Platform, Snapdragon 8 Gen 2 Mobile Platform, Snapdragon 8+ Gen 1 Mobile

Platform, Snapdragon 800 Processor, Snapdragon 801 Processor, Snapdragon 805 Processor, Snapdragon 808 Processor, Snapdragon 810 Processor, Snapdragon 820 Mobile Platform, Snapdragon 821 Mobile Platform, Snapdragon 835 Mobile PC Platform, Snapdragon 835 Mobile Platform, Snapdragon 845 Mobile Platform, Snapdragon 850 Mobile Compute Platform, Snapdragon 855 Mobile Platform, Snapdragon 855+/860 Mobile Platform, Snapdragon 865 5G Mobile Platform, Snapdragon 865+ 5G Mobile Platform, Snapdragon 870 5G Mobile Platform, Snapdragon 888 5G Mobile Platform, Snapdragon 888+ 5G Mobile Platform, Snapdragon 8c Compute Platform, Snapdragon 8cx Compute Platform, Snapdragon 8cx Gen 2 5G Compute Platform, Snapdragon 8cx Gen 3 Compute Platform, Snapdragon AR2 Gen 1 Platform, Video Collaboration VC3 Platform, Video Collaboration VC3 Platform, Video Collaboration VC5 Platform, Vision Intelligence 400 Platform), as well as, their components (*e.g.*, hardware, software, and/or firmware), and processes related to the same.¹

COUNT I

(INFRINGEMENT OF U.S. PATENT NO. 7,664,130)

23. Plaintiff incorporates paragraphs 1 through 22 herein by reference.

24. Redwood is the assignee of the '130 patent, entitled “Wireless Communication System, Wireless Communication Apparatus, Wireless Communication Method, and Computer Program,” with ownership of all substantial rights in the '130 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

25. The '130 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '130 patent issued from U.S. Patent Application No. 11/066,482.

¹ Each of the relevant standards cited herein, and related to the Asserted Patents, are specifically incorporated into this Complaint.

26. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '130 patent in this judicial district and elsewhere in Texas and the United States.

27. Qualcomm directly infringes the '130 patent via 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing the Accused Products, their components and processes, and/or products containing the same that incorporate the fundamental technologies covered by the '130 patent.

28. Furthermore, Defendants directly infringe the '130 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '130 patent under 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing those Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '130 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers, distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '130 patent. *See, e.g., Lake Cherokee*

Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc., 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

29. For example, Qualcomm infringes claim 10 of the '130 patent via the Accused Products, including the Immersive Home 214 Platform. The Accused Products, including the Immersive Home 214 Platform, are mesh devices and comprise a wireless communication station. *See, e.g.,* Fig. 19-2 of IEEE 802.11 2016; <https://www.qualcomm.com/news/releases/2020/10/qualcomm-unveils-immersive-home-platform-next-generation-mesh-wi-fi> (“Broad Wi-Fi technology support: Qualcomm Immersive Home Platforms are built to deliver seamless roaming, band/node client steering, and advanced security safeguards across Wi-Fi 4, 5, 6, 6E, and support many of the industry’s leading mesh software protocols including Qualcomm® Wi-Fi SON, the OpenSync™ open-source software, eero’s TrueMesh and the Wi-Fi Alliance’s Wi-Fi CERTIFIED EasyMesh™ standard.”); <https://www.qualcomm.com/products/internet-of-things/networking/wi-fi-networks/immersive-home-platforms/immersive-home-214-platform> (“The next generation successor to our groundbreaking mesh networking platforms, Qualcomm Immersive Home Platforms are designed to deliver Gigabit-speed wireless performance to every room in the home with devices that fit in the palm of the hand.”).

30. The Accused Products, including the Immersive Home 214 Platform, each comprise a transmitter configured to transmit beacons with information associated with a network being described therein to other communication stations to construct a network. For example, the Accused Products, including the Immersive Home 214 Platform, comprise a transmitter configured to transmit a beacon containing a Mesh Configuration element advertising the mesh services of a mesh network. *See, e.g.,* Sections 9.3.3.3, 9.4.2.98.1 and 14.13.3.31 of IEEE 802.11 2016.

31. The Accused Products, including the Immersive Home 214 Platform, each comprise a receiver configured to receive timing information concerning priority transmission of a neighborhood communication station from said other communication stations. For example, the Accused Products comprise a receiver configured to receive a beacon that contains the Beacon Timing element, which comprises Beacon Timing Information fields that prioritize transmissions from neighborhood communications to avoid Beacon frame collisions. *See, e.g.*, Sections 9.4.2.105, 14.13.4.2.6, and 14.13.4.3 and Figures 9-462 and 9-464 of IEEE 802.11 2016.

32. The Accused Products, including the Immersive Home 214 Platform, each comprise a transmitter further configured to transmit a message to the neighborhood communication station, the message requesting a report of timing information concerning priority transmission of the neighborhood communication station. For example, the Accused Products, including the Immersive Home 214 Platform, each comprise a transmitter further configured to transmit a Probe Request frame to request Beacon Timing Information concerning priority transmission of the neighborhood communication station. *See, e.g.*, Section 14.13.4.2.6 and Figure 9-464 of IEEE 802.11 2016.

33. The specific ways in which the Accused Products, including the Immersive Home 214 Platform, are configured to support the aforementioned features of IEEE 802.11 2016 are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products as to at least Claim 10 of the '130 patent.

34. Furthermore, the Accused Products, including the Immersive Home 214 Platform, are configured or implemented in an infringing manner with the features and functionality recited in at least Claim 10 of the '130 patent.

35. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

36. The claims of the '130 patent are patent eligible under 35 U.S.C. § 101. The '130 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, it offers, for example, a technologically complex invention that "relates to a wireless communication system, a wireless communication apparatus, a wireless communication method and a computer program, all enabling each communication station to evade mutual interference while performing communication securing a band by providing a prioritized utilization region." '130 patent, 1:35-41. The '130 patent provides a technical solution to advance the goal above, for example, by describing that "each communication station can gather the transmission-reception dangerous zone by receiving the prioritized transmission frame from a neighboring station, and the system may be adapted so that each communication station informs the acquired information pertaining to the transmission-reception dangerous zone to the neighboring station. In such a case, when each communication station tries to perform a frame transmission, the communication station can prevent collisions previously by performing the frame transmission in the way of avoiding the transmission-reception dangerous zones recorded in the information signal received from the transmission destination." '130 patent, 14:30-41. That solution is reflected in independent claim 10 of the '130 patent, which includes a limitation that recites "requesting a report of timing information concerning priority transmission of the neighborhood communication station."

37. At a minimum, Qualcomm has known of the '130 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the '130 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of the '130 patent via a

letter. On January 31, 2022, Qualcomm received further notice of its infringement of the '130 patent when Redwood provided an infringement chart of the '130 patent via a data room that Qualcomm had access to and was regularly accessing. Furthermore, Qualcomm has known about the '130 patent since at least May 12, 2022, when Qualcomm and/or its agents received notice of its infringement via email. In addition, Qualcomm has had knowledge of the '130 patent based at least on its conduct before the United States Patent and Trademark Office ("USPTO"). For example, the '130 patent was cited by the Examiner during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent Application Publication No. 2009/0040996 entitled "Methods And Apparatus For Supporting Multiple Communications Modes Of Operation;" U.S. Patent Application Publication No. 2009/0282253 entitled "Network Helper For Authentication Between A Token And Verifiers;" and U.S. Patent Application Publication No. 2010/0046542 entitled "MIMO And SDMA Signaling For Wireless Very High Throughput Systems."

38. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. § 271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers that make, import, use, purchase, offer to sell, and/or sell the Accused Products comprising all of the limitations of one or more claims of the '130 patent to directly infringe one or more claims of the '130 patent by making, using, offering for sale, selling, and/or importing the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the '130 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least, inter alia,

creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals for the Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

39. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented invention of one or more claims of the '130 patent, constituting a material part of the invention. On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '130 patent, and such components are not a staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '130 patent that are especially made or especially adapted for use in end user products that infringe the '130 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

40. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(1) includes supplying or causing to be supplied in or from the United States all or a substantial portion of the components of the patented invention of one or more claims of the '130 patent, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '130 patent, where Qualcomm actively induces the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '130 patent, where Qualcomm actively induces the combination of the hardware and/or software/firmware components with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the components of the Accused Products in

conformity with U.S. laws and regulations, manufacturing the components of the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and software/firmware components, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and/or software/firmware components with other components as part of making an end user device in part or in whole, testing and certifying features related to infringing features in the Accused Products, providing software and/or firmware for the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

41. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(2) includes supplying or causing to be supplied in or from the United States components of the patented invention of one or more claims of the '130 patent that are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use, where such components are uncombined in whole or in part, knowing that such components are so made or adapted and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '130 patent, where such components are uncombined in whole or in part, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or

commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '130 patent, where such components are uncombined in whole or in part with other components of an end user device, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States.

42. On information and belief, despite having knowledge of the '130 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '130 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high likelihood of infringement. Qualcomm's infringing activities relative to the '130 patent have been, and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

43. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

COUNT II

(INFRINGEMENT OF U.S. PATENT NO. 7,917,102)

44. Plaintiff incorporates paragraphs 1 through 43 herein by reference.

45. Redwood is the assignee of the '102 patent, entitled "Radio Transmitting Apparatus and Radio Transmission Method," with ownership of all substantial rights in the '102 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

46. The '102 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '102 patent issued from U.S. Patent Application No. 11/937,422.

47. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '102 patent in this judicial district and elsewhere in Texas and the United States.

48. Qualcomm directly infringes the '102 patent via 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing the Accused Products, their components and processes, and/or products containing the same that incorporate the fundamental technologies covered by the '102 patent.

