UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

MASSIVELY BROADBAND LLC Plaintiff, v. SAMSUNG ELECTRONICS CO., LTD. AND SAMSUNG ELECTRONICS AMERICA, INC., Defendants.	Case No. 2:25-cv-00608 **DEMAND FOR JURY TRIAL**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff, MASSIVELY BROADBAND LLC ("MASSIVELY BROADBAND"), files this complaint for patent infringement against Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (together, "Samsung") and in support thereof alleges and avers as follows:

NATURE OF THE ACTION

1. Professor Theodore Scott Rappaport, a world-renowned researcher, inventor, and educator, has had a storied career at the cutting edge of wireless communications. Prof. Rappaport's groundbreaking work on radio wave propagation and antennas, wireless communication system design, broadband wireless communications circuits and systems, and millimeter wave frequencies has paved the way for the commercialization of foundational wireless technologies, including 5G.

2. The Asserted Patents in this case are (i) U.S. Patent Nos. 7,676,194 ("'194 Patent"), 8,923,754 ("'754 Patent"), 9,667,337 ("'337 Patent"), 10,224,999 ("'999 Patent"), and 10,797,783 ("'783 Patent") (together, the "Intelligent Wireless Broadband Relay Patents"); (ii) U.S. Patent Nos. 8,350,763 ("'763 Patent"), 8,593,358 ("'358 Patent"), 11,063,625 ("'625 Patent"), and

11,876,548 ("'548 Patent") (together, the "Smart Antenna Patents"); and (iii) U.S. Patent Nos. 8,224,794 ("'794 Patent"), 8,515,925 ("'925 Patent"), and 8,725,700 ("'700 Patent") (together, the "Network Monitoring Patents") (Intelligent Wireless Broadband Relay Patents, Smart Antenna Patents, and Network Monitoring Patents collectively the "Asserted Patents"). The Asserted Patents are now owned by MASSIVELY BROADBAND, a company founded and managed by Prof. Rappaport, the named inventor of the Asserted Patents.

3. The Intelligent Wireless Broadband Relay Patents generally describe inventions for intelligent wireless repeaters and relays that operate at high bandwidths, such as 100 MHz or more, and/or high data rates, such as 100 Megabits per second (Mbps) or more. The repeaters and relays are intelligent, for example, in the sense that they can ignore or filter out transmissions from undesired sources, as well as provision and monitor aspects of wireless networks.

4. The Smart Antenna Patents relate to wireless devices, such as smartphones, with novel antenna technologies.

5. The Network Monitoring Patents relate to novel computerized "clearinghouse" systems and methods for collecting, storing, and managing contextual data from wireless devices and/or network infrastructure to support dynamic monitoring, control, configuration, and/or optimization of wireless communication services, device behavior, and policy enforcement.

6. Samsung has widely deployed the inventions claimed in the Asserted Patents in various products, including at least: (i) 5G Radio Access Network ("RAN") infrastructure equipment, including link cells, compact macros, and massive MIMO radios; (ii) mobile devices such as, but not limited to, (a) smartphones, such as Samsung Galaxy S20 through S25 series smartphones, Samsung Galaxy Note 20 Ultra smartphones, various Samsung Galaxy Z series smartphones (including but not limited to Z Fold 2, 3, 4, 5 and 6 models and Z Flip 3, 4, 5 and 6

models), and various A Series smartphones (including but not limited to A13, A14, A33, A34 and A36 5G models), (b) tablets such as various Galaxy Tab S7, S8, S9 and S10 tablets, and (c) laptops such as the Galaxy Book Pro 360 5G, the Galaxy Book Flex 5G, the Galaxy Book Go 5G and the Galaxy Book S 5G; (iii) other wireless hotspot capable devices, such as hospitality TVs and smart hub devices; and (iv) the Samsung Knox Suite ("Knox Suite"), including the Knox embedded security framework integrated into Samsung devices, as well as enterprise mobility solutions like Knox Manage and Knox Asset Intelligence, which enable remote configuration, policy enforcement, and device analytics (together, the "Accused Products").

7. Samsung does not have a license to the Asserted Patents. Instead, Samsung is flagrantly and willfully infringing the Asserted Patents in violation of the patent laws of the United States, 35 U.S.C. §§ 1 *et seq*.

PARTIES

8. Plaintiff MASSIVELY BROADBAND is a limited liability company organized under the laws of the State of Texas. Prof. Rappaport, sole inventor of the Asserted Patents, is MASSIVELY BROADBAND's sole founder and manager.

9. Upon information and belief, Defendant Samsung Electronics Co., Ltd. ("SEC") is a corporation organized under the laws of South Korea, with a place of business at 129 Samsung-Ro, Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, South Korea.

10. Upon information and belief, SEC exercises responsibility and/or control over various infringing activities, including manufacturing and/or having made products that infringe the Asserted Patents and selling, importing, having sold, and/or having imported those infringing products.

11. Upon information and belief, Samsung Electronics America, Inc. ("SEA") is a wholly-owned subsidiary of SEC and a corporation organized under the laws of the State of New York, with places of business at 85 Challenger Rd., Ridgefield Park, New Jersey 07660 and in the Eastern District of Texas.

12. Upon information and belief, SEA oversees the sales and distribution of Samsung's consumer electronic products in the United States, including the Accused Products, at the direction of SEC.

13. Defendants SEC and SEA are each individually liable and are jointly and severally liable for infringement of the Asserted Patents. Under theories of alter ego, single business enterprise liability, and agency, the conduct of each can be attributed to and considered the conduct of the other for purposes of infringement of the Asserted Patents. SEC and SEA have in the past and continue to hold themselves out in the United States as a single entity—"Samsung" as they will be referred to collectively herein—acting in concert, with knowledge of each other's actions and control over each other.

JURISDICTION AND VENUE

14. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 1 *et seq*., including 35 U.S.C. § 271.

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

16. This Court has personal jurisdiction over Samsung in this action because Samsung's contacts with the Eastern District of Texas are significant and pervasive. Samsung regularly transacts business in the State of Texas and within this District. Samsung engages in other persistent courses of conduct and derives substantial revenue from products and/or services

provided in this District and in Texas, and has purposefully established substantial, systematic, and continuous contacts within this District, such that it should reasonably expect to be sued in a court in this District. Given these contacts, the Court's exercise of jurisdiction over Samsung will not offend traditional notions of fair play and substantial justice.

17. Venue in the Eastern District of Texas is proper pursuant to 28 U.S.C. §§ 1391 and 1400(b). As to SEC, which is a corporation organized under the laws of South Korea, venue is proper as to a foreign defendant in any U.S. district. 28 U.S.C. § 1391(c)(3); *In re HTC Corp.*, 889 F.3d 1349 (Fed. Cir. 2018). Moreover, Samsung has a regular and established place of business in this District, including a flagship physical campus in Plano, and has committed acts of infringement within this judicial district giving rise to this action, including designing, testing, and selling infringing products in this District.

18. Moreover, this venue is familiar to Samsung, which has litigated over 195 federal district court cases in the Eastern District of Texas over the past five years.

19. Samsung touts that it has "deep ties to Texas," having spent over twenty-five years "working and investing in the state."[1]

20. SEA is registered to do business in the State of Texas and has been since 1996. SEA has appointed CT Corporation System, located at 1999 Bryan Street, Suite 900, Dallas, Texas 75201, as its registered agent in Texas.

21. Samsung has regular and established places of business in this State and in this District, including its flagship North Texas campus at 6625 Excellence Way, Plano, TX 75023 ("North Texas Campus").

[1] *See* Samsung, *Discover the Galaxy: New Samsung Experience Store Opens in Frisco, TX*, Samsung Newsroom U.S. (Feb. 18, 2022), https://news.samsung.com/us/new-frisco-tx-samsung-experience-store-open-galaxy/.

22. In 2018-2019, Samsung relocated its existing North Texas-based teams from Richardson and Plano facilities to the new North Texas Campus in Plano, which originally had over 200,000 square feet of space.

23. In its 2018 press release announcing the move, Samsung stated that it was "[l]ong committed to the North Texas community" and its "move to Plano further demonstrates the company's dedication to Texas and being an invested corporate citizen." Tim Baxter, President and CEO of "Samsung Electronics North America" explained that the move "not only provides [Samsung] with an opportunity to create an improved workplace experience for our Texas-based employees, but truly showcases our continued investment in our Texas roots."[2]

24. As of 2018, SEA's "second biggest employee population in the U.S. across multiple divisions – Customer Care, Mobile, Mobile R&D and Engineering" was housed in North Texas, with over 1,000 employees being relocated to the North Texas Campus from the preexisting facilities in Richardson and Plano. *See id.*

25. Upon information and belief, Samsung continues to house major customer care, mobile, mobile R&D, and engineering teams at its North Texas Campus, which has repeatedly grown in size, scope, and employee population since it opened.

26. For instance, Samsung expanded its North Texas Campus by another 75,000 square feet in 2020 and 60,000 square feet in 2021.

27. In 2023 Samsung opened the Samsung Networks Innovation Center at its North Texas Campus. Samsung touts this new executive briefing center as providing "an interactive and collaborative space for Samsung's customers and partners" at which Samsung "showcases the

[2] *See* Samsung, *Samsung Electronics America to Open Flagship North Texas Campus*, Samsung Newsroom U.S. (Apr. 6, 2018), https://news.samsung.com/us/samsung-electronics-america-open-flagship-north-texas-campus/.

company's latest network offerings and educates visitors on a wide range of advanced network technologies" and provides use case demos of "Samsung's advanced 5G network solutions and their role in supporting next-generation applications and services."[3]

28. Upon information and belief, Samsung employees have worked on research, development, and testing of the Accused Products in this District, including at Samsung's North Texas Campus.

29. Samsung's U.S. Mobile eXperience ("MX") business unit (previously known as the Mobile Communications business)—which works on the mobile phone and tablet Accused Products—is headquartered in Plano.[4]

30. Members of the MX business unit based in Plano have worked on the Accused Products.

31. Upon information and belief, those Samsung employees include (i) Dave Das, SEA's Executive Vice President, MX Business, who is based in Plano and "responsible for driving revenue, market share, and profit growth for Carrier and National Retail Sales, Mobile Products and Services, Integrated Marketing, Mobile Strategy, Mobile B2B, Mobile Computing & Wearables and Mobile Production Center teams in the U.S. market,"[5] (ii) Vinay Mahendra, a

[3] *See* Christine Nelson, *Blog: Samsung Networks Innovation Center Opens its Doors, Offering a Close Look at Advanced Network Connectivity*, Samsung (June 13, 2023), *available at* https://www.samsung.com/global/business/networks/insights/blog/0613-samsung-networks-innovation-center-opens-its-doors-offering-a-close-look-at-advanced-network-connectivity/.

[4] *See* Samsung, *Discover the Galaxy: New Samsung Experience Store Opens in Frisco, TX*, Samsung Newsroom U.S. (Feb. 18, 2022), *available at* https://news.samsung.com/us/new-frisco-tx-samsung-experience-store-open-galaxy/.

[5] *See* Samsung, *Executive Bios*, Samsung Newsroom U.S., https://news.samsung.com/us/about/executive-bios/#Dave%20Das (last visited May 15, 2025).

Director of Engineering Networks Business based in Dallas, and (iii) O. Terry Joseph, a 5G systems engineer and senior manager based in Plano.

32. Samsung's Networks Innovation Center and 5G Open Lab, both of which are located at Samsung's North Texas Campus, include dedicated testing facilities for research and development of, *inter alia*, RAN and private 5G networks.

33. According to Samsung's website, Samsung collaborates with multiple vendors including HPE, at their 5G Open Lab to simulate 5G networks and develop network interoperability.[6]

34. Upon information and belief, Samsung likewise conducts testing with partners and customers in Texas. For instance, Samsung reported in 2020 that it "teamed up" with Verizon, Motorola Mobility, and Qualcomm Technologies, Inc. to conduct a "trial" that "took place using a commercial network cell site in Texas" and "aggregated 800 MHz of 28 GHz band spectrum using Samsung Network's 5G NR 28 GHz Access Unit, which has been commercially deployed by Verizon."[7]

35. Samsung's North Texas Campus also is strategically located near several semiconductor manufacturing plants in Austin, TX, including an NXP Semiconductors plant.

36. Samsung partners with NXP Semiconductors to manufacture an ultra-wide band ("UWB") chipset used in their UWB enabled devices. NXP's Trimension SR100T UWB chipset,

[6] *See, e.g.*, Wonsik Kim, "Blog: Introducing Samsung's 5G Open Lab, the 5G Innovation Hub," Samsung (Nov. 5, 2020), https://www.samsung.com/global/business/networks/insights/blog/introducing-samsungs-5g-open-lab-5g-innovation-hub/?msockid=1541a5c55aa66d9710c4b0aa5bc96cd4.

[7] *See* Samsung, *Samsung Networks joins Verizon to demonstrate another 5G first: Verizon achieves 4.2 Gbps on its live 5G network*, Samsung Newsroom U.S. (Feb. 25, 2020), https://news.samsung.com/us/verizon-samsung-5g-network-motorola-qualcomm-achieves-4-2-gbps/.

which upon information and belief is manufactured in its Austin plant, can be found in Samsung's Accused Products.

