

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

FINESSE WIRELESS LLC,

Plaintiff,

v.

CELLCO PARTNERSHIP d/b/a VERIZON
WIRELESS,

Defendant.

Civil Action No. 2:21-cv-64

PATENT CASE

JURY TRIAL DEMANDED

COMPLAINT FOR PATENT INFRINGEMENT

This is an action for patent infringement in which plaintiff Finesse Wireless LLC (“Finesse”), makes the following allegations against defendant Cellco Partnership d/b/a Verizon Wireless:

BACKGROUND

1. This Complaint asserts causes of action for infringement of the following United States Patents owned by Finesse: United States Patent Nos. 7,346,134 (“’134 Patent”) and 9,548,775 (“’775 Patent”) (collectively, the “Asserted Patents”).

THE PARTIES

2. Plaintiff Finesse Wireless LLC is a limited liability company organized and existing under the laws of Utah, with its principal place of business at 2689 Sackett Drive, Park City, Utah 84098.

3. Upon information and belief, defendant Cellco Partnership d/b/a Verizon Wireless (“Verizon”) is a general partnership organized and existing under the laws of Delaware, with a principal place of business at 1 Verizon Way, Basking Ridge, New Jersey 07920. Verizon is

doing business, either directly or through its agents, on an ongoing basis in this judicial district and elsewhere in the United States, and has a regular and established place of business in this judicial district. Verizon may be served through its registered agent The Corporation Trust Company, Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

JURISDICTION AND VENUE

4. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a) because this action arises under the patent laws of the United States, 35 U.S.C. §§ 1 *et seq.*

5. This Court has personal jurisdiction over Verizon because, *inter alia*, Verizon has minimum contacts with Texas and this district such that this venue is a fair and reasonable one. Verizon conducts substantial business in this forum, including (i) engaging in the infringing conduct alleged herein and (ii) regularly doing or soliciting business, engaging in other persistent courses of conduct, and/or deriving substantial revenue from goods and services provided to individuals in Texas and in this district.

6. Venue in the Eastern District of Texas is proper under 28 U.S.C. §§ 1391(b) and (c) and 1400(b).

7. Upon information and belief, Verizon has committed infringing acts in this judicial district by making, using, offering for sale, selling, or importing products or services that infringe the Asserted Patents, or by inducing others to infringe the Asserted Patents. On information and belief, Verizon maintains a “regular and established” place of business in this district, including by (a) maintaining or controlling retail stores in this district, (b) maintaining and operating infringing base stations in this district, including on cellular towers and other installation sites owned or leased by them, and (c) maintaining and operating other places of business in this district, including those where research, development, or sales are conducted, where customer service is provided, or where repairs are made.

8. Upon information and belief, Verizon has a regular and established physical presence in the district, including but not limited to, ownership of or control over property, inventory, or infrastructure. For example, Verizon's website displays information for Verizon retail stores located at 2035 North Central Expressway, Suite 620, McKinney, Texas 75070; 8988 South Broadway Avenue, Tyler, Texas 75703; and 2330 Preston Road, Suite 500, Frisco, Texas 75034, all of which lie within this federal judicial district.

9. Upon information and belief, Verizon also has offices, including offices for its network technology and planning group, within this federal judicial district, including, for example, an office in Plano, Texas.

10. Verizon has an active right to transact business in Texas and has a mailing address of 1 Verizon Pl, Alpharetta, GA 30004-8510.

11. In other recent actions, Verizon has either admitted or not contested that this federal judicial district is a proper venue for patent infringement actions against it. *See, e.g.,* Answer ¶ 16 & Counterclaims ¶ 6, *IPCom, GmbH & Co. KG v. Verizon Comm'ns Inc., et al.*, No. 2:20-cv-322 (E.D. Tex. Dec. 21, 2020), ECF No. 23; Am. Answer to Am. Compl. ¶¶ 14, 17, *Sol IP v. Verizon Comm'ns Inc., et al.*, No. 2:18-cv-526 (E.D. Tex. Sept. 18, 2019), ECF No. 180; Answer ¶ 6, *Traxcell Techs., LLC v. Verizon Comm'ns, Inc., et al.*, No. 2:17-cv-721 (E.D. Tex. Jan. 22, 2018), ECF No. 8; Answer ¶ 15, *Cellular Comm'ns Equip., LLC v. Apple Inc., et al.*, No. 6:17-cv-146 (E.D. Tex. June 29, 2017), ECF No. 44. Verizon has also admitted or failed to contest that it has transacted business in this district. *See, e.g.,* *Sol IP*, Am. Answer to Am. Compl. ¶¶ 13, 16; *Cellular Comm'ns*, Answer ¶¶ 6, 16; Answer ¶ 7, *Plectrum LLC v. Verizon Comm'ns Inc., et al.*, No. 4:17-cv-126 (E.D. Tex. Apr. 19, 2017), ECF No. 21

12. Verizon derives benefits from its presence in this federal judicial district, including, but not limited to, sales revenue and serving customers using its mobile network in this district. For example, Verizon receives revenue from its corporate stores in this district, by selling network access, phones/products, and services, and by receiving payment for network access, phones/products, and services.