49. Furthermore, Defendants directly infringe the '102 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '102 patent under 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing those Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '102 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the

same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers, distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '102 patent. *See, e.g., Lake Cherokee Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc.*, 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

50. For example, Qualcomm infringes claim 3 of the '102 patent via the Accused Products, including the FastConnect 7800. The Accused Products, including the FastConnect 7800, each are compliant with IEEE 802.11n and/or IEEE 802.11ac and/or IEEE 802.11ax and/or IEEE 802.11be, and each comprise a radio transmitting apparatus that transmits a modulated signal. *See, e.g.,* <https://www.qualcomm.com/products/technology/wi-fi/fastconnect/fastconnect-7800> (“The Qualcomm FastConnect 7800 is an advanced 14nm Wi-Fi and Bluetooth® Connectivity system delivering ultra-high speeds;” “Standards: 802.11be, 802.11ax, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a;” “Antenna Configuration: 2x2;” and “Spatial Streams: Up to 4.”).

51. The Accused Products, including the FastConnect 7800, each comprise circuitry and/or components (hardware and/or software) that forms a transmission frame which includes a frequency offset estimation signal for estimating frequency offset of the modulated signal at a

receiving apparatus, a channel fluctuation estimation signal for estimating channel fluctuation of the modulated signal at the receiving apparatus and a gain control signal for performing gain control of the modulated signal at the receiving apparatus. The Accused Products, including the FastConnect 7800, must be configured to form the claimed “transmission frame” for a HT-mixed format PPDU frame, which is a mandatory feature of IEEE 802.11 2016. *See, e.g.*, Figure 19-1 of IEEE 802.11 2016; https://www.albany.edu/faculty/dsaha/teach/2019Spring_CEN574/slides/08_WLAN.pdf at slides 67-68 (the HT-mixed format PPDU is mandatory). For example, the Accused Products, including the FastConnect 7800, each form a HT-mixed format PPDU frame, which comprises an L-LTF subframe, which is a frequency offset estimation signal. *See, e.g.*, Figures 17-4 and 19-1 of IEEE 802.11 2016. The HT-mixed format PPDU frame also comprises an HT-LTF subframe, which is a channel fluctuation estimation signal. *See, e.g.*, Figure 19-1 and Section 19.3.9.4.6 of IEEE 802.11 2016. The HT-mixed format PPDU frame also comprises an L-STF subframe, which is a gain control signal. *See, e.g.*, Figure 19-1 and Section 19.3.9.3.3 of IEEE 802.11 2016.

52. The Accused Products, including the FastConnect 7800, each comprise circuitry and/or components (hardware and/or software) configured to transmit the transmission frame. For example, the Accused Products, including the FastConnect 7800, must be configured to transmit a transmission frame for a HT-mixed format PPDU, which is a mandatory feature of IEEE 802.11 2016. *See, e.g.*, Figure 19-1 of IEEE 802.11 2016; https://www.albany.edu/faculty/dsaha/teach/2019Spring_CEN574/slides/08_WLAN.pdf at slides 67-68 (the HT-mixed format PPDU is mandatory).

53. The transmission frame includes a first gain control signal and a second gain control signal. For example, the HT-mixed format PPDU comprises a first gain control signal in the L-

STF subframe and a second gain control signal in the HT-STF subframe. *See, e.g.*, Figure 19-1 and Sections 19.3.9.3.3 and 19.3.9.4.5 of IEEE 802.11 2016. The first gain control signal is arranged prior to the frequency offset estimation signal. For example, the L-STF subframe is arranged prior to the L-LTF subframe. *See, e.g.*, Figure 19-1 of IEEE 802.11 2016. The second gain control is arranged subsequent to the frequency offset estimation signal and prior to the channel fluctuation estimation signal. For example, the HT-STF subframe is arranged subsequent to the L-LTF subframe and prior to the HT-LTF subframe. *See, e.g.*, Figure 19-1 of IEEE 802.11 2016.

54. The specific ways in which the Accused Products, including the FastConnect 7800, are configured to support the aforementioned features of IEEE 802.11n and/or 802.11ac and/or 802.11ax and/or 802.11be are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products as to Claim 3 of the '102 patent.

55. Furthermore, the Accused Products, including the FastConnect 7800, are configured or implemented in an infringing manner with the features and functionality recited in at least Claim 3 of the '102 patent.

56. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

57. The claims of the '102 patent are patent eligible under 35 U.S.C. § 101. The '102 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, for example, it offers a technologically complex, particularized "radio transmitting apparatus and radio transmission method that enable[s] reception quality to be improved by reducing pilot symbol and data symbol quantization error in a system in which the number of simultaneously

transmitted modulated signals is changed according to the propagation environment and so forth.” ’102 patent, 2:12-18. The ’102 patent provides the technical solution above, for example, by “changing the transmit power of the modulated signal transmitted from each antenna according to the number of antennas that simultaneously transmit modulated signals (that is, the number of modulated signals).” ’102 patent, 2:19-22. That solution is reflected in the claims 1, 3, 5, and 10 of the ’102 patent, which include, for example, gain control limitations that can be used in the changing of the transmit power of the modulated signals. See, e.g., ’102 patent, 17:34-50.

58. At a minimum, Qualcomm has known of the ’102 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the ’102 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of its infringement of the ’102 patent via a letter. On December 7, 2021, Qualcomm received further notice of its infringement of the ’102 patent when Qualcomm downloaded an infringement chart of the ’102 patent via a data room provided by Redwood. Furthermore, Qualcomm has known about the ’102 patent since at least May 12, 2022, when Qualcomm and/or its agents received further notice of its infringement via email. On information and belief, Qualcomm has also had knowledge of the ’102 patent based at least on its conduct before the USPTO. For example, at least one patent document related to the ’102 patent was cited by the Examiner during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent No. 8,139,672 entitled “Method And Apparatus For Pilot Communication In A Multi-Antenna Wireless Communication System;” and U.S. Patent No. 8,780,936 entitled “Signal Acquisition For Wireless Communication Systems.”

59. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. § 271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers,

manufacturers, end users, and/or consumers that make, import, use, purchase, offer to sell, and/or sell the Accused Products comprising all of the limitations of one or more claims of the '102 patent to directly infringe one or more claims of the '102 patent by making, using, offering for sale, selling, and/or importing the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the '102 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals for the Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

60. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented invention of one or more claims of the '102 patent, constituting a material part of the invention.

On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '102 patent, and such components are not a staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '102 patent that are especially made or especially adapted for use in end user products that infringe the '102 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

61. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(1) includes supplying or causing to be supplied in or from the United States all or a substantial portion of the components of the patented invention of one or more claims of the '102 patent, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '102 patent, where Qualcomm actively induces the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '102 patent, where Qualcomm actively induces

the combination of the hardware and/or software/firmware components with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the components of the Accused Products in conformity with U.S. laws and regulations, manufacturing the components of the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and software/firmware components, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and/or software/firmware components with other components as part of making an end user device in part or in whole, testing and certifying features related to infringing features in the Accused Products, providing software and/or firmware for the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

62. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(2) includes supplying or causing to be supplied in or from the United States components of the patented invention of one or more claims of the '102 patent that are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce

suitable for substantial noninfringing use, where such components are uncombined in whole or in part, knowing that such components are so made or adapted and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '102 patent, where such components are uncombined in whole or in part, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '102 patent, where such components are uncombined in whole or in part with other components of an end user device, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States.

63. On information and belief, despite having knowledge of the '102 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '102 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high likelihood of infringement. Qualcomm's infringing activities relative to the '102 patent have been,

and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

64. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

COUNT III

(INFRINGEMENT OF U.S. PATENT NO. 7,688,901)

65. Plaintiff incorporates paragraphs 1 through 64 herein by reference.

66. Redwood is the assignee of the '901 patent, entitled "Transmission Method, Transmission Apparatus, and Reception Apparatus," with ownership of all substantial rights in the '901 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

67. The '901 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '901 patent issued from U.S. Patent Application No. 10/486,895.

68. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '901 patent in this judicial district and elsewhere in Texas and the United States.

69. Qualcomm directly infringes the '901 patent via 35 U.S.C. § 271(a) by using and/or testing the Accused Products, their components and processes, and/or products containing the same that incorporate the fundamental technologies covered by the '901 patent.

70. Furthermore, Defendants directly infringe the '901 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '901 patent under 35 U.S.C. § 271(a) by using and/or testing those Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '901 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers, distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '901 patent. *See, e.g., Lake Cherokee Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc.*, 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

71. For example, Qualcomm infringes claim 1 of the '901 patent via the Accused Products. The Accused Products, including the FastConnect 7800, transmit modulation signals. *See, e.g.,* Sections 19.1.1 and 19.1.2 of IEEE 802.11 2016; <https://www.qualcomm.com/products/technology/wi-fi/fastconnect/fastconnect-7800> ("The Qualcomm FastConnect 7800 is an advanced 14nm Wi-Fi and Bluetooth® Connectivity system

delivering ultra-high speeds;” “Standards: 802.11be, 802.11ax, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a;” “Antenna Configuration: 2x2;” and “Spatial Streams: Up to 4.”).

72. The Accused Products, including the FastConnect 7800, each generate a plurality of modulation signals each of which is to be transmitted from a different one of a plurality of antennas, where each modulation signal is to include one or more preamble symbol groups each consisting of a plurality of preamble symbols used for demodulation. For example, the Accused Products generate modulation signals (e.g., HT-mixed format PPDU) which are to be transmitted from a plurality of antennas. *See, e.g.*, Sections 19.3.3 of IEEE 802.11 2016. Each OFDM symbol within a modulation signal comprises a pilot symbol sequence consisting of four pilot symbols used for demodulation. *See, e.g.*, Sections 17.3.5.9 and 19.3.11.10 of IEEE 802.11 2016.