37. Samsung also sells and offers for sale the Accused Products throughout the United States, including in Texas and this District.

38. For example, the Samsung Galaxy S line, Galaxy Z Flip line, and Galaxy Z Fold Line have been available for purchase through the Samsung website, which indicates Samsung will ship purchased products directly to customers in Texas and this District.

39. Accused Products likewise have been sold in this District through, *inter alia*, the physical and online stores of authorized Samsung retailers such as Best Buy, Wal-Mart, and Target.

FACTUAL BACKGROUND

A. Prof. Rappaport's Work in Wireless Communications

40. Prof. Rappaport is an acclaimed figure in the field of wireless communications, having spent over four decades doing cutting edge work in both academia and the industry.

41. Prof. Rappaport is currently the David Lee/Ernst Weber Professor of Electrical and Computer Engineering at the New York University Tandon School of Engineering. Prof. Rappaport also holds co-appointments as a Professor of Computer Science at the Courant Institute of Mathematical Sciences at NYU and as a Professor of Radiology at NYU Langone Health.

42. Prof. Rappaport is a member of the 2024-2025 class of Hagler Fellows at the Hagler Institute for Advanced Study at Texas A&M University in College Station, Texas. This is an honor

bestowed upon "top scholars who have distinguished themselves through outstanding professional accomplishments or significant recognition."[8]

43. Prof. Rappaport also has been named Neil Armstrong Distinguished Visiting Professor at Purdue University for 2024-2027. The Neil Armstrong Distinguishing Visiting Professors Program brings "highly accomplished and recognized scholars and practitioners" that are "preeminent in their fields" to Purdue to "advance interdisciplinary collaboration, engage with students and faculty, and foster global partnerships, driving groundbreaking research and advancing Purdue's mission of innovation."[9]

44. Prof. Rappaport began his academic career at Purdue University, where he obtained his BS, MS, and PhD, after which he began teaching as a professor at Virginia Tech. In 2002, Prof. Rappaport became the William and Bettye Nowlin Professor of Engineering at the University of Texas at Austin ("UT Austin"), where he taught for a decade before transitioning to NYU. In over three decades as a professor and thesis advisor at leading institutions, Prof. Rappaport has played a formative role in teaching the next generation of wireless researchers.

45. Prof. Rappaport founded several of the largest and most prominent academic wireless research centers, including (i) the Mobile and Portable Radio Research Group ("MPRG") at Virginia Tech, one of the world's first academic research centers for wireless communications, in 1990, (ii) the Wireless Networking and Communications Group ("WNCG") at UT Austin in

[8] *See* Hagler Institute for Advanced Study, *Hagler Fellows*, Texas A&M University, https://hias.tamu.edu/faculty-fellows/ (last visited May 12, 2025).

[9] *See* Purdue University College of Engineering, *Neil Armstrong Distinguished Visiting Professors*, Purdue University, https://engineering.purdue.edu/NADVP (last visited May 12, 2025).

2002, and (iii) NYU WIRELESS, an interdisciplinary center combining wireless engineering, computer science, and medicine in 2012.

46. At UT Austin, Prof. Rappaport launched an annual wireless communications education conference (formerly known as the Texas Wireless Summit and now called the 6G@UT Forum, co-sponsored by Ericsson), bringing together students, business leaders, and technical innovators in the industry. Subsequently, while at NYU, Prof. Rappaport founded the Brooklyn 5G summit (now called the Brooklyn 6G Summit), a premier technical meeting co-sponsored by Nokia/Bell Labs. This annual invitation-only event brings together executives from prominent global wireless companies and leading researchers to discuss the future of wireless. The event is broadcast live online by Institute of Electrical and Electronics Engineers ("IEEE").

47. Prof. Rappaport's renown in the field is reflected in countless awards and recognitions, including: (i) induction into the elite IEEE Vehicular Technology Hall of Fame in 2024; (ii) receipt of the NYU Research Catalyst Prize in 2022; (iii) election as a member of the National Academy of Engineering in 2021 for contributions to the characterization of radio frequency propagation in millimeter wave bands for cellular communication networks; (iv) receipt of the 2021 IEEE Global Communications Best Paper Award for the Wireless Communications Symposium; (v) receipt of the 2020 IEEE Eric E. Sumner Award for pioneering contributions to radio channel modeling and characterization, and millimeter wave communication systems; (vi) induction into the Wireless History Foundation Hall of Fame in 2019; and (vii) receipt of the 2018 Armstrong Medal from the Radio Club of America, the world's oldest radio society.

B. The Asserted Patents

48. Prof. Rappaport is the sole named inventor of the Asserted Patents.

49. On March 9, 2010, the USPTO duly and legally issued the ’194 Patent, titled “Broadband Repeater with Security for Ultrawideband Technologies.” A true and accurate copy of the ’194 Patent is attached hereto as Exhibit 1.

50. On December 30, 2014, the USPTO duly and legally issued the ’754 Patent, titled “Intelligent Broadband Relay for Wireless Networks.” A true and accurate copy of the ’754 Patent is attached hereto as Exhibit 2.

51. On May 30, 2017, the USPTO duly and legally issued the ’337 Patent, titled “Intelligent Broadband Relay for Wireless Networks for Connectivity to Mobile or Portable Devices.” A true and accurate copy of the ’337 Patent is attached hereto as Exhibit 3.

52. On March 5, 2019, the USPTO duly and legally issued the ’999 Patent, titled “Broadband Repeater with Security for Ultrawideband Technologies.” A true and accurate copy of the ’999 Patent is attached hereto as Exhibit 4.

53. On October 6, 2020, the USPTO duly and legally issued the ’783 Patent, titled “Broadband Repeater with Security for Ultrawideband Technologies.” A true and accurate copy of the ’783 Patent is attached hereto as Exhibit 5.

54. On January 8, 2013, the USPTO duly and legally issued the ’763 Patent, titled “Active Antennas for Multiple Bands in Wireless Portable Devices.” A true and accurate copy of the ’763 Patent is attached hereto as Exhibit 6.

55. On November 26, 2013, the USPTO duly and legally issued the ’358 Patent, titled “Active Antennas for Multiple Bands in Wireless Portable Devices.” A true and accurate copy of the ’358 Patent is attached hereto as Exhibit 7.

56. On July 13, 2021, the USPTO duly and legally issued the ’625 Patent, titled “Steerable Antenna Device.” A true and accurate copy of the ’625 Patent is attached hereto as Exhibit 8.

57. On January 16, 2024, the USPTO duly and legally issued the ’548 Patent, titled “Steerable Antenna Device.” A true and accurate copy of the ’548 Patent is attached hereto as Exhibit 9.

58. On July 17, 2012, the USPTO duly and legally issued the ’794 Patent, titled “Clearinghouse System, Method, and Process for Inventorying and Acquiring Infrastructure, Monitoring and Controlling Network Performance for Enhancement, and Providing Localized Content in Communication Networks.” A true and correct copy of the ’794 Patent is attached hereto as Exhibit 10.

59. On August 20, 2013, the USPTO duly and legally issued the ’925 Patent, titled “Clearinghouse System, Method, and Process for Inventorying and Acquiring Infrastructure, Monitoring and Controlling Network Performance for Enhancement, and Providing Localized Content in Communication Networks.” A true and correct copy of the ’925 Patent is attached hereto as Exhibit 11.

60. On May 13, 2014, the USPTO duly and legally issued the ’700 Patent, titled “Clearinghouse Systems and Methods for Collecting or Providing Quality or Performance Data for Enhanced Availability of Wireless Communications.” A true and correct copy of the ’700 Patent is attached hereto as Exhibit 12.

61. MASSIVELY BROADBAND is the owner of all right, title, and interest in and to the Asserted Patents, by assignment from Prof. Rappaport.

i. The Intelligent Wireless Broadband Relay Patents

62. The Intelligent Wireless Broadband Relay Patents generally describe inventions for intelligent wireless network repeaters and relays that operate at high bandwidths, such as 100 MHz or more, and/or high data rates, such as 100 Megabits per second (Mbps) or more. The repeaters and relays are intelligent, for example, in the sense that they can ignore or filter out transmissions from undesired sources, as well as provision and monitor aspects of the wireless networks.

63. The Intelligent Wireless Broadband Relay Patents claim priority to an application (Serial No. 10/919,515) filed August 17, 2004, and two provisional applications (Serial Nos. 60/496,913 and 60/498,324) filed August 22, 2003 and August 28, 2003, respectively.

64. In 2003, most cell phones operated on 2G networks, whose channels had bandwidths of about 0.2 MHz to 1.25 MHz, and data rates up to 0.384 Mbps, depending on the type of 2G network. Cell phones then also were not equipped for Wi-Fi communications. And smartphones, tablets, and ultra-thin laptops did not even exist.

65. Nevertheless, the descriptions for the Intelligent Wireless Broadband Relay Patents, which date back to 2003, presaged a time when wide bandwidth and high data rate wireless devices would "proliferate." *See* Ex. 1, '194 Patent at col. 1:20-32. "Wide bandwidth" here refers to bandwidths of 100 MHz or more (*see id.* at col. 3:57-59), which is nearly two orders of magnitude greater than the bandwidths of the 2G cellular channels available in 2003.

66. Prof. Rappaport recognized that such wide bandwidth channels "impl[y] a proportionally higher noise floor power level," which requires ultrawideband devices "generally to be physically closer in distan[ce] to each other in order to obtain a sufficiently strong signal to noise ratio (SNR) when compared to equal power devices with smaller passband channels." *Id*. at col. 3:66 – 4:5.

67. To combat this problem, along with the increased traffic that an anticipated proliferation of ultrawideband devices would bring, Prof. Rappaport envisioned and invented repeaters or relays "tailored for easy and rapid deployment to facilitate the interconnection of network devices using ultrawideband radio …." *Id.* at col. 3:51-56.

68. Prof. Rappaport further envisioned that ultrawideband devices "will be subject to tremendous and increased amount of interference, spam traffic, and RF interferences, as well as security attacks by rouge or spoofed message sources or unwanted transmitters." *Id.* at col. 4:10-13. Thus, his inventive repeaters included "the ability to detect and process such unwanted traffic in a personal or local area network, as well as to report back attempted breaches of security or interference sources to a network controller or host device which is connected to the internet." *Id.* at col. 4:13-18.

69. Claim 1 of the '754 Patent recites an example of Prof. Rappaport's intelligent wireless repeater or relay, stating:

> *1. A broadband wireless repeater or relay, comprising:*
>
> *at least one receiver or transceiver for signal or data reception from one or more devices;*
>
> *at least one transmitter or transceiver for signal or data transmission to one or more devices, wherein the transceiver for signal or data reception and the transceiver for signal or data transmission may be the same or different; and*
>
> *a controller that is configured or configurable for operation in one or more wireless networks, said controller communicating with said at least one receiver or transceiver for signal or data reception and said at least one transmitter or transceiver for signal or data transmission,*
>
> *wherein at least one of said receiver or transceiver for signal or data reception and said transmitter or transceiver for signal or data transmission either or both transmit and receive at an instantaneous or overall occupied bandwidth of 100 MHz or more or have a data transmission rate of 100 Megabits per second or more,*
>
> *wherein said controller is configured or configurable to perform or for performing a plurality of:*

a) ignore or filter out at least some signal or data transmissions from one or more undesired transmitters, users, networks, data sources, or noise sources;

b) instruct one or more devices or networks to ignore or disregard at least some signal or data transmissions of one or more undesired transmitters, undesired users, undesired networks, or noise sources; and

c) network provisioning or monitoring.

See Ex. 2, '754 Patent at col. 22:37-65.

70. The inventive wireless repeater or relay can act as a hotspot between two wireless networks, such as between a cellular network and a Wi-Fi network, as long as, according to claim 1 of the '754 Patent, one of the networks uses a channel with a bandwidth of 100 MHz or more or that has a data transmission rate of 100 Mbps or more.

71. Wireless communication technologies that have channels with a bandwidth of 100 MHz or more and/or that have a data transmission rate of 100 Mbps include, but are not limited to:

(a) Wi-Fi 5 (IEEE 802.11ac), Wi-Fi 6 (IEEE 802.11ax) and Wi-Fi 6E (also IEEE 802.11ax), all of which have 160 MHz channels and typical user data rates of between about 200 and 600 Mbps;

(b) The 3GPP cellphone standard for 4G-LTE and 5G New Radio ("NR") define Carrier Aggregation ("CA") as a mechanism that enables devices to transmit and/or receive across multiple component carriers, thereby achieving aggregated instantaneous or overall occupied bandwidths of 100 MHz or more, such as, within FR1 (which spans carrier frequencies between 440 MHz and 7.125 GHz). Several frequency bands, including Band 41, support CA across component carriers to achieve such bandwidths;

(c) 5G cellular, which has several bands (including but not limited to band n41, n48, n77, n78, n79, n90, n257, n258, n259, n260, n261) that have bandwidths of 100 MHz or more, and average data rates greater than 100 Mbps; and

(d) Citizens Broadband Radio Service ("CBRS")-based 5G deployments, including operations in LTE Band 48 and 5G NR Band n48, which can aggregate multiple 10 MHz channels to achieve total bandwidths approaching 100 MHz under the CBRS spectrum sharing framework.