DEFENDANT’S MOBILE NETWORK

13. Verizon operates and sells access to a mobile network that provides telecommunication, Internet service, and other services to customers via cellular base stations located in this district and throughout the United States (the “Verizon Base Stations”). The Verizon Base Stations incorporate technology that employs oversampling, signal isolation, and phase-shifting for cancellation of passive intermodulation (“PIM”) pursuant to the patented inventions.

14. Verizon’s mobile network, including the Verizon Base Stations, communicates with customers’ mobile devices (also referred to as “terminals” or “user equipment”), such as mobile phones, smartphones, tablets, and mobile hotspots, in accordance with fourth-generation/Long Term Evolution (“4G/LTE”) and fifth-generation (“5G”) mobile network standards. Verizon also sells mobile devices, through channels including its website and retail stores, that communicate in accordance with those 4G/LTE and 5G standards for use on its network.

15. Verizon’s website states that it operates a 4G/LTE and 5G mobile network. According to Verizon’s website, its “network covers more than 2.68 million square miles, 327 million people and over 99% of the U.S. population – and continues to expand.”¹

¹ Verizon, *This is 5G Built Right*, Verizon 5G, <https://www.verizon.com/5g/> (last visited Feb. 23, 2021).

16. Verizon's website states that substantial portions of its mobile network are 5G and 4G/LTE. In addition, the website provides a coverage map that identifies the maximum cellular network speeds available by location nationwide, including within Texas. According to the map, a majority of the cities in this district have 4G/LTE and/or 5G coverage. Among the cities in this district identified with coverage are Marshall, Beaumont, Lufkin, Plano, Sherman, Tyler, and Texarkana.²

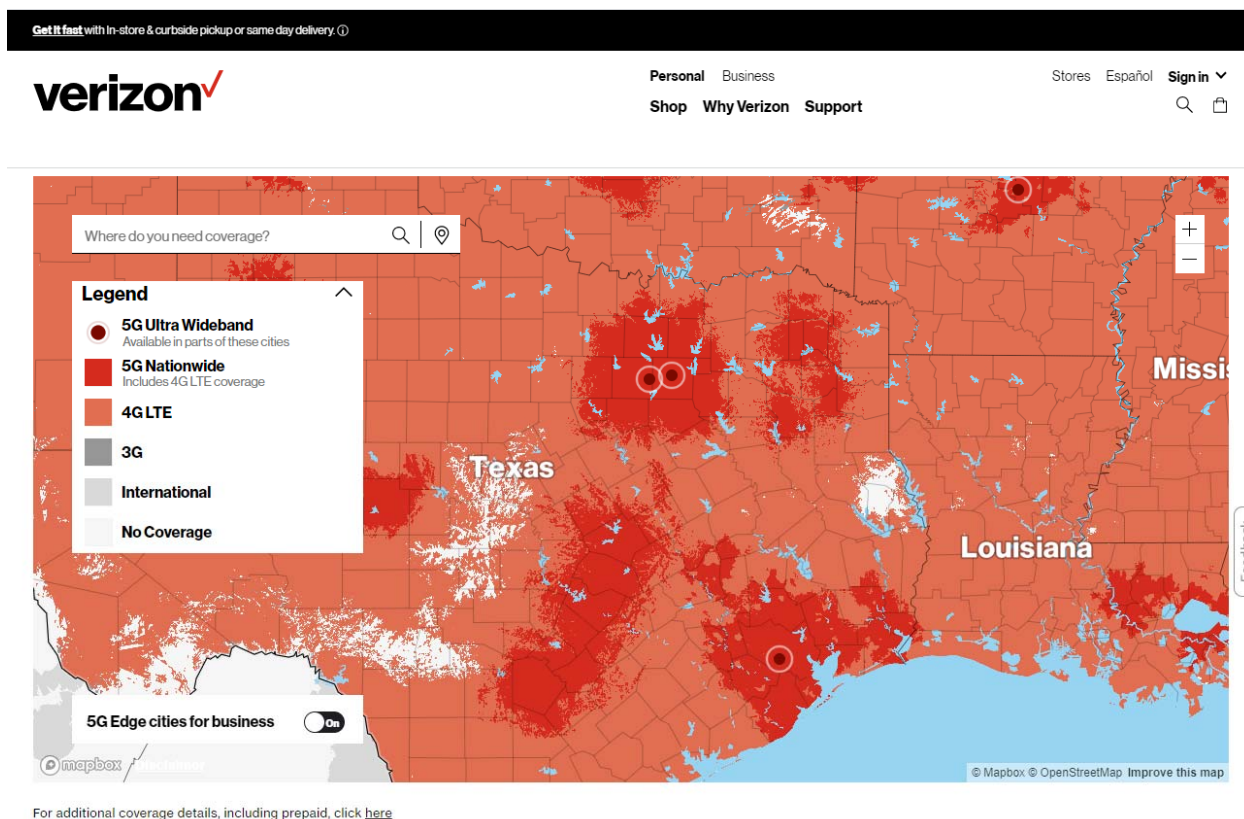


Figure 1: Coverage map from Verizon website showing 5G and 4G/LTE coverage in East Texas³