73. The Accused Products, including the FastConnect 7800, each insert the one or more preamble symbol groups at the same one or more temporal points in each modulation signal, wherein the one or more preamble symbol groups at the one or more temporal points are orthogonal to other preamble symbol groups at the same one or more temporal points with zero mutual correlation among the plurality of modulation signals, each preamble symbol having a non-zero amplitude, and each preamble symbol group consisting of preamble symbols the quantity of which is greater than that of the plurality of modulation signals to be transmitted. For example, each of the Accused Products insert one or more OFDM symbols comprising a pilot symbol sequence in each modulation signal, where each modulation signal sent from different antennas are transmitted simultaneously in time. *See, e.g.*, Section 19.3.11.10 of IEEE 802.11 2016. The pilot symbol sequences corresponding to different spatial streams are orthogonal at the same one or more temporal points with zero mutual correlation among the plurality of spatial streams. *See, e.g.*, Table 19-19 of IEEE 802.11 2016. The pilot symbols are BPSK modulated and have a non-zero

amplitude. *See, e.g.*, Section 17.3.5.9 of IEEE 802.11 2016. Each pilot symbol sequence contains four pilot symbols, which is greater than the modulation signals to be transmitted by two or three antennas utilized by the Accused Products. *See, e.g.*, Sections 19.1.1 and 19.3.11.10 of IEEE 802.11 2016.

74. The Accused Products, including the FastConnect 7800, each transmit the plurality of modulation signals, each comprising transmission data, which is different between the plurality of modulation signals, and the one or more preamble symbol groups, from the plurality of antennas, respectively, in an identical frequency band. For example, each of the Accused Products transmit the plurality of modulation signals comprising transmission data and the pilot symbol sequence from the two or three antennas in the same channel having a particular width (*e.g.*, 20 MHz). *See, e.g.*, Section 19.3.15.1, Tables 19-28, 19-29, and 19-30, and Figure 17-13 of IEEE 802.11 2016. Each stream of data to be transmitted is divided into multiple spatial streams to form respective modulation signals having different transmission data during the encoding process. *See, e.g.*, Section 19.3.4 of IEEE 802.11 2016.

75. The specific ways in which the Accused Products, including the FastConnect 7800, are configured to support the aforementioned features of IEEE 802.11n and/or 802.11ac and/or 802.11ax are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products, including the FastConnect 7800, as to Claim 1 of the '901 patent.

76. Furthermore, the Accused Products, including the FastConnect 7800, are configured or implemented in an infringing manner with the features and functionality recited in at least Claim 1 of the '901 patent.

77. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

78. The claims of the '901 patent are patent eligible under 35 U.S.C. § 101. The '901 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, it is a technologically complex, particularized method of transmitting modulation signals. As the '901 patent explains, the "present invention aims to provide a transmission method for estimating channels accurately and with ease from multiplexed modulation signals." '901 patent, 1:50-52. The '901 patent further explains that the "conventional structure gives no thought to the synchronization between channels in the same frequency band as well as a frequency offset. As a result, this structure encounters the difficulty of achieving the most important factor in order to demultiplex a multiplexed signal, namely, obtaining an accuracy of estimating channels." '901 patent, 1:41-45.

79. The '901 patent provides the technical solution above by, for example, "plac[ing] the symbols used for demodulation at an identical time of the respective channels and orthogonally to each other." '901 patent, 2:16-18. The '901 patent explains that "[t]his preparation, i.e. the symbols used for demodulation are placed to be orthogonal to each other, allows the reception apparatus to isolate the symbols with ease for estimating channels." '901 patent, 2:18-22. That solution is reflected in the claims of the '901 patent such as independent claim 1.

80. At a minimum, Qualcomm has known of the '901 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the '901 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of its infringement of the '901 patent via a letter. On December 7, 2021, Qualcomm received further notice of its

infringement of the '901 patent when Qualcomm downloaded an infringement chart of the '901 patent via a data room provided by Redwood. Furthermore, Qualcomm has known about the '901 patent since at least May 12, 2022, when Qualcomm and/or its agents received further notice of its infringement via email. On information and belief, Qualcomm has also had knowledge of the '901 patent based at least on its conduct before the USPTO. For example, at least one patent document related to the '901 patent was cited by the Examiner or otherwise known by Qualcomm during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent No. 8,009,551 entitled "Initial Pilot Frequency Selection;" U.S. Patent No. 8,139,672 entitled "Methods And Apparatus For Pilot Communication In A Multi-Antenna Wireless Communication System;" U.S. Patent No. 10,659,117 entitled "Codebook Restriction And Sub-Sampling For Channel State Information Reporting;" U.S. Patent No. 10,716,054 entitled "Methods And Systems For Controlling Network Access;" U.S. Patent No. 10,721,717 entitled "Band Combination Constraint On The Number Of Supported Layers;" and U.S. Patent No. 11,388,586 entitled "Downlink Control Channel Monitoring Capability For Ultra-Reliable Low-Latency Communications."

81. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. § 271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers to directly infringe one or more claims of the '901 patent by testing and/or using the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the '901 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least,

inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals for the Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products that are then used and/or tested by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

82. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented invention of one or more claims of the '901 patent, constituting a material part of the invention. On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '901 patent, and such components are not a staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '901 patent that are especially made or

especially adapted for use in end user products that infringe the '901 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

83. On information and belief, despite having knowledge of the '901 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '901 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high likelihood of infringement. Qualcomm's infringing activities relative to the '901 patent have been, and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

84. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

COUNT IV

(INFRINGEMENT OF U.S. PATENT NO. 7,974,371)

85. Plaintiff incorporates paragraphs 1 through 84 herein by reference.

86. Redwood is the assignee of the '371 patent, entitled "Communication Method and Radio Communication Apparatus," with ownership of all substantial rights in the '371 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

87. The '371 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '371 patent issued from U.S. Patent Application No. 10/486,896.

88. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '371 patent in this judicial district and elsewhere in Texas and the United States.

89. Qualcomm directly infringes the '371 patent via 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing the Accused Products, their components and processes, and/or products containing the same that incorporate the fundamental technologies covered by the '371 patent.

90. Furthermore, Defendants directly infringe the '371 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '371 patent under 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing those Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '371 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers, distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '371 patent. *See, e.g., Lake Cherokee*

Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc., 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

91. For example, Qualcomm infringes claim 14 of the '371 patent via the Accused Products, including the FastConnect 7800. The Accused Products, including the FastConnect 7800, comprise a radio transmission apparatus. *See, e.g.*, Fig. 19-2 of IEEE 802.11 2016; <https://www.qualcomm.com/products/technology/wi-fi/fastconnect/fastconnect-7800> (“The Qualcomm FastConnect 7800 is an advanced 14nm Wi-Fi and Bluetooth® Connectivity system delivering ultra-high speeds;” “Standards: 802.11be, 802.11ax, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a;” “Antenna Configuration: 2x2;” and “Spatial Streams: Up to 4.”).

92. The Accused Products, including the FastConnect 7800, each comprise circuitry and/or components (hardware and/or software) comprising a transmission method determining unit configured to select one of a first transmission method and a second transmission method based on received information of an estimated radio-wave propagation environment corresponding to a communication partner. For example, the Accused Products receive information associated with a channel quality assessment to select an appropriate Modulation and Coding Scheme (MCS) for Accused Products to utilize in subsequent transmissions to a receiving station, where the MCS value is utilized to determine the modulation, coding, and number of spatial channels based on information associated with the channel quality assessment. *See, e.g.*, Sections 19.3.13.4 and 19.3.5 of IEEE 802.11 2016.

93. The Accused Products, including the FastConnect 7800, each comprise circuitry and/or components (hardware and/or software) comprising a modulation signal generator configured to generate a single modulation signal if said transmission method determining unit choose selects said first transmission method, and to generate a plurality of modulation signals

which include different information from each other for transmission to an identical frequency band at an identical temporal point, if said transmission method determining unit selects said second transmission method. For example, if the MCS indicates that a transmission will utilize only one spatial stream, the Accused Products generate a single modulation signal. *See, e.g.*, Section 19.3.5 of IEEE 802.11 2016. If the MCS indicates that a transmission will include multiple spatial streams for, *e.g.*, spatial multiplexing, a plurality of modulation signals are produced, where each of the modulation signals represents a respective spatial stream and each spatial stream includes distinct information. *See, e.g.*, Section 19.3.5 of IEEE 802.11 2016. Spatial multiplexing increases bandwidth by transmitting data over multiple available spatial channels. Transmissions are simultaneous and are transmitted using the same channel having a particular width (*e.g.*, 20 MHz). *See, e.g.*, Section 19.3.15.1 and Tables 19-28, 19-29, and 19-30 of IEEE 802.11 2016.

94. The single modulation signal and the plurality of modulation signals contain information indicating the number of modulation signals to multiplex and transmit at the same time. For example, all HT transmissions of the Accused Products, including the FastConnect 7800, utilize an HT-SIG, which contains an MCS that indicates the number of modulation signals to multiplex and transmit at the same time. *See, e.g.*, Sections 19.3.9.4.3 and 19.3.5 of IEEE 802.11 2016.

95. The specific ways in which the Accused Products, including the FastConnect 7800, are configured to support the aforementioned features of IEEE 802.11n and/or IEEE 802.11ac and/or IEEE 802.11ax and/or IEEE 802.11be are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products as to at least Claim 14 of the '371 patent.

96. Furthermore, the Accused Products, including the FastConnect 7800, are configured or implemented in an infringing manner with the features and functionality recited in at least Claim 14 of the '371 patent.

97. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

98. The claims of the '371 patent are patent eligible under 35 U.S.C. § 101. The '371 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, it offers, for example, a technologically complex communication method and a radio communication apparatus that, for example, "switches between the method of transmitting modulation signals of a plurality of channels to the same frequency band from a plurality of antennas and the method of transmitting a modulation signal of one channel from an antenna." '371 patent, 4:27-31. This allows the transmitter to choose which of these transmission methods is used, based on estimated channel conditions. The '371 patent explains that "when the communication method is used, which multiplexes modulation signals of a plurality of channels to the same frequency band, a receiver transmits the information of an estimated radio-wave propagation environment to a transmitter. The transmitter then selects a communication method based on the information. Multiplexing modulation signals of a plurality of channels to the same frequency band by using the foregoing method can increase the data transmission rate. At the same time, a radio communication apparatus of the present invention can advantageously demultiplex the multiplexed modulation signals received with ease." '371 patent, 5:4-16. That solution is reflected in, for example, claim 14 of the '371 patent.