72. The Intelligent Wireless Broadband Relay Patents further describe that the inventive wireless repeater or relay can include a configuration where one side of the repeater or relay has a wired connection. *See, e.g.*, Ex. 1, '194 Patent at col. 19:1-5. In that way, the inventive wireless repeater or relay could act as an access point or wireless router, providing Internet backbone access to ultrawideband devices.

73. Various claims of the '194, '754, '337, and '999 Patents recite that the repeater or relay uses "MIMO or adaptive antenna technology …." Ex. 2, '754 Patent at claim 13; *see also* Ex. 1, '194 Patent at claim 8; Ex. 3, '337 Patent at claim 17; and Ex. 4, '999 Patent at claim 12.

74. "MIMO" antennas in the context of the Intelligent Wireless Broadband Relay Patents refers to multiple-input multiple-output antennas. *See e.g.*, Ex. 2, '754 Patent at col. 6:8-9, col. 9:45-46.

75. A MIMO antenna system employs multiple antennas at both the transmitting and receiving ends of a wireless communication link, which configuration significantly enhances the performance and capacity of the system. It does so, for example, by (i) allowing for the simultaneous transmission and reception of multiple data streams, thereby effectively increasing the data transfer rate; (ii) sending different data streams through different spatial paths, thereby increasing the use of the available bandwidth; and/or (iii) improving signal quality by combining signals from multiple antennas, thereby reducing the impact of fading and interference.

76. Incorporating MIMO antennas into a broadband relay or repeater to intelligently repeat, process, and filter signals over wideband bandwidths, including using MIMO techniques to improve link quality under changing conditions, was inventive as of 2003. The MIMO antennas can be used to manage and combine various propagating signal paths in environments that undergo

complex reflections and interference, which is particularly important for wide bandwidth channels using very high data rates and short range.

77. Various claims of the Intelligent Wireless Broadband Relay Patents recite that the wireless repeater or relay transmits "beacon frames." *See* Ex. 5, '783 Patent at claim 1; Ex. 4, '999 Patent at claim 32.

78. Beacon frames are used in cellular networks, including 4G LTE and 5G networks, to broadcast information about the network.

79. Logical channels in 4G LTE and 5G with beacon frames include one or more of: a Broadcast Control Channel ("BCCH"); a Paging Control Channel ("PCCH"); a Common Control Channel ("CCH"); a Dedicated Control Channel ("DCCH"); and/or a Dedicated Traffic Channel ("DTCH").

80. Beacon frames are management frames in Wi-Fi 5, 6, and 6E, and are transmitted periodically to announce the presence of a wireless network and to provide a timing signal to synchronize communications with the devices using the network.

81. The inventions claimed in the Intelligent Wireless Broadband Relay Patents, including claim 1 of the '754 Patent recited above, address technological problems and provide technological solutions that were not well-understood, routine, or conventional in the 2003-2004 time frame.

82. A person of ordinary skill in the art reading the Intelligent Wireless Broadband Relay Patents and their claims would understand that (a) the disclosures and claims of the Intelligent Wireless Broadband Relay Patents are drawn to solving specific, technical problems; (b) the claimed subject matter represents an advancement in the technical field of the Intelligent Wireless Broadband Relay Patents, including that, when the patents were written, wireless

communication devices and networks with much greater bandwidth and vast quantities of data had not yet proliferated; and (c) at the time, severe interference and network management issues in the vicinity of other wireless high-data-rate devices were less onerous and, in fact, scarce when compared to today, where ultrawideband wireless connectivity is used practically everywhere and such issues are prevalent in the ubiquitous wireless data-heavy world in which we live. A wireless repeater or relay, with a receiver, transmitter, and/or transceiver operable at an "instantaneous or overall occupied bandwidth of 100 MHz or more or have a data transmission rate of 100 Megabits per second or more" solves the technical problem of connecting ultrawide bandwidth devices over greater distances than a single ultrawide bandwidth device could connect by itself. *See* Ex. 1, '194 Patent at col. 4:5-7. Further, the controller of the repeater or relay solves the problem of, for example, filtering out undesired transmissions to the ultrawideband device connected to the repeater/relay, so that the ultrawideband device operates more effectively and efficiently.

83. The claims of the Intelligent Wireless Broadband Relay Patents recite intelligent features that are beneficial to the connected devices, such as processing received data to determine what should be transmitted by the wireless repeater or relay. Additional claims recite MIMO antennas and transmission of beacon frames, such that those claims do not preempt repeater and relays that do not use MIMO antennas and/or transmit beacon frames.

84. The claims of the Intelligent Wireless Broadband Relay Patents address and provide a solution to a problem in the field of wireless communications—increasing the distance over which ultrawideband devices can communicate, which is otherwise relatively short without the inventions of the Intelligent Wireless Broadband Relay Patents, including the claimed use of repeaters that increase power and the achievable transmission lengths.

ii. Smart Antenna Patents

85. The Smart Antenna Patents relate to wireless devices with novel antenna technologies.

86. The ’763 and ’358 Patents claim priority to a non-provisional application (Serial No. 12/541,764), filed on August 14, 2009, and to a provisional application (Serial No. 61/088,829) filed on August 14, 2008.

87. An antenna operates more efficiently when it is tuned, or matched, to the frequency of its radio waves and to the circuit to which it is connected.

88. The ’763 and ’358 Patents explain that mobile devices require multiple antennas that are designed for different communication channels, such as cellular and Wi-Fi channels, which operate at vastly different frequencies. *See* Ex. 6, ’763 Patent at col. 1:20-27. Fitting and engineering multiple antennas into small mobile devices, however, is difficult, time-consuming, and expensive, especially considering the applicable requirements for radiation efficiency for mobile devices, as well as power considerations. *Id.* at col. 1:28-42, col. 9:57-58 (power or current drain).

89. “5G” cellular, the fifth-generation technology standard for cellular networks which cellular carriers began deploying in around 2019, exacerbated the need for multiple antennas in mobile devices. This is because 5G channels operate in different frequency bands, which can be broadly categorized into three main categories: (i) Low-band, or “Sub-1 GHz,” with frequencies below 1 GHz; (ii) Mid-band, or “Sub-6 GHz,” with frequencies greater than 1 GHz but less than 6 GHz; and (iii) High-band, or “mmWave,” which operates at 24 GHz and above.

90. mmWave channels are so named because their wavelengths are on the order of millimeters. For example, a 24 GHz signal has a wavelength of 12.5 mm and a 38 GHz signal has

a wavelength of approximately 7.9 mm. mmWave channels offer high data rates, but have much shorter range due to poorer penetration through obstacles like buildings than do the Low-band and Mid-band 5G channels.

91. To reduce the number of antennas that are needed in mobile devices, the '763 and '358 Patents describe an antenna that operates on multiple, different frequency bands (or channels), "thereby greatly simplifying the antenna structures in portable wireless devices, and greatly reducing the mechanical design complexity, the cost of bill of materials, and the variance in manufacturing of different devices of a particular model." Ex. 6, '763 Patent at col. 3:62-67.

92. The '763 and '358 Patents explain that the single antenna could be implemented with multiple elements, such as an antenna array (*see id.* at col. 9:65-66), and can be tuned to a particular frequency band actively or passively. *See id.* at col. 6:13-18, col. 8:61-9:3.

93. Claim 1 of the '763 Patent recites an example of a wireless device with Prof. Rappaport's tunable antenna, stating:

> *1. A wireless device, comprising:*
>
> *one or more antennas; and*
>
> *a plurality of transmitters, receivers or transceivers that operate in one or more frequency bands,*
>
> *wherein at least one antenna of said one or more antennas is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands,*
>
> *wherein said at least one antenna is one or more of a) an actively tuned antenna, and b) is tuned by one or more passive elements which are selected or interconnected using electronic control.*

Id. at col. 10:18-28.

94. The '763 and '358 Patents further describe circuitry for, and claim, operating a single multi-band antenna at two different bands simultaneously. *See, e.g.*, *id.* at col. 4:1-15, col.

6:9-51, col. 10:32-35 (claim 3), col. 10:63-65 (claim 7), col. 11:27-12:9 (claim 13); Ex. 7, '358 Patent at col. 10:39-42 (claim 3), col. 11:12-14 (claim 9), col. 11:57-12:10 (claim 19).

95. The '763 and '358 Patents provide a novel solution to the engineering challenge of supporting an increasing number of wireless frequency bands within compact consumer electronics by enabling a single antenna structure to transmit and receive across multiple bands—thereby reducing size, complexity, and manufacturing cost while improving performance across device orientations.

96. The '763 and '358 Patents are narrowly drawn to active, tunable multi-band antenna systems and cover specific architectures involving tuning components (*e.g.*, tunable capacitors or inductors) and controllers for multi-band operation, excluding a purely single-band solution.

97. By enabling tuning of a single antenna to accommodate transmission and reception over multiple frequency bands, the inventions of the '763 and '358 Patents directly address and overcome the problem of limited antenna real estate and RF interference in compact devices, delivering a substantial improvement in the efficiency and scalability of wireless communications. Such a single antenna can, in turn, streamline design and manufacturing of devices and decrease material costs.

98. In addition to tunable antennas, the '625 and '548 Patents describe wireless devices with a steerable antenna, *e.g.*, an antenna whose radiation pattern can be steered to avoid directions where an obstacle has been detected that would interfere with, or attenuate, radio transmissions from the antenna. This "beam steering" supports effective operation of wireless devices on certain 5G bands, because those 5G bands are more easily blocked by attenuating objects, which can lead to a shorter coverage area. The Smart Antenna Patents exploit the benefits of directional antennas

by selecting optimal transmission paths, which avoid attenuating objects and extend the coverage area.

99. The ’625 and ’548 Patents claim priority to a continuation-in-part application (Serial No. 13/966,853), filed on August 14, 2013.

100. The ’625 and ’548 Patents explain that it is “useful to steer radiation energy of a portable or fixed device away from” an obstacle, such a person’s head, or body, or building, because the obstacle may “attenuate or interfere with an intended radiation signal of such a device.” Ex. 8, ’625 Patent at col. 10:46-52.

101. The ’625 and ’548 Patents describe how a sensor (or sensors) of the mobile device with the steerable antenna can be used to help detect an orientation of the obstacle relative to the mobile device. *See id.* at col. 11:52-56, col. 12:4-13:3. Based on this information, beamforming or beamsteering algorithms can determine an appropriate radiation pattern for the antenna so that the radiation pattern from the antenna is directed away from the obstacle. *Id.* at col. 12:8-11, col. 13:4-8. Furthermore, the antenna can be adjusted to radiate the energy in one or more desired directions. *Id.* at col. 11:65-12:3, col. 13:35-45.

102. The ’625 and ’548 Patents further describe how the steerable antenna could be implemented with an antenna array, including for a MIMO antenna system. *See id.* at col. 14:32-36.

103. Claim 1 of the ’625 Patent recites an example of a wireless device with such a steerable antenna, stating:

> *1. A method for avoiding radiation of a user or structure by a wireless device having at least one steerable antenna, comprising the steps of:*
>
> *detecting in a three dimensional space, using one or more cameras, microphones, audio sensors, ultrasound sensors or transducers, range finders, capacitive sensors, gyroscopes, light detectors, or motion detectors, an orientation of said wireless device relative to either or both said user and said structure;*

> *determining zones or spans of directions in the three dimensional space corresponding with one or more directions of either or both said user and said structure relative to said at least one steerable antenna; and*
>
> *adjusting one or more beam radiation patterns of said at least one steerable antenna to radiate in one or more directions which are not in said zones or spans of directions in the three dimensional space, wherein said at least one steerable antenna is configured to steer or direct its energy in particular directions while providing nulls or dead zones in other directions, and wherein said adjusting step adjusts the one or more beam radiation patterns for direction of energy to one or more of said particular directions while avoiding said zones or spans of directions in the three dimensional space, and wherein said at least one steerable antenna operates on one or multiple bands and radiates at one or more frequencies in the range of 10 GHz to 500 GHz.*

Id. at col. 14:55-15:15.

104. The above claim, as well as other claims of the ’625 and ’548 Patents, recite that the steerable antenna “operates on one or more frequencies in the range of 10 GHz to 500 GHz.” *Id.*; *see also id.* at claims 11 and 23; Ex. 9, ’548 Patent at claims 1, 7, and 12.

105. Beam steering is especially important for the mmWave bands of 5G cellular because radio transmissions at those bands are more easily attenuated by objects, which can lead to shorter coverage range.

106. The mmWave bands of 5G operate at frequencies in the range of 10 GHz to 500 GHz.

107. The n258 band of 5G NR operates at about 24 GHz.

108. The n261 band of 5G NR operates at about 39 GHz.

109. The n258 and n261 bands of 5G NR are commonly used in the U.S., with at least one major cellular carrier in the U.S. operating on each of those bands.

110. The ’625 and ’548 Patents address the technical limitations of conventional mobile antennas by claiming steerable antenna systems that dynamically direct radiation patterns away from obstructing objects or human users, thereby improving beam efficiency, reducing power loss, and enhancing signal integrity in high-frequency bands such as mmWave.

111. The claims of the ’625 and ’548 Patents are limited to specific steerable antenna architectures that employ active control to adjust directional radiation patterns, optionally with feedback from sensors or user interaction.

112. The inventions of the ’625 and ’548 Patents address the problem of degraded performance caused by blocked or misaligned antennas in handheld devices, especially at 10 GHz and above, by enabling antennas that automatically steer signals away from obstructions—providing a tangible improvement in link reliability and user experience in real-world environments, and thus yielding benefits such as increased coverage range and reduced power loss.

iii. Network Monitoring Patents

113. The Network Monitoring Patents describe novel and comprehensive methods and systems, running across both central servers and end-user mobile devices, for dynamic, location-aware management of wireless communication infrastructure and services, in which, for example, mobile devices, end users, and carriers interact through a centralized or distributed “clearinghouse” platform that inventories available assets, monitors network performance across multiple radio frequency bands, and enables responsive, real-time optimization of connectivity, device behavior, and service delivery based on contextual data such as user location, device usage patterns, and observed signal quality. The monitored information can be analyzed and used to produce recommendations or control commands that may be sent back to the user devices or network operators to optimize network usage, coverage, or user experience. Thus, the inventions claimed in the Network Monitoring Patents support centralized, dynamic, and automated monitoring and configuration of wireless device operations, tracking of service coverage and network conditions across geographies, and the use of user-specific data to enhance wireless performance, enforce policy controls, and deliver targeted content or configuration updates. This facilitates improved

service quality, resource efficiency, and user control. In an enterprise context, the inventions of the Network Monitoring Patents could be used to remotely monitor and optimize wireless device behavior and network interactions at scale, such as within an organization that manages many mobile devices for its employees.

114. The Network Monitoring Patents claim priority to three provisional applications: (i) Serial No, 60/971,175, filed on September 10, 2007; (ii) Serial No, 60/977,582, filed on October 4, 2007; and (iii) Serial No. 61/028,261, filed on February 13, 2008.

115. In the 2007-2008 timeframe, wireless network operators, service providers, and enterprises generally lacked direct, scalable, and real-time visibility into the conditions under which end users experienced wireless connectivity—such as signal strength, quality of service, device configuration, and infrastructure availability—particularly across diverse geographic locations. Existing network planning and monitoring approaches relied heavily on static models, isolated test equipment, or costly consultants, and did not leverage the wealth of contextual data available from end-user devices themselves. Moreover, end users had historically been passive participants in network deployment and optimization, with no efficient means to contribute infrastructure resources or real-world performance insights.

116. The Network Monitoring Patents address these problems by introducing methods and systems in which a clearinghouse, such as a communication interface, aggregates, organizes, and acts upon location-specific and device-specific data. The communication interface enables the dynamic inventorying of assets (*e.g.*, towers, rooftops, and power sources), the continuous collection of real-world network performance data from mobile devices, and the responsive optimization of connectivity and device behavior based on current conditions. By incorporating feedback mechanisms, monitoring applications, and user engagement, the inventions provide a

scalable framework for proactive network and device management—supporting functions such as remote device monitoring, network-aware configuration updates, policy enforcement, and delivery of location-based services or content.

117. Claim 20 of the ’794 Patent recites an example of such a communication interface, stating:

> *20. A clearinghouse system for communications networks, comprising:*
>
> *one or more computers which interface with a database, the database including performance or quality of service information for one or more specific locations, and one or more of*
>
> > *records for one or more telecommunications carriers which identify infrastructure and location information for one or more specific locations,*
> >
> > *records for one or more end users which identify telecommunications assets or property assets owned or controlled by said one or more end users, and*
> >
> > *public records which include, for a plurality of geographic locations, one or more of mapping information for said geographic locations, zoning information for said geographic locations, local ordinances for said geographic locations, contact information for government officials for said geographic locations, and information about carriers serving said geographic locations;*
>
> *one or more electronic interfaces to said one or more computers which permit performance or quality of service information obtained from one or more mobile or fixed devices that are located in one of said one or more specific locations to be automatically or manually updated into said database, and which permits at least one of said one or more telecommunications carriers or said one or more end users or one or more parties which are not telecommunications carriers or end users to review, catalog or sort information in said database; and*
>
> *one or more applications operable with said one or more mobile or fixed devices or said one or more computers for obtaining and providing said performance or quality of service information to said one or more electronic interfaces.*

See Ex. 10, ’794 Patent at col. 37:56-38:24.

118. By way of further example, dependent claim 25 of the ’794 Patent, which depends from claim 20, recites that the clearinghouse system further comprises “a monitoring application which permits monitoring of radio operating conditions of one or more wireless devices, wherein

monitored radio operating conditions are used to update performance or quality of service information in said database." *Id.* at col. 38:42-47.

119. The Network Monitoring Patents solve, for example, the technical problem of fragmented and inefficient network infrastructure management by introducing a novel clearinghouse system that dynamically collects, aggregates, and applies real-world, location-specific radio operating conditions from wireless devices to optimize service quality and infrastructure deployment—representing a substantial advancement over static, consultant-driven approaches that lacked real-time responsiveness or integration with end-user data.

120. The claims of the Network Monitoring Patents are directed to specific, structured systems and methods involving a clearinghouse database, contextual data inputs from mobile devices, and monitoring applications that use radio operating conditions to update performance metrics.

121. The inventions of the Network Monitoring Patents address the technical challenge of enabling wireless network providers and enterprises to monitor and respond to variable network performance across devices and locations by using a monitoring application to collect radio operating condition data from wireless devices and updating a shared database with quality information or service information—thereby enabling a scalable, real-time solution applicable to modern enterprise-level systems, such as mobile device management and policy enforcement platforms.

C. The Accused Products and Samsung's Infringement

i. Hotspot Devices

122. A hotspot connects another nearby device (the "connected device") to the internet. The connection between the hotspot and the connected device is established through Wi-Fi, where

the hotspot shares its cellular network data with the connected device. Essentially, the hotspot taps into the internet backbone via its network connection—such as 4G LTE or 5G—and then broadcasts a Wi-Fi signal to which the connected device can connect. This allows devices, such as the connected device, without direct access to a cellular network to use the hotspot's cellular data connection for internet access. A hotspot is useful for, for example, staying connected on the go, especially in areas without Wi-Fi networks.

123. Samsung makes, has made, uses, sells, offers to sell, and/or distributes in the United States, and/or imports into the United States, devices that can operate as a hotspot, where the device is operable at channels with a bandwidth of 100 MHz more and/or data rates of 100 Mbps or more ("Accused Hotspot Devices"), including but not limited to the following products: (i) smartphones, such as but not limited to the Galaxy S20, S21, S22, S23. S24 and S25 model smartphones, the Galaxy Z Fold 2, 3, 4, 5, and 6 and Z Flip 5G, 3, 4, 5 and 6 model smartphones, the Galaxy Note 20 Ultra smartphones, and Galaxy Series A smartphones such as A13, A14, A15, A23, A25, A32, A35, A36, A42, A51, A52, A53, A54, and A71 model smartphones; (ii) tablets, such as but not limited to the Galaxy Series Tab S6, S7, S8, S9 and S10 tablets, along with the A9+, Active4 Pro and Active 5 model tablets; (iii) laptops, such as but not limited to the Galaxy Book Pro 360 5G, the Galaxy Book Flex 5G, the Galaxy Book Go 5G and the Galaxy Book S 5G model laptops; (iv) hospitality TVs, such as but not limited to the HQ60A series, NT690 series, NJ690 series, NT678 series, NJ678 series, NT670 series, and NJ670 series; and (v) smart hub devices, such as but not limited to SmartThings Hub, SmartThings Wi-Fi, Connect Home, and Connect Home Pro.

124. The Accused Hotspot Devices are configurable to operate as hotspots to connect a connected device via a Wi-Fi network to the Internet via a cellular network, using channels with bandwidths of 100 MHz or more and/or data rates of 100 Mbps or more.

125. The Accused Hotspot Devices are configurable to operate as hotspots to connect a connected device—using, for example, a Wi-Fi 5 (IEEE 802.11ac), Wi-Fi 6 (IEEE 802.11ax) and/or Wi-Fi 6E (IEEE 802.11ax) network—to the Internet backbone via, for example, a 4G LTE or a 5G cellular network.

126. Wi-Fi 5, Wi-Fi 6, and Wi-Fi 6E all support channels with bandwidths of 100 MHz or more.

127. Wi-Fi 5, Wi-Fi 6, and Wi-Fi 6E all support channels with bandwidths of 160 MHz.

128. The 160 MHz channels of Wi-Fi 5, Wi-Fi 6, and Wi-Fi 6E support data rates of 1000 Mbps or more.

129. 4G LTE and 5G cellular networks are used in the United States.

130. LTE-Advanced can aggregate up to five component carriers ("CCs"), each with a bandwidth of up to 20 MHz, resulting in a total aggregated bandwidth of up to 100 MHz.

131. 4G LTE CCs can be aggregated intra-band to achieve an aggregated bandwidth of 100 MHz or more.

132. 4G LTE Band 41 supports up to five 20 MHz carriers that can be aggregated to achieve an aggregated bandwidth of 100 MHz or more.

133. One or more cellular carriers have used and/or currently use Band 41 in the United States.

134. Aggregated 4G LTE channels can support data rates of 100 Mbps or more.

135. 5G cellular includes bands with bandwidths of 100 MHz or more and data rates of 100 Mbps or more, including the 4G bands.

136. 5G cellular bands that have bandwidths of 100 MHz or more include, but are not limited to, n41, n48, n77, n260, and n261.

137. The n41, n48, n77, n260, and n261 5G bands are used in the United States.

138. The n41, n48, n77, n260, and n261 5G bands can achieve data rates of 100 Mbps or more.

139. Upon information and belief, certain Accused Hotspot Devices, including but not limited to the Galaxy S20, S21, S22, S23, S24, S25, Note 20 Ultra, Z Fold 2, 3, 4, 5 and 6, Z Flip 3, 4, 5 and 6, and A52, A53, A54 and A71 model smartphones, the Galaxy Tab S6, S7, S8, S9, S10, A9+, Active4 Pro and Active5 model tablets, and the Galaxy Book Pro 360 5G, Galaxy Book Flex 5G, Galaxy Book Go 5Gm and Galaxy Book S model laptops, include a MIMO antenna.

140. The Accused Hotspot Devices transmit beacon frames for both cellular and Wi-Fi networks.

141. Samsung provides instructions to customers to configure and use Accused Hotspot Devices, including but not limited to Galaxy smartphones and tablets, in an infringing manner through customer-facing documentation like configuration guides and answers on the support pages of Samsung's website.[10]

142. For example, the configuration guides provide instructions to Samsung's customers on how to configure Accused Hotspot Devices to operate as hotspots for a wireless channel with a bandwidth of 100 MHz or more.[11]

143. A user of Accused Hotspot Devices, including but not limited to the Galaxy S20, S21, S22, S23, S24, S25, Note 20 Ultra, Z Fold 2, 3, 4, 5 and 6, Z Flip 3, 4, 5 and 6, and A52, A53,

[10] *See, e.g.*, Samsung, "Use a mobile hotspot on your Galaxy phone or tablet," https://www.samsung.com/us/support/answer/ANS10002918/ (last visited May 28, 2025) (providing instructions for how to, *inter alia*, "[t]urn on mobile hotspot," "[c]onfigure mobile hotspot," and "[s]et up an Automatic Hotspot").

[11] *See id.*

A54 and A71 model smartphones, the Galaxy Tab S6, S7, S8, S9, S10, A9+, Active4 Pro and Active5 model tablets, the Galaxy Book Pro 360 5G, Galaxy Book Flex 5G, Galaxy Book Go 5Gm, and Galaxy Book S model laptops, hospitality TVs, such as but not limited to the HQ60A series, NT690 series, NJ690 series, NT678 series, NJ678 series, NT670 series, and NJ670 series, and smart hub devices, such as but not limited to SmartThings Hub, SmartThings Wi-Fi, Connect Home, and Connect Home Pro, can follow the instructions provided by Samsung in its configuration guides to configure the Accused Hotspot Devices to operate in an infringing manner.[12]

144. A user of Accused Hotspot Devices, including but not limited to the Galaxy S20, S21, S22, S23, S24, S25, Note 20 Ultra, Z Fold 2, 3, 4, 5 and 6, Z Flip 3, 4, 5 and 6, and A52, A53, A54 and A71 model smartphones, the Galaxy Tab S6, S7, S8, S9, S10, A9+, Active4 Pro and Active5 model tablets, the Galaxy Book Pro 360 5G, Galaxy Book Flex 5G, Galaxy Book Go 5Gm and Galaxy Book S model laptops, hospitality TVs, such as but not limited to the HQ60A series, NT690 series, NJ690 series, NT678 series, NJ678 series, NT670 series, and NJ670 series, and smart hub devices, such as but not limited to SmartThings Hub, SmartThings Wi-Fi, Connect Home, and Connect Home Pro, can follow the instructions provided by Samsung in its configuration guides to configure the Accused Hotspot Devices to operate as hotspots for a wireless channel with a bandwidth of 100 MHz or more.[13]

145. Upon information and belief, certain Accused Hotspot Devices, including but not limited to Samsung's Hospitality TVs such as HQ60A series, NT690 series, NJ690 series, NT678

[12] *See id.*
[13] *See id.*

series, NJ678 series, NT670 series, NJ670 series, can be configured to deploy a hotspot through a software access point ("SoftAP").