99. At a minimum, Qualcomm has known of the '371 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the '371 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of its infringement of the '371 patent via a letter. On December 7, 2021, Qualcomm received further notice of its infringement of the '371 patent when Qualcomm downloaded an infringement chart of the '371 patent via a data room provided by Redwood. Furthermore, Qualcomm has known about the '371 patent since at least May 12, 2022, when Qualcomm and/or its agents received further notice of its infringement via email. On information and belief, Qualcomm has also had knowledge of the '371 patent based at least on its conduct before the USPTO. For example, at least one patent document related to the '371 patent was cited by the Examiner or otherwise known by Qualcomm during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent No. 8,009,551 entitled "Initial Pilot Frequency Selection;" U.S. Patent No. 8,139,672 entitled "Methods And Apparatus For Pilot Communication In A Multi-Antenna Wireless Communication System;" U.S. Patent No. 10,659,117 entitled "Codebook Restriction And Sub-Sampling For Channel State Information Reporting;" U.S. Patent No. 10,716,054 entitled "Methods And Systems For Controlling Network Access;" U.S. Patent No. 10,721,717 entitled "Band Combination Constraint On The Number Of Supported Layers;" and U.S. Patent No. 11,388,586 entitled "Downlink Control Channel Monitoring Capability For Ultra-Reliable Low-Latency Communications."

100. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. § 271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers that make, import, use, purchase, offer to sell, and/or sell the Accused Products comprising all of the limitations of one or more claims of the '371 patent

to directly infringe one or more claims of the '371 patent by making, using, offering for sale, selling, and/or importing the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the '371 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals for the Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

101. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented invention of one or more claims of the '371 patent, constituting a material part of the invention. On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '371 patent, and such components are not a

staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '371 patent that are especially made or especially adapted for use in end user products that infringe the '371 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

102. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(1) includes supplying or causing to be supplied in or from the United States all or a substantial portion of the components of the patented invention of one or more claims of the '371 patent, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '371 patent, where Qualcomm actively induces the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '371 patent, where Qualcomm actively induces the combination of the hardware and/or software/firmware components with other components of an end user device outside of the United States in a manner that would infringe the patent if such

combination occurred within the United States. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the components of the Accused Products in conformity with U.S. laws and regulations, manufacturing the components of the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and software/firmware components, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and/or software/firmware components with other components as part of making an end user device in part or in whole, testing and certifying features related to infringing features in the Accused Products, providing software and/or firmware for the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

103. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(2) includes supplying or causing to be supplied in or from the United States components of the patented invention of one or more claims of the '371 patent that are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use, where such components are uncombined in whole or in part, knowing that such components are so made or adapted and intending that such components

will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '371 patent, where such components are uncombined in whole or in part, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '371 patent, where such components are uncombined in whole or in part with other components of an end user device, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States.

104. On information and belief, despite having knowledge of the '371 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '371 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high likelihood of infringement. Qualcomm's infringing activities relative to the '371 patent have been, and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical

infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

105. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

COUNT V

(INFRINGEMENT OF U.S. PATENT NO. 8,155,224)

106. Plaintiff incorporates paragraphs 1 through 105 herein by reference.

107. Redwood is the assignee of the '224 patent, entitled "Transmission Method, Transmission Apparatus, and Reception Apparatus," with ownership of all substantial rights in the '224 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

108. The '224 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '224 patent issued from U.S. Patent Application No. 12/698,917.

109. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '224 patent in this judicial district and elsewhere in Texas and the United States.

110. Qualcomm and/or its agents directly infringe the '224 patent via 35 U.S.C. § 271(a) by using and/or testing the Accused Products, their components and processes, and/or products containing the same that incorporate the fundamental technologies covered by the '224 patent.

111. Furthermore, Defendants directly infringe the '224 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '102 patent under 35 U.S.C. § 271(a) by using and/or testing those

Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '224 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers, distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '224 patent. *See, e.g., Lake Cherokee Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc.*, 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

112. For example, Qualcomm infringes claim 1 of the '224 patent via the Accused Products. The Accused Products, including the FastConnect 7800, perform a method of transmitting modulation signals. *See, e.g.,* Sections 19.1.1 and 19.1.2 of IEEE 802.11 2016; <https://www.qualcomm.com/products/technology/wi-fi/fastconnect/fastconnect-7800> (“The Qualcomm FastConnect 7800 is an advanced 14nm Wi-Fi and Bluetooth® Connectivity system delivering ultra-high speeds;” “Standards: 802.11be, 802.11ax, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a;” “Antenna Configuration: 2x2;” and “Spatial Streams: Up to 4.”).

113. The Accused Products, including the FastConnect 7800, each generate a plurality of modulation signals, where each modulation signal to be transmitted from a different one of a plurality of antennas, where each modulation signal includes a pilot symbol sequence consisting of a plurality of pilot symbols used for demodulation. For example, each of the Accused Products generates modulation signals (e.g., HT-mixed format PPDU) which are to be sent to a plurality of antennas. *See, e.g.*, Section 19.3.3 of IEEE 802.11 2016. Each OFDM symbol includes a pilot symbol sequence consisting of four pilot symbols used for demodulation. *See, e.g.*, Sections 17.3.5.9 and 19.3.11.10 of IEEE 802.11 2016.

114. Each of the Accused Products, including the FastConnect 7800, insert each of the pilot symbol sequences at the same temporal point in each modulation signal, wherein the pilot symbol sequences are orthogonal to each other with zero mutual correlation among the plurality of modulation signals, where each pilot symbol has a non-zero amplitude, where the quantity of the plurality of pilot symbols in each sequence being greater than the quantity of the plurality of modulation signals to be transmitted. For example, the Accused Products insert each of the four pilot symbol sequences at the same temporal point in each modulation signal. *See, e.g.*, Section 19.3.11.10 of IEEE 802.11 2016. The pilot symbol sequences corresponding to different spatial streams are orthogonal and have zero mutual correlation. *See, e.g.*, Table 19-19 of IEEE 802.11 2016. The pilot symbols are BPSK modulated and have a non-zero amplitude. *See, e.g.*, Section 17.3.5.9 of IEEE 802.11 2016. Each pilot symbol sequence contains four pilot symbols, which is greater than the modulation signals to be transmitted by two or three antennas utilized by the Accused Products. *See, e.g.*, Sections 19.1.1 and 19.3.11.10 of IEEE 802.11 2016.

115. Each of the Accused Products, including the FastConnect 7800, transmit in an identical frequency band the plurality of modulation signals from the plurality of antennas, where

each modulation signal comprises different transmission data and one of the pilot symbol sequences. For example, each of the Accused Products transmit the plurality of modulation signals in the same channel having a particular width (e.g., 20 MHz) from two or three antennas. *See, e.g.*, Sections 19.3.15.1, Tables 19-28, 19-29, and 19-30, and Figure 17-13 of IEEE 802.11 2016. Each stream of data is divided into multiple spatial streams by the Accused Products to form respective modulation signals comprising different transmission data during encoding. *See, e.g.*, Section 19.3.4 of IEEE 802.11 2016. Further, each of the modulation signals comprises one of the pilot symbol sequences. *See, e.g.*, Section 19.3.11.10 of IEEE 802.11 2016.

116. The specific ways in which the Accused Products, including the FastConnect 7800, are configured to support the aforementioned features of IEEE 802.11n and/or IEEE 802.11ac and/or IEEE 802.11ax and/or IEEE 802.11be are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products as to at least Claim 1 of the '224 patent.

117. Furthermore, the Accused Products, including the FastConnect 7800, are configured or implemented in an infringing manner with the features and functionality recited in at least Claim 1 of the '224 patent.

118. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

119. The claims of the '224 patent are patent eligible under 35 U.S.C. § 101. The '224 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, the '224 patent describes a specific problem to be solved in digital signal transmission and communication involving multiplexing modulation signals of a plurality of channels to the same frequency band

and its claims are directed to specific ways of solving that problem. '224 patent, 1:21-24. The patent describes that “the foregoing conventional structure gives no thought to the synchronization between channels in the same frequency band as well as a frequency offset. As a result, this structure encounters the difficulty of achieving the most important factor in order to demultiplex a multiplexed signal, namely, obtaining an accuracy of estimating channels.” *Id.* at 1:53-58. “The present invention aims to provide a transmission method for estimating channels accurately and with ease from multiplexed modulation signals.” *Id.* at 1:62-64.

120. To overcome the aforementioned problems, the '224 patent and its claims describe specific solutions for transmitting multiplexed communications. “The transmission method of the present invention transmits modulation signals of a plurality of channels available in the same frequency band from a plurality of antennas. A symbol used for demodulation is inserted in a given channel at a certain time, while in another channel symbol at the time, the same phase and quadrature signals in the in-phase quadrature plane are made to be zero signals. With this method, multiplexing the modulation signals of a plurality of channels to the same frequency allows increasing a data transmission rate. Because the symbol used for demodulation has not undergone the time multiplexing, so that the demodulation symbol can be isolated with ease at the reception apparatus.” *Id.*, 2:9-21. Claim 1 recites that “each pilot symbol ha[s] a non-zero amplitude.”

121. The '224 patent and its claims describe another specific solution to overcome the aforementioned problems. “The transmission method of the present invention places the symbols used for demodulation at an identical time of the respective channels and orthogonally to each other. This preparation, i.e., the symbols used for demodulation are placed to be orthogonal to each other, allows the reception apparatus to isolate the symbols with ease for estimating channels.” *Id.*, 2:28-34. This additional solution is recited by claim 1 by the steps of “inserting each of the pilot

symbol sequences at the same temporal point in each modulation signal, wherein the pilot symbol sequences are orthogonal to each other.” *Id.*, claim 1.

122. The ’224 patent describes a specific problem to be solved in multiplexing modulation signals from a plurality of antennas and its claims are directed to specific ways of solving that problem. That solution is further implemented in the claims, including claim 1. Therefore, the claims of ’224 patent are patent eligible. In addition, the claims of the ’224 Patent are directed to solving problems that solely arise in computer technology (digital signal communication and transmission) via a specific improvement to its operation. For example, the claims are directed to a specific improvement in wireless systems as to multiplexing modulation signals of a plurality of channels to the same frequency band. As such, they are not patent ineligible abstract ideas.