146. Upon information and belief, wireless mobile devices can be connected to the Internet via Samsung Hospitality TVs, such as the HQ60A series, NT690 series, NJ690 series, NT678 series, NJ678 series, NT670 series, and NJ670 series, acting as a hotspot with a wireless channel with a bandwidth of 100 MHz or more.

147. Samsung provides instructions to customers to configure Samsung Hospitality TVs, such as the HQ60A series, NT690 series, NJ690 series, NT678 series, NJ678 series, NT670 series, and NJ670 series, through, for example, documentation like developer reference guides.[14]

148. The Accused Hotspot Devices infringe at least one claim of each of the Intelligent Wireless Broadband Relay Patents as set forth, by way of example, in the non-limiting exemplary claim charts attached hereto as Exhibits 13 to 17 respectively.

149. Users of the Accused Hotspot Devices include customers that purchase an Accused Hotspot Device for personal use.

150. Samsung provides instructions on how to configure the Accused Hotspot Devices as hotspots.

151. Users of the Accused Hotspot Devices can configure their Accused Hotspot Devices to operate as a hotspot according to the instructions in the user manual corresponding to the Accused Hotspot Device.

[14] *See, e.g.*, Samsung Developer, "Samsung Product API References: Network API," https://developer.samsung.com/smarttv/develop/api-references/samsung-product-api-references/network-api.html (last visited May 28, 2025).

152. As an example, a Samsung user manual for the Galaxy S24 Ultra smartphone is available for download from Samsung's website.[15]

153. This user manual includes instructions on how to configure the Galaxy S24 Ultra smartphone to operate as a hotspot:[16]

> **Mobile Hotspot**
>
> Use your phone as a mobile hotspot to share your phone's mobile data connection with other devices.
>
> 1 On the Settings screen, tap **Connections** → **Mobile Hotspot and Tethering** → **Mobile Hotspot**.
>
> 2 Tap the switch to turn it on.
> You can change the network name, password, and more.
> The Hotspot icon (((•))) appears on the status bar.
>
> 3 On the other device's screen, search for and select your phone from the Wi-Fi networks list.
> Alternatively, tap **QR code** on the Mobile Hotspot screen and scan the QR code with the other device.
>
> - If the mobile hotspot is not found, on your phone, set **Band** to **2.4 GHz**, tap **Advanced**, and then tap the **Hidden network** switch to turn it off.
> - If you turn on the **Auto Hotspot** feature, you can share your phone's mobile data connection with other devices signed in to your Samsung account.

154. A user of the Galaxy S24 Ultra could configure their Galaxy S24 Ultra to operate as a hotspot based on the instructions in the Samsung user manual for the Galaxy S24 Ultra.

155. The components of the Accused Hotspot Devices that provide the hotspot capability have no substantial use other than to provide the hotspot capability.

[15] *See* Samsung, *User Guide Rev. 1.1* (May 2025), *available at* https://downloadcenter.samsung.com/content/UM/202505/20250521090034599/SM-S92X_UG_LTN_15_Eng_Rev.1.1_250519.pdf.

[16] *Id.* at 121.

156. The components of the Accused Hotspot Devices that provide the hotspot capability are a material part of the claims of the Intelligent Wireless Broadband Relay Patents.

ii. RAN Products

157. Samsung makes, has made, uses, sells, offers to sell, and/or distributes in the United States, and/or imports into the United States, radio access network ("RAN") equipment and components that provide cellular coverage for mobile devices with channels that have a bandwidth of 100 MHz more and/or data rates of 100 Mbps or more ("Accused RAN Products"), including but not limited to: (i) Massive MIMO radios, (ii) Compact Macros, (iii) Link Cells, (iv) CBRS radios, and (v) mmWave radios.

158. The Accused RAN Products are configurable to provide a 5G cellular data connection to mobile devices, with 5G channels having bandwidths of 100 MHz or more and/or data rates of 100 Mbps or more.

159. Certain Accused RAN Products, including but not limited to Massive MIMO radios and compact macros, include a MIMO antenna.

160. The Accused RAN Products transmit beacon frames for cellular networks.

161. Samsung has described the Accused RAN Products, including but not limited to Massive MIMO radios, compact macros, CBRS radios, and mmWave radios, as configured to provide 5G networks through Fixed Wireless Access ("FWA"), which connect on the back end to the internet backbone.[17]

[17] *See* Tajinder (TJ) Maan, "Closing the Gap: How Samsung is Enabling a Connected Future for All," Samsung (Aug. 8, 2024), *available at* https://www.samsung.com/global/business/networks/insights/blog/0806-closing-the-gap-how-samsung-is-enabling-a-connected-future-for-all/.

162. Samsung has described the Accused RAN Products, including but not limited to Massive MIMO radios, compact macros, and mmWave radios, as configured to provide 5G networks through FWA, which connect on the back end to the internet backbone.[18]

163. The Accused RAN Products infringe at least one claim of each of the '194, '754 and '337 Patents as set forth, by way of example, in non-limiting exemplary claim charts attached hereto as Exhibits 13, 14 and 15 respectively.

164. Samsung provides instructions on how to install the Accused RAN Products.

165. As an example, an installation manual for a Samsung Massive MIMO device available for download online describes how to install a Samsung Massive MIMO device.[19]

166. Samsung also provides white papers describing how the Accused RAN Products operate as wireless receivers and transmitters.

167. As an example, Samsung has made available for download from its website a technical white paper titled "Massive MIMO for New Radio."[20]

168. This technical white paper describes how Samsung's Massive MIMO devices operate as a wireless transmitter and receiver, including for 5G channels with bandwidths of 100 MHz or more.

[18] Samsung, "Realizing the benefits of Fixed Wireless Access," https://www.samsung.com/global/business/networks/solutions/fixed-wireless-access/ (last visited May 28, 2025).

[19] Samsung, *MT6402-48A Installation Manual*, v. 1.0 (May 2019), *available at* https://fcc.report/FCC-ID/A3LMT6402-48A/4387889.pdf.

[20] Samsung, "Massive MIMO for New Radio" (December 2020), *available at* https://images.samsung.com/is/content/samsung/p5/global/business/networks/insights/white-papers/1208_massive-mimo-for-new-radio/MassiveMIMOforNRTechnicalWhitePaper-v1.2.0.pdf.

169. For example, Table 2 of that technical white paper describes a simulation set up with a channel bandwidth of 100 MHz.[21]

170. The technical white paper also describes an application "using 3.5 GHz carrier frequency."[22]

171. A 3.5 GHz carrier frequency falls within the n78 5G frequency band.

172. The n78 5G frequency band has a bandwidth greater than or equal to 100 MHz.

173. The total bandwidth of band n78 is 500 MHz, from 3300 MHz to 3800 MHz.

174. The components of the Accused RAN Products that provide a wireless transmitter and receiver for a channel with a bandwidth greater than or equal to 100 MHz have no substantial use other than to operate as a wireless transmitter and receiver configurable to operate at a channel with a bandwidth greater than or equal to 100 MHz.

175. The components of the Accused RAN Products that provide a wireless transmitter and receiver for a channel with a bandwidth greater than or equal to 100 MHz are a material part of the Intelligent Wireless Broadband Relay Patents.

iii. Advanced Antenna Mobile Devices

176. Samsung makes, has made, uses, sells, offers to sell, and/or distributes in the United States, and/or imports into the United States, wireless devices that can include a multi-frequency-band antenna ("Accused Advanced Antenna Mobile Devices"), including but not limited to (i) smartphones, such as but not limited to the Galaxy S20, S21, S22, S23, S24 and S25 model smartphones, Galaxy Z Flip 3, 4, 5 and 6 model smartphones, Galaxy Z Fold 3, 4, 5 and 6 model

[21] *Id.* at 15.

[22] *Id.* at 3.

smartphones, and Galaxy Note 20 model smartphones, and (ii) tablets, such as but not limited to the Galaxy Tab S10 and S10 Ultra model tablets.

177. The Accused Advanced Antenna Mobile Devices include one or more RF front-end modules ("FEMs") and/or modems that can tune an antenna of the Accused Advanced Antenna Mobile Devices to operate at multiple frequency bands, such as, but not limited to, multiple Sub-6 GHz bands.

178. On information and belief, certain Accused Advanced Antenna Mobile Devices, including but not limited to Galaxy S20 Ultra model smartphones and Galaxy Tab S7+ 5G tablets, include a Qualcomm Snapdragon X55 modem, which includes a QAT 3555 adaptive antenna impedance tuner that can be tuned to operate, for example, at channels from 600 MHz to 6 GHz, such as the n71 (600 MHz), n5 (850 MHz), n41 (2.5 GHz) and n78 (3.5 GHz) bands.

179. Upon information and belief, certain Accused Advanced Antenna Mobile Devices, including but not limited to the Galaxy S21 and S22 Series smartphones and Galaxy Tab S8+ and S9+ Series tablets, include a Qualcomm X60 or X65 modem, with an adaptive impedance tuner tunable to the n71, n41, n5, n2, n66, and n77 bands, which operate in a range from 600 MHz to 6 GHz.

180. Upon information and belief, certain Accused Advanced Antenna Mobile Devices, including but not limited to the Galaxy Tab S10 and S10 Ultra tablets, include a MediaTek Dimensity 9300+ chipset, which supports adaptive antenna tuning across multiple Sub-6 GHz bands, including the n71, n41 and n77 bands.

181. Qorvo, Inc. ("Qorvo") provides integrated antenna tuning integrated circuits ("ICs").

182. Qorvo's integrated antenna tuning ICs include ICs that are capable of actively tuning a single antenna to operate at multiple frequency bands.

183. Qorvo's integrated antenna tuning ICs include ICs that are capable of actively tuning a single antenna to operate at multiple frequency bands simultaneously.

184. At least some mobile devices made and sold by Samsung included a Qorvo integrated antenna tuning IC capable of actively tuning a single antenna to operate at multiple frequency bands.

185. At least some mobile devices made and sold by Samsung included a Qorvo integrated antenna tuning IC capable of actively tuning a single antenna to operate at multiple frequency bands simultaneously.

186. In 2021, Samsung awarded Qorvo with the Best Quality Award in the Mobile Communications Business Division.[23]

187. The Samsung award recognized Qorvo's continuous quality improvement on projects for the Samsung Galaxy 21 platform.[24]

188. Samsung Galaxy 21 platform models include the Galaxy S21, Galaxy S21+ and Galay S21 Ultra model smartphones.

189. Upon information and belief, certain Accused Advanced Antenna Mobile Devices, including but not limited to the Galaxy 21 platform models, include a Qorvo integrated antenna tuning IC, which supports adaptive antenna tuning across, for example, multiple Sub-6 GHz bands, including the n71, n41 and n77 bands.

[23] *See* Qorvo, "Qorvo Recognized by Samsung for Best Quality in Mobile" (May 27, 2021), *available at* https://www.qorvo.com/newsroom/news/2021/qorvo-recognized-by-samsung-for-best-quality-in-mobile.

[24] *See id*.

190. At least some mobile devices, including at least some smartphones and tablets, made, used, offered for sale, sold and/or imported by Samsung within the U.S., include an antenna tunable to multiple Sub-6 GHz 5G frequency bands.

191. At least some mobile devices, including at least some smartphones and tablets, made, used, offered for sale, sold and/or imported by Samsung within the U.S., use adaptive impedance tuning to tune an antenna to different Sub-6 GHz 5G frequency bands.

192. At least some mobile devices, including at least some smartphones and tablets, made, used, offered for sale, sold and/or imported by Samsung within the U.S., use adaptive impedance tuning to tune a MIMO antenna to different Sub-6 GHz 5G frequency bands.

193. Upon information and belief, at least some mobile devices, including at least some smartphones and tablets, made, used, offered for sale, sold and/or imported by Samsung within the U.S., include a 4x4 MIMO antenna that is actively tunable to different Sub-6 GHz 5G bands.

194. The adaptive impedance tuning in the Accused Advanced Antenna Mobile Devices employs active tuning using tunable passive elements.

195. RF front-end components, including but not limited to Qualcomm's QAT355x tuners, in various Accused Advanced Antenna Mobile Devices, employ active tuning using tunable passive elements.