123. The claims also survive step two of Alice because they recite an inventive concept that provides features that are more than well-understood, routine, conventional activity. *See e.g.*, ’224 patent, claim 1, 1:53-64, 2:9-21, 2:28-34.

124. At a minimum, Qualcomm has known of the ’224 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the ’224 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of its infringement of the ’224 patent via a letter. On December 7, 2021, Qualcomm received further notice of its infringement of the ’224 patent when Qualcomm downloaded an infringement chart of the ’224 patent via a data room provided by Redwood. Furthermore, Qualcomm has known about the ’224 patent since at least May 12, 2022, when Qualcomm and/or its agents received further notice of its infringement via email. On information and belief, Qualcomm has also had knowledge of the ’224 patent based at least on its conduct before the USPTO. For example, at least one patent document

related to the '224 patent was cited by the Examiner or otherwise known by Qualcomm during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent No. 8,009,551 entitled "Initial Pilot Frequency Selection;" U.S. Patent No. 8,139,672 entitled "Methods And Apparatus For Pilot Communication In A Multi-Antenna Wireless Communication System;" U.S. Patent No. 10,659,117 entitled "Codebook Restriction And Sub-Sampling For Channel State Information Reporting;" U.S. Patent No. 10,716,054 entitled "Methods And Systems For Controlling Network Access;" U.S. Patent No. 10,721,717 entitled "Band Combination Constraint On The Number Of Supported Layers;" and U.S. Patent No. 11,388,586 entitled "Downlink Control Channel Monitoring Capability For Ultra-Reliable Low-Latency Communications."

125. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. § 271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers to directly infringe one or more claims of the '224 patent by testing and/or using the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the '224 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals for the

Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products that are then used and/or tested by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

126. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented invention of one or more claims of the '224 patent, constituting a material part of the invention. On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '224 patent, and such components are not a staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '224 patent that are especially made or especially adapted for use in end user products that infringe the '224 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

127. On information and belief, despite having knowledge of the '224 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '224 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high likelihood of infringement. Qualcomm's infringing activities relative to the '224 patent have been,

and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

128. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

COUNT VI

(INFRINGEMENT OF U.S. PATENT NO. 8,744,005)

129. Plaintiff incorporates paragraphs 1 through 128 herein by reference.

130. Redwood is the assignee of the '005 patent, entitled "Method and Apparatus for Generating Modulation Signals," with ownership of all substantial rights in the '005 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

131. The '005 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '005 patent issued from U.S. Patent Application No. 14/019,346.

132. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '005 patent in this judicial district and elsewhere in Texas and the United States.

133. Qualcomm directly infringes the '005 patent via 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing the Accused Products, their components and processes, and/or products containing the same that incorporate the fundamental technologies covered by the '005 patent.

134. Furthermore, Defendants directly infringe the '005 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '005 patent under 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing those Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '005 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers, distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '005 patent. *See, e.g., Lake Cherokee Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc.*, 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

135. For example, Qualcomm infringes claim 9 of the '005 patent via the Accused Products, including the FastConnect 7800. The Accused Products, including the FastConnect 7800, are each a signal generation apparatus configured to generate modulation signals. For example, the Accused Products are each compliant with IEEE 802.11n, which specifies generating

modulation signals. *See, e.g.*, Sections 19.1.1 and 19.1.2 of IEEE 802.11 2016; <https://www.qualcomm.com/products/technology/wi-fi/fastconnect/fastconnect-7800> (“The Qualcomm FastConnect 7800 is an advanced 14nm Wi-Fi and Bluetooth® Connectivity system delivering ultra-high speeds;” “Standards: 802.11be, 802.11ax, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a;” “Antenna Configuration: 2x2;” and “Spatial Streams: Up to 4.”).

136. The Accused Products, including the FastConnect 7800, comprise one or more processing devices configured to generate a plurality of modulation signals each of which is to be transmitted from a different one of a plurality of antennas in an identical frequency band, wherein each modulation signal includes a pilot symbol sequence each comprising a plurality of pilot symbols used for demodulation. For example, the Accused Products generate modulation signals, e.g., HT-mixed format PPDU, which are to be transmitted from a different one of a plurality of antennas in an identical frequency band (e.g., a 20 MHz channel). *See, e.g.*, Sections 19.3.3, 19.3.15, 19.3.14.1, Tables 19-28, 19-29, 19-30, and Figure 17-13 of IEEE 802.11 2016. Each OFDM symbol within a modulation signal includes a pilot symbol sequence of four pilot symbols, which are used for detecting frequency offsets and phase noise for demodulation. *See, e.g.*, Sections 17.3.5.9 and 19.3.11.10 of IEEE 802.11 2016.

137. The Accused Products, including the FastConnect 7800, comprise one or more processing devices configured to insert each of the pilot symbol sequences at the same temporal point in each modulation signal. For example, each modulation signal is made up of OFDM symbols containing a pilot symbol sequence inserted at the same temporal point in each modulation signal, where the modulation signals to be sent from different antennas are transmitted simultaneously in time. *See, e.g.*, Section 19.3.11.10 and Equation 19-54 of IEEE 802.11 2016.

138. The Accused Products, including the FastConnect 7800, comprise one or more processing devices configured to output the plurality of modulation signals, each comprising different transmission data and one of the pilot symbol sequences, to the plurality of antennas. For example, the Accused Products divide a stream of data to be transmitted into multiple spatial streams to form respective modulation signals during the encoding and mapping process, where the divided data is then sent to a plurality of antennas. *See, e.g.*, Section 19.3.4 of IEEE 802.11 2016. Each divided stream of data includes one of the pilot symbol sequences. *See, e.g.*, Section 19.3.11.10 of IEEE 802.11 2016.

139. The pilot symbol sequences are orthogonal to each other with zero mutual correlation among the plurality of modulation signals. For example, the pilot sequences corresponding to different spatial streams are orthogonal and have zero mutual correlation, such that the dot product of the two vectors is zero and the vectors are perpendicular in space. *See, e.g.*, Table 19-19 19.1.1 of IEEE 802.11 2016.

140. Each pilot symbol has a non-zero amplitude. For example, the pilot symbols are BPSK modulated and have a non-zero amplitude. *See, e.g.*, Section 17.3.5.9 of IEEE 802.11 2016.

141. A quantity of the plurality of pilot symbols in each sequence are greater than a quantity of the plurality of modulation signals to be transmitted. For example, each pilot symbol sequence contains four pilot symbols. Therefore, when the modulation signals are to be transmitted using fewer than four antennas, the number of pilot symbols per sequence is greater than the number of modulation signals to be transmitted. *See, e.g.*, Sections 19.1.1, 19.3.11.10, and Equation 19-54 of IEEE 802.11 2016.

142. The specific ways in which the Accused Products, including the FastConnect 7800, are configured to support the aforementioned features of IEEE 802.11n and/or 802.11ac and/or

802.11ax and/or 802.11be are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products as to at least Claim 9 of the '005 patent.

143. Furthermore, the Accused Products, including the FastConnect 7800, are configured or implemented in an infringing manner with the features and functionality recited in at least Claim 9 of the '005 patent.

144. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

145. The claims of the '005 patent are patent eligible under 35 U.S.C. § 101. The '005 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, the '005 patent describes a specific problem to be solved in digital signal transmission and communication involving multiplexing modulation signals of a plurality of channels to the same frequency band and its claims are directed to specific ways of solving that problem. '005 patent, 1:23-26. The patent describes that “the foregoing conventional structure gives no thought to the synchronization between channels in the same frequency band as well as a frequency offset. As a result, this structure encounters the difficulty of achieving the most important factor in order to demultiplex a multiplexed signal, namely, obtaining an accuracy of estimating channels.” *Id.* at 1:56-61. “The present invention aims to provide a transmission method for estimating channels accurately and with ease from multiplexed modulation signals.” *Id.* at 1:65-67.

146. To overcome the aforementioned problems, the '005 patent and its claims describe specific solutions for transmitting multiplexed communications. “The transmission method of the present invention transmits modulation signals of a plurality of channels available in the same frequency band from a plurality of antennas. A symbol used for demodulation is inserted in a given

channel at a certain time, while in another channel symbol at the time, the same phase and quadrature signals in the in-phase quadrature plane are made to be zero signals. With this method, multiplexing the modulation signals of a plurality of channels to the same frequency allows increasing a data transmission rate. Because the symbol used for demodulation has not undergone the time multiplexing, so that the demodulation symbol can be isolated with ease at the reception apparatus.” *Id.*, 2:12-24. Claim 9 recites that “each pilot symbol ha[s] a non-zero amplitude.”

147. The ’005 patent and its claims describe another specific solution to overcome the aforementioned problems. “The transmission method of the present invention places the symbols used for demodulation at an identical time of the respective channels and orthogonally to each other. This preparation, i.e., the symbols used for demodulation are placed to be orthogonal to each other, allows the reception apparatus to isolate the symbols with ease for estimating channels.” *Id.*, 2:31-37. This additional solution is recited by claim 9 by the steps of “insert each of the pilot symbol sequences at the same temporal point in each modulation signal ..., wherein the pilot symbol sequences are orthogonal to each other.” *Id.*, claim 9.

148. The ’005 patent describes a specific problem to be solved in multiplexing modulation signals from a plurality of antennas and its claims are directed to specific ways of solving that problem. That solution is further implemented in the claims, including claim 9. Therefore, the claims of ’005 patent are patent eligible. In addition, the claims of the ’005 Patent are directed to solving problems that solely arise in computer technology (digital signal communication and transmission) via a specific improvement to its operation. For example, the claims are directed to a specific improvement in wireless systems as to multiplexing modulation signals of a plurality of channels to the same frequency band. As such, they are not patent ineligible abstract ideas.

149. The claims also survive step two of Alice because they recite an inventive concept that provides features that are more than well-understood, routine, conventional activity. *See e.g.*, '005 patent, claim 9, 1:56-67, 2:12-24, 2:31-37.

150. At a minimum, Qualcomm has known of the '005 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the '005 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of the '005 patent via a letter. On January 18, 2022, Qualcomm received further notice of its infringement of the '005 patent when Redwood provided an infringement chart of the '005 patent via a data room that Qualcomm downloaded on January 19, 2022. Furthermore, Qualcomm has known about the '005 patent since at least May 12, 2022, when Qualcomm and/or its agents received notice of its infringement via email. On information and belief, Qualcomm has also had knowledge of the '005 patent based at least on its conduct before the USPTO. For example, at least one patent document related to the '005 patent was cited by the Examiner or otherwise known by Qualcomm during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent No. 8,009,551 entitled "Initial Pilot Frequency Selection;" U.S. Patent No. 8,139,672 entitled "Methods And Apparatus For Pilot Communication In A Multi-Antenna Wireless Communication System;" U.S. Patent No. 10,659,117 entitled "Codebook Restriction And Sub-Sampling For Channel State Information Reporting;" U.S. Patent No. 10,716,054 entitled "Methods And Systems For Controlling Network Access;" U.S. Patent No. 10,721,717 entitled "Band Combination Constraint On The Number Of Supported Layers;" and U.S. Patent No. 11,388,586 entitled "Downlink Control Channel Monitoring Capability For Ultra-Reliable Low-Latency Communications."

151. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. §

271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers that make, import, use, purchase, offer to sell, and/or sell the Accused Products comprising all of the limitations of one or more claims of the '005 patent to directly infringe one or more claims of the '005 patent by making, using, offering for sale, selling, and/or importing the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the '005 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals for the Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

152. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented

invention of one or more claims of the '005 patent, constituting a material part of the invention. On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '005 patent, and such components are not a staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '005 patent that are especially made or especially adapted for use in end user products that infringe the '005 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

153. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(1) includes supplying or causing to be supplied in or from the United States all or a substantial portion of the components of the patented invention of one or more claims of the '005 patent, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '005 patent, where Qualcomm actively induces the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion

of the components of the patented inventions of the '005 patent, where Qualcomm actively induces the combination of the hardware and/or software/firmware components with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the components of the Accused Products in conformity with U.S. laws and regulations, manufacturing the components of the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and software/firmware components, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and/or software/firmware components with other components as part of making an end user device in part or in whole, testing and certifying features related to infringing features in the Accused Products, providing software and/or firmware for the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

154. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(2) includes supplying or causing to be supplied in or from the United States components of the patented invention of one or more claims of the '005 patent that are especially made or

especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use, where such components are uncombined in whole or in part, knowing that such components are so made or adapted and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '005 patent, where such components are uncombined in whole or in part, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '005 patent, where such components are uncombined in whole or in part with other components of an end user device, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States.

155. On information and belief, despite having knowledge of the '005 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '005 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high

likelihood of infringement. Qualcomm's infringing activities relative to the '005 patent have been, and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

156. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

COUNT VII

(INFRINGEMENT OF U.S. PATENT NO. 8,873,517)

157. Plaintiff incorporates paragraphs 1 through 156 herein by reference.

158. Redwood is the assignee of the '517 patent, entitled "Wireless Communication System, Wireless Communication Apparatus, Wireless Communication Method and Computer Program," with ownership of all substantial rights in the '517 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

159. The '517 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '517 patent issued from U.S. Patent Application No. 11/333,582.

160. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '517 patent in this judicial district and elsewhere in Texas and the United States.

161. Qualcomm directly infringes the '517 patent via 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing the Accused Products, their components and

processes, and/or products containing the same that incorporate the fundamental technologies covered by the '517 patent.

162. Furthermore, Defendants directly infringe the '517 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '517 patent under 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing those Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '517 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers, distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '517 patent. *See, e.g., Lake Cherokee Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc.*, 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

163. For example, Qualcomm infringes claim 1 of the '517 patent via the Accused Products, including the Immersive Home 214 Platform. The Accused Products, including the

Immersive Home 214 Platform, are mesh stations in a wireless communication system using a signal described in IEEE 802.11. *See, e.g.*, Sections 14.3.2 and 14.13.2.1 of IEEE 802.11 2016; <https://www.qualcomm.com/news/releases/2020/10/qualcomm-unveils-immersive-home-platform-next-generation-mesh-wi-fi> (“Broad Wi-Fi technology support: Qualcomm Immersive Home Platforms are built to deliver seamless roaming, band/node client steering, and advanced security safeguards across Wi-Fi 4, 5, 6, 6E, and support many of the industry’s leading mesh software protocols including Qualcomm® Wi-Fi SON, the OpenSync™ open-source software, zero’s TrueMesh and the Wi-Fi Alliance’s Wi-Fi CERTIFIED EasyMesh™ standard.”); <https://www.qualcomm.com/products/internet-of-things/networking/wi-fi-networks/immersive-home-platforms/immersive-home-214-platform> (“The next generation successor to our groundbreaking mesh networking platforms, Qualcomm Immersive Home Platforms are designed to deliver Gigabit-speed wireless performance to every room in the home with devices that fit in the palm of the hand.”).

164. The Accused Products, including the Immersive Home 214 Platform, each comprise circuitry configured to set a duration of transmission opportunity and an offset of the transmission opportunity indicating a beginning of the transmission opportunity with respect to a beginning of a transmission interval. For example, the Accused Products, including the Immersive Home 214 Platform, comprise circuitry configured to set a duration of a transmission opportunity via a Mesh Awake Window, which specifies the duration of a transmission opportunity. *See, e.g.*, Figure 14-6 of IEEE 802.11 2016. The Accused Products comprise circuitry configured to perform a Target Beacon Transmission Time (“TBTT”) adjustment procedure, subtracting a delay amount as an offset from the TBTT, which indicates a beginning of the Mesh Awake Windows. *See, e.g.*, Section 14.13.4.4.3 and Figure 14-6 of IEEE 802.11 2016. The adjusted TBTT indicates a

beginning of the Mesh Awake Window with respect to the beginning of a Beacon Interval. *See, e.g.*, Section 14.13.4.4.3 and Figure 14-6 of IEEE 802.11 2016.

165. The Accused Products, including the Immersive Home 214 Platform, each comprise circuitry configured to transmit information specifying the duration and the offset to at least one or more other mesh stations. For example, the Accused Products are configured to transmit Mesh Beacons specifying the duration and the offset to at least one or more other mesh stations. *See, e.g.*, Sections 9.4.2.105, 14.13.4.2.5, 14.13.3.1, and 14.13.4.4.3 of IEEE 802.11 2016.

166. The Accused Products, including the Immersive Home 214 Platform, each comprise circuitry configured to transmit or receive data during the transmission opportunity. For example, the Accused Products are configured to transmit or receive data during the Mesh Awake Window. *See, e.g.*, Section 14.14.4.7 and Figure 14-6 of IEEE 802.11 2016.

167. The specific ways in which the Accused Products, including the Immersive Home 214 Platform, are configured to support the aforementioned features of IEEE 802.11 2016 are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products as to at least Claim 1 of the '517 patent.

168. Furthermore, the Accused Products, including the Immersive Home 214 Platform, are configured or implemented in an infringing manner with the features and functionality recited in at least Claim 1 of the '517 patent.

169. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

170. The claims of the '517 patent are patent eligible under 35 U.S.C. § 101. The '517 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, the '517

patent describes a specific problem to be solved in signal transmission and communication, and its claims are directed to specific ways of solving that problem. The '517 patent is eligible because it is directed to a non-abstract improvement in an existing technological process. Indeed, the '517 patent is directed to improving the efficiency of a wireless network by setting durations and transmission opportunities to evade mutual interference among communication stations within a mesh network. *See, e.g.*, '517 patent, 1:40-46) (the '517 patent enables a “communication station[s] to evade mutual interference”).

171. For example, the claims of the '517 patent provide a specific solution of evading mutual interference by setting durations and periodicities of transmission opportunities. As the '517 patent explains, these limitations effectively shift beacon transmission times away from each other to evade overlapping transmissions among communication stations, thus advancing the goal of evading interference. *See, e.g.*, '517 patent, 21:50-60 (“By providing the TBTT offset, actual beacon transmission times can be shifted from each other even in a case where two communication stations arrange their beacon transmission timing in the same slot on a super frame.”). Accordingly, claim 1 does not cover an abstract idea but instead covers a patentable improvement in signal transmission. *See, e.g., Id.*, claim 1 (“set a duration of transmission opportunity and an offset of the transmit opportunity indicating a beginning of the transmission opportunity with respect to a beginning of a transmission interval.”). In addition, the claims of the '517 patent are directed to solving problems, e.g., signal interference, that solely arise in computer technology (digital signal communication and transmission) via a specific improvement in its operation, e.g., shifting beacon transmission times away from each other to evade overlapping transmissions among communication stations. As such, they are not patent ineligible abstract ideas.

172. The claims of the '517 patent also survive step two of Alice because they recite an inventive concept that provides features that are more than well-understood, routine, conventional activity. As explained above, the claims shift beacon transmission times away from each other to evade overlapping transmissions among communication stations, thus advancing the goal of evading interference. The claims are directed to the technical solutions described in the specification. *See, e.g.*, '517 patent, claim 1, 1:40-46, 21:50-60.

173. At a minimum, Qualcomm has known of the '517 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the '517 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of the '517 patent via a letter. On January 31, 2022, Qualcomm received further notice of its infringement of the '517 patent when Redwood provided an infringement chart of the '517 patent via a data room that Qualcomm had access to and was regularly accessing. Furthermore, Qualcomm has known about the '517 patent since at least May 12, 2022, when Qualcomm and/or its agents received notice of its infringement via email. On information and belief, Qualcomm has also had knowledge of the '517 patent based at least on its conduct before the USPTO. For example, at least one patent document related to the '517 patent was cited by the Examiner or otherwise known by Qualcomm during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent No. 8,811,369 entitled "Methods And Apparatus For Supporting Multiple Communications Modes Of Operation;" U.S. Patent No. 8,340,027 entitled "Monitor Period For Asynchronous Wireless Communication;" U.S. Patent No. 8,737,313 entitled "Transmit Time Segments For Asynchronous Wireless Communication;" U.S. Patent No. 9,008,002 entitled "Conditional Requests For Asynchronous Wireless Communication;" U.S. Patent No. 8,416,762 entitled "Message Exchange Scheme For Asynchronous Wireless Communication;" U.S. Patent No.