196. Upon information and belief, certain Accused Advanced Antenna Mobile Devices, including not limited to the Galaxy S21, S22, S23 S24, and S25 model smartphones, the Galaxy Z Flip 3, 4, 5 and 6 model smartphones, the Galaxy Fold 3, 4, 5 and 6 model smartphones, and the Galaxy Note 20 model smartphones, include (i) one or more on-board sensors for detecting an orientation of the Accused Advanced Antenna Mobile Device and (ii) a steerable antenna that (a)

radiates at frequencies in the range of 10 GHz to 500 GHz and (b) in a direction determined at least in part based on the orientation of the Accused Advanced Antenna Mobile Device.

197. 5G cellular networks support channels with frequencies greater than 10 GHz and less than 500 GHz.

198. The so-called Frequency Range 2 ("FR2"), which is one of the frequency ranges supported by 5G, includes frequency bands from 24.25 GHz to 52.6 GHz, which are greater than 10 GHz and less than 500 GHz.

199. The FR2 bands have wavelengths from approximately 5.7 mm to approximately 12.36 mm. For this reason, FR2 bands are often referred to as "millimeter wave" bands.

200. FR2 bands that have frequencies greater than 10 GHz and less than 500 GHz, and that are used in the United States by U.S.-based cellular carriers, include the n260 and n261 bands.

201. n260 operates at approximately 39 GHz, which is greater than 10 GHz and less than 500 GHz.

202. n261 operates at approximately 28 GHz, which is greater than 10 GHz and less than 500 GHz.

203. Samsung makes, uses, offers to sell, sells, and/or imports at least some mobile devices within the U.S., including at least some smartphones and tablets, that include a steerable antenna operable at a frequency in the range of 10 GHz to 500 GHz.

204. Samsung makes, uses, offers to sell, sells, and/or imports at least some mobile devices within the U.S., including at least some smartphones and tablets, that include a steerable MIMO antenna operable at a frequency in the range of 10 GHz to 500 GHz.

205. Samsung makes, uses, offers to sell, sells, and/or imports at least some mobile devices within the U.S., including at least some smartphones and tablets, that include a steerable antenna operable at the n260 and/or n261 bands.

206. Samsung makes, uses, offers to sell, sells, and/or imports at least some mobile devices within the U.S., including at least some smartphones and tablets, that include a steerable MIMO antenna operable at the n260 and/or n261 bands.

207. Upon information and belief, certain Accused Advanced Antenna Mobile Devices, including but not limited to the S21 Ultra and the Z Fold5 model smartphones, include a Qualcomm QTM525 or QTM545 module. These modules include phased array antennas configured to operate in mmWave 5G bands, including n260 and/or n261 bands, and enable electronic beam steering. Upon information and belief, at least those Accused Advanced Antenna Mobile Devices include a sensor(s) to detect an orientation of the device, such as proximity to an obstruction, which can trigger changes to beamforming behavior of the phase array antennas. Upon information and belief, the sensor(s) used to detect the orientation of the device, such as proximity to an obstruction, include, but are not limited to, (i) a range finder embodied, in whole or in part, by the modem and RF front-end system of the Accused Advanced Antenna Mobile Devices, including the phased array module and associated transceiver, (ii) one or more capacitive sensors, (iii) one or more light detectors, and/or (iv) one or more gyroscopes.

208. The Accused Advanced Antenna Mobile Devices infringe at least one claim of each of the Smart Antenna Patents as set forth, by way of example, in the non-limiting exemplary claim charts attached hereto as Exhibits 18-21 respectively.

209. The components of the Accused Advanced Antenna Mobile Devices that actively control an antenna of the Accused Advanced Antenna Mobile Devices to be tuned actively to

operate at multiple frequency bands have no substantial use other than to actively tune the antenna to operate at multiple frequency bands.

210. The components of the Accused Advanced Antenna Mobile Devices that steer an antenna of the Accused Advanced Antenna Mobile Devices so that radiation therefrom avoids a sensed obstruction have no substantial use other than to steer the antenna so that radiation therefrom avoids a sensed obstruction.

211. The components of the Accused Advanced Antenna Mobile Devices that actively control an antenna of the Accused Advanced Antenna Mobile Devices to be tuned actively to operate at multiple frequency bands are a material part of the claims of the ’763 Patent and the ’358 Patent.

212. The components of the Accused Advanced Antenna Mobile Devices that steer an antenna of the Accused Advanced Antenna Mobile Devices so that radiation therefrom avoids a sensed obstruction are a material part of the claims of the ’625 Patent and the ’548 Patent.

213. Samsung makes user manuals available to customers of the Accused Advanced Antenna Mobile Devices.

214. Such user manuals include instructions for, for example, inserting a SIM card and powering on a Samsung device for purposes of connecting to a network.

215. A SIM card is a small, removable chip used in mobile devices, such as the Accused Advanced Antenna Mobile Devices, to connect to a cellular network, such as a 5G cellular network.

216. For example, the user manual for the Samsung Galaxy S24 Ultra available for download from Samsung's website describes how to insert a SIM card in a Samsung Galaxy S24 Ultra, a necessary step for the device to connect to a cellular network.[25]

iv. Samsung Knox Suite

217. Samsung's Knox Suite is an enterprise-grade mobility and security framework that enables organizations to secure, manage, and monitor Samsung mobile devices used by employees.

218. The Knox Suite combines the Knox embedded security framework, which is built directly into Samsung hardware and operating systems, with a suite of enterprise mobility solutions—including Knox Manage, Knox Asset Intelligence, Knox Configure, and Knox Remote Support—that provide centralized tools for device configuration, policy enforcement, and operational analytics.

219. The Knox Suite includes hardware-based protections such as secure boot, hardware root of trust, and real-time kernel protection, along with software-level features like containerization, data separation, certificate management, and secure key storage. These embedded security capabilities are exposed through Application Programming Interfaces ("APIs") that allow enterprise IT systems to enforce security policies, control device features, and protect enterprise data even on employee-managed or personally-enabled devices.

220. The Knox Suite is typically embodied as a combination of on-device firmware and software, cloud-based management portals, and integration APIs.

221. Within the Knox Suite, Knox Manage, a cloud-based EMM solution, enables remote device enrollment, configuration, and management at scale.

[25] Samsung, *User Guide Rev. 1.1* at 19-20 (May 2025), *available at* https://downloadcenter.samsung.com/content/UM/202505/20250521090034599/SM-S92X_UG_LTN_15_Eng_Rev.1.1_250519.pdf.

222. Knox Asset Intelligence, which is also in Samsung's Knox Suite, provides real-time analytics on device health, usage, and network conditions, allowing enterprises to proactively identify and resolve performance issues.

223. The Knox Suite is used by enterprises, government agencies, healthcare providers, schools, logistics firms, and other organizations that deploy Samsung devices in business-critical or regulated environments.

224. IT administrators use the Knox Suite to enforce compliance with corporate policies, protect sensitive data, monitor device behavior and location, ensure consistent user experiences, and optimize device performance across a mobile workforce.

225. The Knox Suite's Knox Asset Intelligence, as implemented for an enterprise, collects and stores in a database ("Knox Database") data about performance and quality of service ("QoS") of end user devices of the enterprise. Such data include or are associated with locations of the end user devices.

226. The QoS data captured by the Knox Suite's Knox Asset Intelligence can include abnormal Wi-Fi connection events on enterprise-managed Samsung end-user mobile devices.[26]

227. On Samsung devices, a Wi-Fi module runs at the system level to detect issues. Abnormal Wi-Fi disconnection events are broadcast to the Knox Asset Intelligence agent and uploaded to the server in real time.[27]

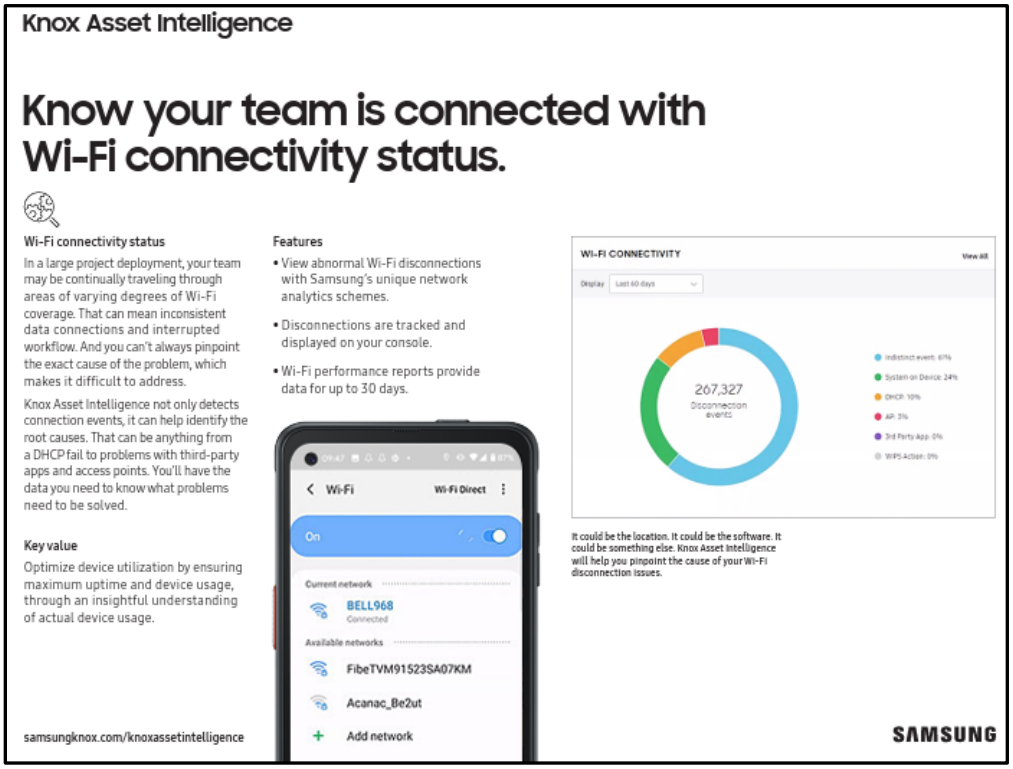
228. Knox Asset Intelligence monitors various Wi-Fi disconnection scenarios, including device internal failures, access point rejections, authentication errors, DHCP failures, driver or

[26] *See* Samsung, "Wi-Fi disconnection events," Samsung Knox Documentation (last updated July 26, 2023), *available at* https://docs.samsungknox.com/admin/knox-asset-intelligence/dashboard/network-insights/wifi-disconnection-events/.

[27] *Id.*

firmware issues, and third-party app interference. These events are logged and uploaded to the KAI server in real time, allowing for immediate analysis and response.[28]

229. The Knox Asset Intelligence dashboard collects and summarizes the Wi-Fi connection issues for the enterprise-managed Samsung end-user mobile devices.[29]



230. Knox Asset Intelligence also tags, in the Knox Database, performance and/or QoS data with location information collected from the end user devices.

231. Knox Asset Intelligence uses one or more APIs to update performance and/or QoS data in the Knox Database that is associated with end user devices.

[28] *Id.*

[29] *See* Samsung, *Knox Asset Intelligence*, https://www.content.shi.com/cms-content/accelerator/media/pdfs/samsung-mobility/samsung-mobility-063022-knox-asset-intelligence-flyer.pdf (last visited May 29, 2025).

232. Using Samsung's Knox Suite, an enterprise's IT administrative personnel can review, catalog, and/or sort data in the Knox Database.

233. Knox Asset Intelligence provides a dashboard that presents performance and QoS data associated with end-user devices, for example, to IT administrative personnel within an enterprise using the Samsung Knox Suite.

234. The Knox Suite's Knox Manage can send, via one or more electronic interfaces, updates to an end user device, including in response to a request from the end user device.

235. Knox Asset Intelligence monitors radio operating conditions of end user devices, including, but not limited to, signal strength, signal quality, network type, and network connectivity.

236. Knox Asset Intelligence updates performance and/or QoS data in the Knox Database based on the monitored radio operating conditions.

237. The Knox Suite allows the user of the managed mobile device to request support in response to network performance issues. The IT administrative personnel for an enterprise employing the Knox Suite can configure network settings on the managed mobile device in response to the request.

238. IT administrative personnel for an enterprise employing the Knox Suite can also use the Knox Suite's enterprise mobility management ("EMM") console remotely to resolve problems with the managed mobile device, based on a support request from the user of the managed device.

239. The Knox Suite can also provide advanced Wi-Fi policy controls that allow administrators to manage Wi-Fi settings on devices. These controls can be configured to enforce

specific Wi-Fi constructions, restrict connections on certain networks, and adjust settings to optimize connectivity.[30]

240. Administrators for an enterprise employing the Knox suite can use the Knox Suite's Enterprise Firmware Over The Air ("E-FOTA") to deploy firmware versions that address known Wi-Fi issues. For instance, if a particular firmware update includes enhancements to Wi-Fi stability, it can be selectively pushed to affected devices.[31]

241. The Knox Suite can send instructions based on enhanced spectrum usage and/or control of interference. Adjusting device behavior to optimize how it uses Wi-Fi frequency bands can enhance spectrum usage by, for example, improving utilization of available spectrum resources. Additionally, an enterprise pushing configuration instructions or firmware updates to change transmit power, channel selection, or band preference to reduce interference, is an example of controlling interference through device-side instructions.