8,595,501 entitled “Network Helper For Authentication Between A Token And Verifiers;” U.S. Patent No. 9,755,705 entitled “Method And Apparatus For Supporting Multi-User And Single-User MIMO In A Wireless Communication System;” U.S. Patent No. 8,867,565 entitled “MIMO and SDMA Signaling For Wireless Very High Throughput Systems;” U.S. Patent No. 8,792,459 entitled “Methods And Apparatus For Joint Scheduling Of Peer-To-Peer Links And Wireless Wide Area Network Links In Cellular Networks;” U.S. Patent Application Publication No. 2013/0034004 entitled “Reference TBTT Estimation Algorithm For Smart Power Saving On WLAN Client;” and U.S. Patent No. 9,301,266 entitled “Beacons For Wireless Communication.”

174. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. § 271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers that make, import, use, purchase, offer to sell, and/or sell the Accused Products comprising all of the limitations of one or more claims of the ’517 patent to directly infringe one or more claims of the ’517 patent by making, using, offering for sale, selling, and/or importing the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the ’517 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11

standards, distributing or making available instructions or manuals for the Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

175. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented invention of one or more claims of the '517 patent, constituting a material part of the invention. On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '517 patent, and such components are not a staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '517 patent that are especially made or especially adapted for use in end user products that infringe the '517 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

176. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(1) includes supplying or causing to be supplied in or from the United States all or a substantial portion of the components of the patented invention of one or more claims of the '517

patent, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '517 patent, where Qualcomm actively induces the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '517 patent, where Qualcomm actively induces the combination of the hardware and/or software/firmware components with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the components of the Accused Products in conformity with U.S. laws and regulations, manufacturing the components of the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and software/firmware components, distributing or making available instructions or manuals or

marketing materials regarding the combination of the hardware and/or software/firmware components with other components as part of making an end user device in part or in whole, testing and certifying features related to infringing features in the Accused Products, providing software and/or firmware for the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

177. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(2) includes supplying or causing to be supplied in or from the United States components of the patented invention of one or more claims of the '517 patent that are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use, where such components are uncombined in whole or in part, knowing that such components are so made or adapted and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '517 patent, where such components are uncombined in whole or in part, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or

software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '517 patent, where such components are uncombined in whole or in part with other components of an end user device, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States.

178. On information and belief, despite having knowledge of the '517 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '517 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high likelihood of infringement. Qualcomm's infringing activities relative to the '517 patent have been, and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

179. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

COUNT VIII

(INFRINGEMENT OF U.S. PATENT NO. 9,628,300)

180. Plaintiff incorporates paragraphs 1 through 179 herein by reference.

181. Redwood is the assignee of the '300 patent, entitled "Method and Signal Generating Apparatus for Generating Modulation Signals" with ownership of all substantial

rights in the '300 patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

182. The '300 patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code. The '300 patent issued from U.S. Patent Application No. 14/591,346.

183. Qualcomm has and continues to directly and/or indirectly infringe one or more claims of the '300 patent in this judicial district and elsewhere in Texas and the United States.

184. Qualcomm directly infringes the '300 patent via 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing the Accused Products, their components and processes, and/or products containing the same that incorporate the fundamental technologies covered by the '300 patent.

185. Furthermore, Defendants directly infringe the '300 patent through its direct involvement in the activities of its subsidiaries. Such subsidiaries conduct activities that constitute direct infringement of the '300 patent under 35 U.S.C. § 271(a) by making, using, offering for sale, selling, and/or importing those Accused Products, their components and processes, and/or products containing the same that incorporated the fundamental technologies covered by the '300 patent. Further, Defendants are vicariously liable for this infringing conduct of its subsidiaries (under both the alter ego and agency theories) because, as an example and on information and belief, Qualcomm Incorporated, QTI, and their subsidiaries and related companies are essentially the same company, and Qualcomm Incorporated and/or QTI have the right and ability to control their subsidiaries infringing acts and receive a direct financial benefit from the infringement of its subsidiaries. Furthermore, on information and belief, Qualcomm sells and makes the Accused Products outside of the United States, delivers those products to manufacturers, customers,

distributors, and/or subsidiaries in the United States, or in the case that it delivers the Accused Products outside of the United States it does so intending and/or knowing that those products or products that are manufactured to include Qualcomm's Accused Products are destined for the United States and/or designing those products for inclusion in other products to be placed on sale and used in the United States, thereby directly infringing the '300 patent. *See, e.g., Lake Cherokee Hard Drive Techs., L.L.C. v. Marvell Semiconductor, Inc.*, 964 F. Supp. 2d 653, 658 (E.D. Tex. 2013).

186. For example, Qualcomm infringes claim 1 of the '300 patent via the Accused Products, including the FastConnect 7800. Each of the Accused Products perform a method of transmitting modulation signals. *See, e.g.*, Sections 19.1.1 and 19.1.2 of IEEE 802.11 2016; <https://www.qualcomm.com/products/technology/wi-fi/fastconnect/fastconnect-7800> (“The Qualcomm FastConnect 7800 is an advanced 14nm Wi-Fi and Bluetooth® Connectivity system delivering ultra-high speeds;” “Standards: 802.11be, 802.11ax, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a;” “Antenna Configuration: 2x2;” and “Spatial Streams: Up to 4.”).

187. The Accused Products, including the FastConnect 7800, each generate a plurality of modulation signals each of which is to be transmitted from a different one of a plurality of antennas. For example, each of the Accused Products generate modulation signals (e.g., HT-mixed format PPDU) which are to be transmitted from a plurality of antennas. *See, e.g.*, Section 9.3.3 of IEEE 802.11 2016. Each modulation signal includes a pilot symbol sequence and/or a pilot subcarrier including a plurality of pilot symbols used for demodulation. For example, each OFDM symbol within a modulation signal includes a pilot symbol sequence, in a 20 MHz transmission, of four pilot symbols located at carrier positions -21, -7, 7, and 21, or a pilot symbol sequence, in a 40 MHz transmission, of six pilot symbols, where the pilot symbols are used for demodulation

for detecting frequency offsets and phase noise. *See, e.g.*, Sections 17.3.5.9, 19.3.11.10, and Equation 19-54 of IEEE 802.11 2016.

188. Each of the Accused Products insert each of the pilot symbol sequences and/or pilot subcarriers at a same temporal point in each modulation signal. For example, each of the modulation signals is comprised of pilot symbol sequences that include at least four pilot symbols inserted in, for example, carrier positions -21, -7, 7, and 21, such that each modulation signal and respective pilot symbol sequence are inserted and transmitted simultaneously in time. *See, e.g.*, Section 19.3.11.10 of IEEE 802.11 2016. The pilot symbol sequences and/or pilot subcarriers are orthogonal to each other, where each pilot symbol has a non-zero amplitude. For example, the pilot sequences corresponding to different spatial streams are orthogonal to each other and have zero mutual correlation. *See, e.g.*, Table 19-19 of IEEE 802.11 2016. A quantity of the plurality of pilot symbols in each pilot symbol sequence and/or pilot subcarrier are greater than a quantity of the plurality of modulation signals to be transmitted. As previously discussed, each pilot symbol sequence contains at least four pilot symbols in a 20 MHz transmission and at least six pilot symbols in a 40 MHz transmission, such that these quantities are greater than a respective number of modulation signals to be transmitted by the Accused Device. *See, e.g.*, Sections 19.1.1, 19.3.11.10 and Equation 19-54 of IEEE 802.11 2016.

189. Each of the Accused Products transmit in an identical frequency band the plurality of modulation signals, each including different transmission data and one of the pilot symbol sequences and/or pilot subcarriers, from the plurality of antennas. For example, each of the modulation signals is transmitted using a channel (e.g., a 20 MHz channel or a 40 MHz channel) from at least two antennas, such that each of the modulation signals include different transmission

data. *See, e.g.*, Section 19.3.15.1, Tables 19-28, 19-29, and 19-30, and Figure 17-13 of IEEE 802.11 2016.

190. As previously discussed, each of the plurality of modulation signals contains one of the pilot symbol sequences and/or pilot subcarriers. *See, e.g.*, Section 19.3.11.10 of IEEE 802.11 2016.

191. Furthermore, the Accused Products are configured or implemented in an infringing manner with the features and functionality recited in at least claim 1 of the '300 patent.

192. The specific ways in which the Accused Products are configured to support the aforementioned features of IEEE 802.11n and/or IEEE 802.11ac and/or IEEE 802.11ax and/or IEEE 802.11be are further detailed in confidential documents and/or source code that evidence infringement by the Accused Products as to at least claim 1 of the '300 patent.

193. The technology discussion above and the exemplary Accused Products provide context for Plaintiff's infringement allegations.

194. The claims of the '300 patent are patent eligible under 35 U.S.C. § 101. The '300 patent is not directed to an ineligible abstract idea. For example, it is not a mathematical algorithm executed on a generic computer or a fundamental economic business practice. Instead, the '300 patent describes a specific problem to be solved in digital signal transmission and communication involving multiplexing modulation signals of a plurality of channels to the same frequency band and its claims are directed to specific ways of solving that problem. '300 patent, 1:26-29. The patent describes that "the foregoing conventional structure gives no thought to the synchronization between channels in the same frequency band as well as a frequency offset. As a result, this structure encounters the difficulty of achieving the most important factor in order to demultiplex a multiplexed signal, namely, obtaining an accuracy of estimating channels." *Id.* at 1:56-62. "The

present invention aims to provide a transmission method for estimating channels accurately and with ease from multiplexed modulation signals.” *Id.* at 1:66-2:1.

195. To overcome the aforementioned problems, the ’300 patent and its claims describe specific solutions for transmitting multiplexed communications. “The transmission method of the present invention transmits modulation signals of a plurality of channels available in the same frequency band from a plurality of antennas. A symbol used for demodulation is inserted in a given channel at a certain time, while in another channel symbol at the time, the same phase and quadrature signals in the in-phase quadrature plane are made to be zero signals. With this method, multiplexing the modulation signals of a plurality of channels to the same frequency allows increasing a data transmission rate. Because the symbol used for demodulation has not undergone the time multiplexing, so that the demodulation symbol can be isolated with ease at the reception apparatus.” *Id.*, 2:14-27. Claim 1 recites that “each pilot symbol ha[s] a non-zero amplitude.”

196. The ’300 patent and its claims describe another specific solution to overcome the aforementioned problems. “The transmission method of the present invention places the symbols used for demodulation at an identical time of the respective channels and orthogonally to each other. This preparation, i.e., the symbols used for demodulation are placed to be orthogonal to each other, allows the reception apparatus to isolate the symbols with ease for estimating channels.” *Id.*, 2:34-40. This additional solution is recited by claim 1 by the steps of “inserting each of the pilot symbol sequences and/or pilot subcarriers at a same temporal point in each modulation signal ..., wherein the pilot symbol sequences and/or pilot subcarriers are orthogonal to each other.” *Id.*, claim 1.

197. The ’300 patent describes a specific problem to be solved in multiplexing modulation signals from a plurality of antennas and its claims are directed to specific ways of

solving that problem. That solution is further implemented in the claims, including claim 1. Therefore, the claims of '300 patent are patent eligible. In addition, the claims of the '300 patent are directed to solving problems that solely arise in computer technology (digital signal communication and transmission) via a specific improvement to its operation. For example, the claims are directed to a specific improvement in wireless systems as to multiplexing modulation signals of a plurality of channels to the same frequency band. As such, they are not patent ineligible abstract ideas.

198. The claims also survive step two of Alice because they recite an inventive concept that provides features that are more than well-understood, routine, conventional activity. *See e.g.*, '300 patent, claim 9, 1:56-2:1, 2:14-27, 2:34-40.

199. At a minimum, Qualcomm has known of the '300 patent at least as early as the filing date of the Complaint. In addition, Qualcomm has known about the '300 patent since at least November 5, 2021, when Qualcomm and/or its agents received notice of the '300 patent via a letter. On January 18, 2022, Qualcomm received further notice of its infringement of the '300 patent when Redwood provided an infringement chart of the '300 patent via a data room that Qualcomm downloaded on January 19, 2022. Furthermore, Qualcomm has known about the '300 patent since at least May 12, 2022, when Qualcomm and/or its agents received further notice of its infringement via email. On information and belief, Qualcomm has also had knowledge of the '300 patent based at least on its conduct before the USPTO. For example, at least one patent document related to the '300 patent was cited by the Examiner or otherwise known by Qualcomm during the prosecution of the following patent documents assigned to Qualcomm: U.S. Patent No. 8,009,551 entitled "Initial Pilot Frequency Selection;" U.S. Patent No. 8,139,672 entitled "Methods And Apparatus For Pilot Communication In A Multi-Antenna Wireless Communication System;" U.S.

Patent No. 10,659,117 entitled “Codebook Restriction And Sub-Sampling For Channel State Information Reporting;” U.S. Patent No. 10,716,054 entitled “Methods And Systems For Controlling Network Access;” U.S. Patent No. 10,721,717 entitled “Band Combination Constraint On The Number Of Supported Layers;” and U.S. Patent No. 11,388,586 entitled “Downlink Control Channel Monitoring Capability For Ultra-Reliable Low-Latency Communications.”

200. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm has actively induced, under U.S.C. § 271(b), distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers that make, import, use, purchase, offer to sell, and/or sell the Accused Products comprising all of the limitations of one or more claims of the '300 patent to directly infringe one or more claims of the '300 patent by making, using, offering for sale, selling, and/or importing the Accused Products. Since at least the notice provided on the above-mentioned dates, Qualcomm does so with knowledge, or with willful blindness of the fact, that the induced acts constitute infringement of the '300 patent. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, end users, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the Accused Products in conformity with U.S. laws and regulations, manufacturing the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals for the Accused Products to purchasers and prospective buyers, providing the accused functionalities via hardware, software, and/or firmware that are included in the Accused Products to manufacturers, purchasers, sellers,

distributors, and/or end users, testing and certifying features related to infringing features in the Accused Products, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

201. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's contributory infringement pursuant to 35 U.S.C. § 271(c) includes offering to sell and/or license, selling and/or licensing, and/or providing within the United States, or importing into the United States, components of the patented invention of one or more claims of the '300 patent, constituting a material part of the invention. On information and belief, Qualcomm knows and has known the same to be especially made or especially adapted for use in an infringement of the '300 patent, and such components are not a staple article or commodity of commerce suitable for substantial noninfringing use. For example, Qualcomm offers to sell, sells, and/or licenses or otherwise provides hardware and/or software/firmware components of the Accused Products within the United States; the components constitute a material part of the claimed inventions of the '300 patent that are especially made or especially adapted for use in end user products that infringe the '300 patent; and the components are not a staple article or commodity of commerce suitable for substantial noninfringing use.

202. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(1) includes supplying or causing to be supplied in or from the United States all or a substantial portion of the components of the patented invention of one or more claims of the '300 patent, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm

supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '300 patent, where Qualcomm actively induces the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components of the Accused Products that comprise all or a substantial portion of the components of the patented inventions of the '300 patent, where Qualcomm actively induces the combination of the hardware and/or software/firmware components with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. Qualcomm intends to cause, and has taken affirmative steps to induce infringement by distributors, customers, subsidiaries, importers, partners, affiliates, resellers, manufacturers, and/or consumers by at least, inter alia, creating advertisements that promote the infringing use of the Accused Products, creating and/or maintaining and/or knowledge of established distribution channels for the Accused Products into and within the United States, manufacturing the components of the Accused Products in conformity with U.S. laws and regulations, manufacturing the components of the Accused Products in conformity with the relevant IEEE 802.11 standards, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and software/firmware components, distributing or making available instructions or manuals or marketing materials regarding the combination of the hardware and/or software/firmware components with other components as part of making an end user device in part or in whole, testing and certifying features related to infringing features in the Accused Products, providing software

and/or firmware for the Accused Products to manufacturers, purchasers, sellers, distributors, and/or end users, and/or providing technical support, replacement parts, or services for these products to these purchasers and/or sellers in the United States.

203. On information and belief, since at least the above-mentioned dates when Qualcomm was on notice of its infringement, Qualcomm's infringement pursuant to 35 U.S.C. § 271(f)(2) includes supplying or causing to be supplied in or from the United States components of the patented invention of one or more claims of the '300 patent that are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use, where such components are uncombined in whole or in part, knowing that such components are so made or adapted and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. For example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '300 patent, where such components are uncombined in whole or in part, knowing that such components are especially made or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. In another example, Qualcomm supplies or causes to be supplied in or from the United States the hardware and/or software/firmware components that comprise all or a substantial portion of the components of the patented inventions of the '300 patent, where such components are uncombined in whole or in part with other components of an end user device, knowing that such components are especially made

or especially adapted for use in the invention and not staple articles or commodities of commerce suitable for substantial noninfringing use and intending that such components will be combined with other components of an end user device outside of the United States in a manner that would infringe the patent if such combination occurred within the United States.

204. On information and belief, despite having knowledge of the '300 patent and knowledge that it is directly and/or indirectly infringing one or more claims of the '300 patent, Qualcomm has nevertheless continued its infringing conduct and disregarded an objectively high likelihood of infringement. Qualcomm's infringing activities relative to the '300 patent have been, and continue to be, willful, wanton, malicious, in bad-faith, deliberate, consciously wrongful, flagrant, characteristic of a pirate, and an egregious case of misconduct beyond typical infringement such that Plaintiff is entitled under 35 U.S.C. § 284 to enhanced damages up to three times the amount found or assessed.

205. Redwood has been damaged as a result of Qualcomm's infringing conduct described in this Count. Qualcomm is, thus, liable to Redwood in an amount that adequately compensates Redwood for Qualcomm's infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

CONCLUSION

206. Plaintiff Redwood is entitled to recover from Qualcomm the damages sustained by Plaintiff as a result of Qualcomm's wrongful acts, and willful infringement, in an amount subject to proof at trial, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court.

207. Plaintiff has incurred and will incur attorneys' fees, costs, and expenses in the prosecution of this action. The circumstances of this dispute may give rise to an exceptional case

within the meaning of 35 U.S.C. § 285, and Plaintiff is entitled to recover its reasonable and necessary attorneys' fees, costs, and expenses.

JURY DEMAND

208. Plaintiff hereby requests a trial by jury pursuant to Rule 38 of the Federal Rules of Civil Procedure.

PRAYER FOR RELIEF

209. Plaintiff respectfully requests that the Court find in its favor and against Qualcomm, and that the Court grant Plaintiff the following relief:

1. A judgment that Qualcomm has infringed the Asserted Patents as alleged herein, directly and/or indirectly;
2. A judgment for an accounting of all damages sustained by Plaintiff as a result of the acts of infringement by Qualcomm;
3. A judgment and order requiring Qualcomm to pay Plaintiff damages under 35 U.S.C. § 284, including up to treble damages as provided by 35 U.S.C. § 284, and any royalties determined to be appropriate;
4. A judgment and order requiring Qualcomm to pay Plaintiff pre-judgment and post-judgment interest on the damages awarded;
5. A judgment and order finding this to be an exceptional case and requiring Qualcomm to pay the costs of this action (including all disbursements) and attorneys' fees as provided by 35 U.S.C. § 285; and
6. Such other and further relief as the Court deems just and equitable.

Dated: October 4, 2023

Respectfully submitted,

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