242. Upon information and belief, Samsung uses the Knox Suite in the United States.

243. Upon information and belief, Samsung provides instructions to enterprises for such enterprises to use the Knox Suite in an infringing manner, including through documentation like service guides.[32]

[30] *See Managed Configuration*, https://docs.samsungknox.com/admin/knox-platform-for-enterprise/knox-service-plugin/policies.html (last visited June 2, 2025).

[31] *See Knox E-FOTA On-Premises admin guide,* https://docs.samsungknox.com/admin/efota-one/assets/knox-efota-on-premises-admin-guide.pdf (last visited June 2, 2025).

[32] *See, e.g.*, Samsung, *Knox Manage and Configure Quickstart Services Service Guide Version 3.05* at 8 (April 2019), *available at* https://image-us.samsung.com/SamsungUS/samsungbusiness/pdfs/Samsung-KNOX-QuickStarts-3v05.pdf ("Samsung will show you how to enable this functionality and demonstrate its use.").

244. Samsung's Knox Suite infringes at least one claim of each of the Network Monitoring Patents as set forth, by way of example, in the non-limiting exemplary claim charts in Exhibits 22-24.

D. Samsung's Knowledge of Prof. Rappaport's Work and the Asserted Patents

245. Prof. Rappaport's inventive work is widely known in the wireless industry.

246. Prof. Rappaport has published and presented extensively on his work, run numerous research centers with prominent industrial affiliates, and had his critical contributions recognized by leading industry organizations.

247. Prof. Rappaport's work is frequently cited in the wireless field. In 2024, Prof. Rappaport was ranked #22 in the United States and #37 globally on Research.com's Top 1000 Scientists in the field of Electronics and Electrical Engineering. He likewise has held annual designations as a highly cited researcher from Clarivate Analytics for 2020-2024.

248. Prof. Rappaport's seminal paper, "Millimeter Wave Mobile Communications for 5G Cellular: It Will Work!" published in 2013, currently ranks as one of the top five most popular IEEE articles of all time. Since its publication, this paper has been cited by over 5,800 papers and 90 patents.

249. Samsung is very familiar with Prof. Rappaport's work.

250. In 2011, for example, Samsung invited Prof. Rappaport to its Korean campus to speak about his research and development in the field of millimeter waves. Prof. Rappaport's presentation was attended by hundreds of Samsung employees. In conjunction with that speaking engagement, Prof. Rappaport met with various Samsung executives to discuss his work.

251. Samsung also was a founding industrial affiliate member of NYU WIRELESS, the research center Prof. Rappaport founded in 2012, and has since periodically held such membership.

252. When renewing Samsung's industrial affiliate membership in NYU WIRELESS in 2019, Samsung America's vice president and head of its research and mobilities innovation lab, Charlie Zhang, stated "we believe close collaborations between academia and industry leaders are the key to sustained innovation for the future of 5G and beyond."[33]

253. As part of his involvement with NYU WIRELESS, Prof. Rappaport developed channel measurement systems to test and measure the path loss of millimeter wave bands in outdoor environments in order to assess the feasibility of millimeter wave frequency bands for mobile broadband access. Prof. Rappoport collected data in Austin, Texas and New York City during his tenure at UT Austin and NYU, respectively. Samsung worked with NYU WIRELESS to replicate a similar channel measurement system at the Samsung Complex in Suwon, Korea.[34]

[33] NYU WIRELESS, *Momentum Continues at NYU WIRELESS with New Industrial Affiliates*, NYU WIRELESS Pulse, Spring 2019, vol. 6, no. 1 at 2, *available at* https://wireless.engineering.nyu.edu/newsletter/pulse-final-spring-2019.pdf.

[34] *See* Theodore (Ted) S. Rappaport, NYU WIRELESS, New York University School of Engineering, Keynote Presentation at the 2014 International Conference on Communications: *Millimeter Wave Wireless Communications: The Renaissance of Computing and Communications* (June 13, 2014), available at https://wireless.engineering.nyu.edu/presentations/keynote.pdf; Theodore S. Rappaport, NYU WIRELESS, Polytechnic Institute of New York University (NYU-Poly), Presentation at the IEEE ICC 2013: *Millimeter Wave Cellular* (June 11, 2013), *available at* https://wireless.engineering.nyu.edu/presentations/icc2013.pdf.

254. Citing Prof. Rappaport's research, Samsung highlighted that millimeter wave system technologies, advanced MIMO/beamforming, and interference management were some of the key 5G enabling technologies necessary to achieve their 5G service mission.[35]

255. Wonil Roh, Samsung's Director of Advanced Communications, praised Prof. Rappaport's work, noting that Prof. Rappaport's research "provides strong evidence of the feasibility of high-frequency bands for outdoor cellular applications" and that such research on "millimeter-wave bands can be the most effective answer to the problem of ever-increasing mobile data traffic."[36]

256. Prof. Rappaport frequently speaks at industry conferences and is often asked to offer keynote addresses. Samsung employees regularly attend those same conferences.[37]

257. Samsung employees have co-authored at least four articles with Prof. Rappaport in the field of wireless communications.[38]

[35] Wonil Roh, Ph. D., Communications Research Team, Samsung Electronics Corp., Presentation at the IEEE ICC 2013: *Performances and Feasibility of mmWave Beamforming Prototype for 5G Cellular Communications*, (June 11, 2013), *available at* https://wireless.engineering.nyu.edu/presentations/samsung.pdf.

[36] *See* Gary Anthes, *Nsf Grant to Help Point Way to 5g Wireless*, Communications of the ACM (Nov. 7, 2013), *available at* https://cacm.acm.org/news/nsf-grant-to-help-point-way-to-5g-wireless/.

[37] *See, e.g.*, Federal Communications Commission, *Spectrum Frontiers Workshop*, https://www.fcc.gov/news-events/events/2016/03/spectrum-frontiers-workshop (last visited May 13, 2025); Brooklyn 5G Summit 2016, *Preliminary Agenda*, NYU WIRELESS and Nokia Networks, https://bgarchive.com/wp-content/uploads/2022/04/Brooklyn-5G-Summit-2016.pdf (last visited May 13, 2025).

[38] T. S. Rappaport, W. Roh and K. Cheun, "Mobile's millimeter-wave makeover," *IEEE Spectrum*, vol. 51, no. 9, Sept. 2014 at 34-58; S. Hur *et al.*, "Proposal on Millimeter-Wave Channel Modeling for 5G Cellular System," *IEEE Journal of Selected Topics in Signal Processing*, vol. 10, no. 3, April 2016 at 454-69; K. Haneda *et al.*, "Indoor 5G 3GPP-like channel models for office and shopping mall environments," *2016 IEEE International Conference on Communications Workshops (ICC)*, Kuala Lumpur, Malaysia, 2016, at 694-99; K. Haneda *et al.*, "5G 3GPP-Like

258. Moreover, when Samsung employees publish their own research in the wireless communications field, they often cite to Prof. Rappaport's work, including his textbooks and prior publications.[39]

259. Samsung also has cited to Prof. Rappaport's seminal textbook – *Wireless Communications: Principles and practice*, Prentice Hall (1996) – in support of various Petitions for Inter Partes Review asserted against certain patents in the wireless space.[40]

260. Samsung was aware of several of the Asserted Patents based on the prosecution history of several of Samsung's own patents.

261. During prosecution of U.S. Patent Application No. 11/977,603, which is assigned to SEC and has since issued as U.S. Patent No. 8,244,266, the examiner cited the '194 Patent in support of an obviousness rejection under 35 U.S.C. 103. To overcome this rejection, SEC argued that its proposed claims were distinguishable from the '194 Patent.

262. When filing U.S. Patent Application No. 15/063,018, SEC concurrently filed an IDS citing the '358 Patent. During prosecution of that application, the examiner cited the '358 Patent in multiple office actions in support of both anticipation and obviousness rejections. In

Channel Models for Outdoor Urban Microcellular and Macrocellular Environments," *2016 IEEE 83rd Vehicular Technology Conference (VTC Spring)*, Nanjing, China, 2016, at 1-7.

[39] *See, e.g.*, W. Hong, Y. G. Kim, K. -h. Baek and Y. Lee, "Design and testing of a millimeter-wave beam-steering mesh-grid array for 5th generation (5G) mobile communication handset devices," *2014 USNC-URSI Radio Science Meeting (Joint with AP-S Symposium)*, Memphis, TN, USA, 2014, at 282; N. A. Abbasi *et al*., "An Ultra-Wideband Study of Vegetation Impact on Upper Midband / FR3 Communication," *IEEE Wireless Communications Letters*, May 9, 2025; J. Gomez-Ponce *et al*., "Impact of common reflecting and absorbing building materials on THz multipath channels," *Radio Science*, vol. 57, no. 2, Feb. 2022 at 1-16.

[40] *See, e.g.*, *Samsung Elec. Co., Ltd. v. Smart Mobile Tech., LLC*, IPR2022-01248, Petition for Inter Partes Review, p.11 (July 6, 2022); *Samsung Elec., Inc. v. Red Rock Analytics, LLC*, IPR2018-00555, Ex. 2001 (Expert Dec. of Dr. Payam Heydari), p. 23 (July 2, 2018).

responses to those office actions, SEC attempted to distinguish its proposed claims from the ’358 Patent, but its arguments were unsuccessful and the application was ultimately abandoned.

263. During prosecution of U.S. Patent Application No. 15/898,316, which is assigned to SEC and has since issued as U.S. Patent No. 10,523,258, the examiner cited the ’625 Patent in support of an obviousness rejection.

264. In light of the foregoing, Samsung had specific knowledge of one or more of the Asserted Patents and/or was willfully blind to the Asserted Patents.

FIRST CAUSE OF ACTION
(Infringement of the ’194 Patent)

265. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

266. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 8, and 22 of the ’194 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused RAN Products and Accused Hotspot Devices within the United States, including this District.

267. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 8, and 22 of the ’194 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused RAN Products and Accused Hotspot Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 13.

268. As a direct and proximate result of Samsung’s direct infringement of the ’194 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

269. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 8, and 22 of the '194 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused RAN Products and Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused RAN Products and Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 8, and 22 of the '194 Patent, where the component is a material part of at least Claims 1, 8, and 22 of the '194 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 8, and 22 of the '194 Patent.

270. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '194 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 8, and 22 of the '194 Patent, and intended that its actions would induce and contribute to such direct infringement.

271. As a direct and proximate result of Samsung's indirect infringement of the '194 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

272. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the '194 Patent, pursuant to 35 U.S.C. § 271.

273. Samsung has committed these acts of infringement without license or authorization.

274. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '194 Patent.

275. As a result of Samsung's willful infringement of the '194 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

SECOND CAUSE OF ACTION
(Infringement of the '754 Patent)

276. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

277. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1 and 14 of the '754 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused RAN Products and Accused Hotspot Devices within the United States, including this District.

278. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1 and 14 of the '754 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused RAN Products and Accused Hotspot Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 14.

279. As a direct and proximate result of Samsung's direct infringement of the '754 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

280. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1 and 14 of the ’754 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused RAN Products and Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused RAN Products and Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1 and 14 of the ’754 Patent, where the component is a material part of at least Claims 1 and 14 of the ’754 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1 and 14 of the ’754 Patent.

281. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the ’754 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1 and 14 of the ’754 Patent, and intended that its actions would induce and contribute to such direct infringement.

282. As a direct and proximate result of Samsung’s indirect infringement of the ’754 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

283. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the ’754 Patent, pursuant to 35 U.S.C. § 271.

284. Samsung has committed these acts of infringement without license or authorization.

285. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '754 Patent.

286. As a result of Samsung's willful infringement of the '754 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

THIRD CAUSE OF ACTION
(Infringement of the '337 Patent)

287. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

288. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 17, and 29 of the '337 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused RAN Products and Accused Hotspot Devices within the United States, including this District.

289. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 17, and 29 of the '337 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused RAN Products and Accused Hotspot Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 15.

290. As a direct and proximate result of Samsung's direct infringement of the '337 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

291. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 17, and 29 of the ’337 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused RAN Products and Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused RAN Products and Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 17, and 29 of the ’337 Patent, where the component is a material part of at least Claims 1, 17, and 29 of the ’337 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 17, and 29 of the ’337 Patent.

292. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the ’337 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 17, and 29 of the ’337 Patent, and intended that its actions would induce or contribute to such direct infringement.

293. As a direct and proximate result of Samsung’s indirect infringement of the ’337 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

294. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the ’337 Patent, pursuant to 35 U.S.C. § 271.

295. Samsung has committed these acts of infringement without license or authorization.

296. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '337 Patent.

297. As a result of Samsung's willful infringement of the '337 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

FOURTH CAUSE OF ACTION
(Infringement of the '999 Patent)

298. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

299. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 11, 12, 15, 26, 31, and 32 of the '999 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others, and/or contributing to use by others of to use the Accused Hotspot Devices within the United States, including this District.

300. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 11, 12, 15, 26, 31, and 32 of the '999 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused Hotspot Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 16.

301. As a direct and proximate result of Samsung's direct infringement of the '999 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

302. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 11, 12, 15, 26, 31, and 32 of the '999 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 11, 12, 15, 26, 31, and 32 of the '999 Patent, where the component is a material part of at least Claims 1, 11, 12, 15, 26, 31, and 32 of the '999 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 11, 12, 15, 26, 31, and 32 of the '999 Patent.

303. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '999 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 11, 12, 15, 26, 31, and 32 of the '999 Patent, and intended that its actions would induce or contribute to such direct infringement.

304. As a direct and proximate result of Samsung's indirect infringement of the '999 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

305. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the '999 Patent, pursuant to 35 U.S.C. § 271.

306. Samsung has committed these acts of infringement without license or authorization.

307. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '999 Patent.

308. As a result of Samsung's willful infringement of the '999 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

FIFTH CAUSE OF ACTION
(Infringement of the '783 Patent)

309. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

310. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 13, and 16 of the '783 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused Hotspot Devices within the United States, including this District.

311. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 13, and 16 of the '783 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused Hotspot Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 17.

312. As a direct and proximate result of Samsung's direct infringement of the '783 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

313. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 13, and 16 of the '783 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused Hotspot Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 13, and 16 of the '783 Patent, where the component is a material part of at least Claims 1, 13, and 16 of the '783 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 13, and 16 of the '783 Patent.

314. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '783 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 13, and 16 of the '783 Patent, and intended that its actions would induce or contribute to such direct infringement.

315. As a direct and proximate result of Samsung's indirect infringement of the '783 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

316. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the '783 Patent, pursuant to 35 U.S.C. § 271.

317. Samsung has committed these acts of infringement without license or authorization.

318. In committing these acts of infringement, Samsung acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '783 Patent.

319. As a result of Samsung's willful infringement of the '783 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

SIXTH CAUSE OF ACTION
(Infringement of the '763 Patent)

320. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

321. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 3, 6, 7, 10 and 13 of the '763 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused Advanced Antenna Mobile Devices within the United States, including this District.

322. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 3, 6, 7, 10 and 13 of the '763 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused Advanced Antenna Mobile Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 18.

323. As a direct and proximate result of Samsung's direct infringement of the '763 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

324. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 3, 6, 7, 10 and 13 of the '763 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 3, 6, 7, 10 and 13 of the '763 Patent, where the component is a material part of at least Claims 1, 3, 6, 7, 10 and 13 of the '763 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 3, 6, 7, 10 and 13 of the '763 Patent.

325. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '763 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 3, 6, 7, 10 and 13 of the '763 Patent, and intended that its actions would induce or contribute to such direct infringement.

326. As a direct and proximate result of Samsung's indirect infringement of the '763 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

327. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the '763 Patent, pursuant to 35 U.S.C. § 271.

328. Samsung has committed these acts of infringement without license or authorization.

329. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '763 Patent.

330. As a result of Samsung's willful infringement of the '763 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

SEVENTH CAUSE OF ACTION
(Infringement of the '358 Patent)

331. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

332. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 3, 8, 9, 14 and 19 of the '358 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused Advanced Antenna Mobile Devices within the United States, including this District.

333. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 3, 8, 9, 14 and 19 of the '358 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused Advanced Antenna Mobile Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 19.

334. As a direct and proximate result of Samsung's direct infringement of the '358 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

335. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 3, 8, 9, 14 and 19 of the '358 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 3, 8, 9, 14 and 19 of the '358 Patent, where the component is a material part of at least Claims 1, 3, 8, 9, 14 and 19 of the '358 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 3, 8, 9, 14 and 19 of the '358 Patent.

336. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '358 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 3, 8, 9, 14 and 19 of the '358 Patent, and intended that its actions would induce or contribute to such direct infringement.

337. As a direct and proximate result of Samsung's indirect infringement of the '358 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

338. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the '358 Patent, pursuant to 35 U.S.C. § 271.

339. Samsung has committed these acts of infringement without license or authorization.

340. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '358 Patent.

341. As a result of Samsung's willful infringement of the '358 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

EIGHTH CAUSE OF ACTION
(Infringement of the '625 Patent)

342. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

343. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 2, 5, 9, 11, 12, 13, 17, 21 and 23 of the '625 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused Advanced Antenna Mobile Devices within the United States, including this District.

344. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, Claims 1, 2, 5, 9, 11, 12, 13, 17, 21 and 23 of the '625 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Accused Advanced Antenna Mobile Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 20.

345. As a direct and proximate result of Samsung's direct infringement of the '625 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

346. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 2, 5, 9, 11, 12, 13, 17, 21 and 23 of the '625 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 2, 5, 9, 11, 12, 13, 17, 21 and 23 of the '625 Patent, where the component is a material part of at least Claims 1, 2, 5, 9, 11, 12, 13, 17, 21 and 23 of the '625 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 2, 5, 9, 11, 12, 13, 17, 21 and 23 of the '625 Patent.

347. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '625 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 2, 5, 9, 11, 12, 13, 17, 21 and 23 of the '625 Patent, and intended that its actions would induce or contribute to such direct infringement.

348. As a direct and proximate result of Samsung's indirect infringement of the '625 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

349. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the ’625 Patent, pursuant to 35 U.S.C. § 271.

350. Samsung has committed these acts of infringement without license or authorization.

351. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND’s rights in the’625 Patent.

352. As a result of Samsung’s willful infringement of the ’625 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung’s infringement, together with enhanced damages, attorneys’ fees, interest, and costs.

NINTH CAUSE OF ACTION
(Infringement of the ’548 Patent)

353. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

354. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 3, 6, 7, 9, 10, 12, 14 and 15 of the ’548 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, inducing others to use, and/or contributing to use by others of the Accused Advanced Antenna Mobile Devices within the United States, including this District.

355. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 3, 6, 7, 9, 10, 12, 14, and 15 of the ’548 Patent, by making, having made, using, selling, offering to sell, supplying,

distributing, and/or importing the Accused Advanced Antenna Mobile Devices within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 21.

356. As a direct and proximate result of Samsung's direct infringement of the '548 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

357. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 3, 6, 7, 9, 10, 12, 14, and 15 of the '548 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, (i) actively inducing its customers and/or end users to use the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District, and/or (ii) contributing to the use by its customers and/or end users of the Accused Advanced Antenna Mobile Devices in a directly infringing manner, literally or under the doctrine of equivalents, within the United States by offering to sell or selling within the United States, or importing into the United States a component of, or for use in, at least Claims 1, 3, 6, 7, 9, 10, 12, 14 and 15 of the '548 Patent, where the component is a material part of at least Claims 1, 3, 6, 7, 9, 10, 12, 14 and 15 of the '548 Patent and is not a staple article or commodity of commerce suitable for substantial noninfringing use, knowing such component to be especially made or especially adapted for use in at least Claims 1, 3, 6, 7, 9, 10, 12, 14 and 15 of the '548 Patent.

358. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '548 Patent and the fact that its actions would induce or contribute to direct infringement by its customers or end users of at least Claims 1, 3, 6, 7, 9, 10, 12, 14 and 15 of the '548 Patent, and intended that its actions would induce or contribute to such direct infringement.

359. As a direct and proximate result of Samsung's indirect infringement of the '548 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

360. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the '548 Patent, pursuant to 35 U.S.C. § 271.

361. Samsung has committed these acts of infringement without license or authorization.

362. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '548 Patent.

363. As a result of Samsung's willful infringement of the '548 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

TENTH CAUSE OF ACTION
(Infringement of the '794 Patent)

364. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

365. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 20 and 25 of the '794 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, and/or inducing others to use the Knox Suite within the United States, including this District.

366. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 20 and 25 of the '794 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or

importing the Knox Suite within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 22.

367. As a direct and proximate result of Samsung's direct infringement of the '794 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

368. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 20 and 25 of the '794 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, actively inducing its customers and/or end users to use the Knox Suite in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District.

369. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the '794 Patent and the fact that its actions would induce direct infringement by its customers or end users of at least Claims 20 and 25 of the '794 Patent, and intended that its actions would induce such direct infringement.

370. As a direct and proximate result of Samsung's indirect infringement of the '794 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

371. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the '794 Patent, pursuant to 35 U.S.C. § 271.

372. Samsung has committed these acts of infringement without license or authorization.

373. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '794 Patent.

374. As a result of Samsung's willful infringement of the '794 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an

amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

ELEVENTH CAUSE OF ACTION
(Infringement of the '925 Patent)

375. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

376. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1, 4, 12 and 14 of the '925 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having made, using, selling, offering to sell, supplying, distributing, importing, and/or inducing others to use the Knox Suite within the United States, including this District.

377. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1, 4, 12 and 14 of the '925 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Knox Suite within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 23.

378. As a direct and proximate result of Samsung's direct infringement of the '925 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

379. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1, 4, 12 and 14 of the '925 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, actively inducing its customers and/or end users to use the Knox Suite in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District.

380. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the ’925 Patent and the fact that its actions would induce direct infringement by its customers or end users of at least Claims 1, 4, 12, and 14 of the ’925 Patent, and intended that its actions would induce such direct infringement.

381. As a direct and proximate result of Samsung’s indirect infringement of the ’925 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

382. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the ’925 Patent, pursuant to 35 U.S.C. § 271.

383. Samsung has committed these acts of infringement without license or authorization.

384. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND’s rights in the ’925 Patent.

385. As a result of Samsung’s willful infringement of the ’925 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung’s infringement, together with enhanced damages, attorneys’ fees, interest, and costs.

TWELFTH CAUSE OF ACTION
(Infringement of the ’700 Patent)

386. The allegations set forth in each and every preceding paragraph are incorporated herein by reference.

387. Upon information and belief, Samsung is now and/or has been directly and/or indirectly infringing at least Claims 1 and 10 of the ’700 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, making, having

made, using, selling, offering to sell, supplying, distributing, importing, and/or inducing others to use the Knox Suite within the United States, including this District.

388. Upon information and belief, Samsung has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, at least Claims 1 and 10 of the ’700 Patent, by making, having made, using, selling, offering to sell, supplying, distributing, and/or importing the Knox Suite within the United States, including this District, without authority. *See, e.g.*, claim chart at Exhibit 24.

389. As a direct and proximate result of Samsung’s direct infringement of the ’700 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

390. Upon information and belief, Samsung is now and/or has been indirectly infringing at least Claims 1 and 10 of the ’700 Patent, as proscribed by 35 U.S.C. §§ 271 *et seq*., by, without permission or authority from MASSIVELY BROADBAND, actively inducing its customers and/or end users to use the Knox Suite in a directly infringing manner, literally or under the doctrine of equivalents, within the United States, including this District.

391. Samsung knew (at least as of the filing date of the Complaint) or has been willfully blind to the existence of the ’700 Patent the fact that its actions would induce direct infringement by its customers or end users of at least Claims 1 and 10 of the ’700 Patent, and intended that its actions would induce such direct infringement.

392. As a direct and proximate result of Samsung’s indirect infringement of the ’700 Patent, MASSIVELY BROADBAND has been and continues to be damaged.

393. By engaging in the conduct described herein, Samsung has injured MASSIVELY BROADBAND and thus is liable for infringement of the ’700 Patent, pursuant to 35 U.S.C. § 271.

394. Samsung has committed these acts of infringement without license or authorization.

395. In committing these acts of infringement, Samsung has acted recklessly and willfully with regard to MASSIVELY BROADBAND's rights in the '700 Patent.

396. As a result of Samsung's willful infringement of the '700 Patent, MASSIVELY BROADBAND has suffered monetary damages and is entitled to a monetary judgment in an amount adequate to compensate for Samsung's infringement, together with enhanced damages, attorneys' fees, interest, and costs.

JURY DEMAND

MASSIVELY BROADBAND hereby requests a trial by jury on all issues so triable by right.

PRAYER FOR RELIEF

WHEREFORE, MASSIVELY BROADBAND requests that:

A. The Court find that Samsung has directly infringed the Asserted Patents and hold Samsung liable for such infringement;

B. The Court find that Samsung has indirectly infringed the Asserted Patents by inducing its customers to directly infringe the Asserted Patents and hold Samsung liable for such infringement;

C. The Court find that Samsung has indirectly infringed the Asserted Patents by contributing to Samsung's customers' direct infringement of the Asserted Patents and hold Samsung liable for such infringement;

D. The Court award damages pursuant to 35 U.S.C. § 284 adequate to compensate MASSIVELY BROADBAND for Samsung's infringement of the Asserted Patents, including both pre- and post-judgment interest and costs as fixed by the Court;

E. The Court increase the damages to be awarded to MASSIVELY BROADBAND by three times the amount found by the jury or assessed by the Court;

F. The Court declare that this is an exceptional case entitling MASSIVELY BROADBAND to its reasonable attorneys' fees under 35 U.S.C. § 285; and

G. The Court award such other relief as the Court may deem just and proper.

Dated: June 6, 2025

Respectfully submitted,

/s/ *Patrick J. McElhinny by permission Andrea L. Fair*

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