17. Verizon encourages prospective customers and visitors to its website to “[d]iscover Verizon 5G.” It also states, “5G is the fifth generation of wireless technology. See what sets Verizon 5G apart.” In addition, Verizon's website lists the following features of its 5G

² Verizon, *Nationwide 5G and 4G LTE Network*, Verizon Coverage Map, <https://www.verizon.com/coverage-map/> (last visited Feb. 23, 2021).

³ *Id.*

network: “The fastest 5G in the world. With peak speeds of more than 2 Gbps. Response times in less than the blink of an eye. Ultra-low latency. Massive capacity. Potential for more devices in the same place at the same time.” It also states, “Welcome to the 5G era. Verizon 5G is driving a seismic shift in entertainment, gaming and emerging tech. Get Verizon 5G.”⁴

INTERFERENCE FROM PASSIVE INTERMODULATION

18. One of the common problems associated with wireless communications is unwanted signals intermixed with the information signal. These unwanted signals are referred to as interference. This interference can alter the radio frequency (“RF”) reception so that a receiver does not receive the information signal as needed.⁵

19. The increased usage of the RF system and expansion of 5G technology to account for expansion of traditional and non-traditional uses of wireless systems, including, upon information and belief, those advertised by Verizon, has resulted in higher overall RF energy being transmitted across an increasingly congested spectrum. The result is a higher likelihood of intersystem interference from sources including PIM.⁶

20. PIM represents the intermodulation products (“IMPs”) generated when two or more signals (*e.g.*, data transmitted from a base station to a cell phone) transit through a passive device (*e.g.*, connectors and mechanical components at a base station) with nonlinear properties (*e.g.*, loose or dirty connectors, aged antennas, amplifiers, etc.).⁷

⁴ Verizon, *This is 5G Built Right*, Verizon 5G, <https://www.verizon.com/5g/> (last visited Feb. 23, 2021).

⁵ U.S. Patent No. 7,346,134 (issued Mar. 18, 2008), at 1:55–60.

⁶ See, *e.g.*, 3rd Generation P’ship Project (3GPP), *Technical Specification Group Radio Access Network; Passive Intermodulation (PIM) Handling for Base Stations (Release 12)* (TR 37.808 V12.0.0, Sept. 28, 2013), available at https://www.3gpp.org/ftp//Specs/archive/37_series/37.808/.

⁷ See *id.*

21. PIM is a significant issue within the cellular industry. PIM degrades wireless performance because it causes unwanted RF interference which will reduce receiver sensitivity or may even inhibit communication completely. This interference can affect the cell that created it, as well as other nearby receivers. It manifests in degraded voice quality, dropped calls, and reduced data throughput.⁸

22. One way to mitigate PIM is by fixing the connectors and mechanical components at a base—in other words, by avoiding the sources of interference, removing the non-linearities that cause interference, and using frequency planning to minimize interference. The latter option is less practical given the increased usage of RF spectrum. The former two options can be costly given the labor and time involved in manually detecting and resolving problems with base stations. Particularly as the number of base stations has increased, mitigation of the causes of PIM by avoidance or manually fixing non-linearities is less practical.⁹

23. Another way to remove interference is by filtering. The filtering may be performed in the analog or digital domain. In one commonly used technique, digital samples are low pass filtered to eliminate the higher harmonics above a baseband signal. However, this technique does not eliminate the interference due to the tails of the harmonic images that extend into the baseband signal.¹⁰ Further, if the PIM falls in band of the signal of interest, filtering will

⁸ See, e.g., *id.*; 4G Americas, *White Paper: Mobile Broadband Evolution Towards 5G: 3GPP Rel-12 & Rel-13 and Beyond* (June 2015), at 193-94 available at https://www.5gamericas.org/wp-content/uploads/2019/07/4G_Americas_Mobile_Broadband_Evolution_Toward_5G-Rel-12_Rel-13_June_2015x.pdf.

⁹ See, e.g., *id.* (describing method for technician to scan for PIM); 3GPP, *supra* note 6, at 23.

¹⁰ U.S. Patent No. 7,346,134 (issued Mar. 18, 2008), at 1:61–67.

remove energy from the signal of interest. There is no known filtering technique that will not damage the signal of interest.¹¹

24. The Asserted Patents recite novel and inventive systems and methods for the reduction and cancellation of PIM interference, including using a digital-signal processor-based approach in digital hardware to mitigate PIM on an on-going basis without the need for an on-site technician. In other words, they use “cancelling” rather than “filtering” technology. Cancellation is a method that does not involve avoidance, manual fixes, frequency planning, or filtering—rather, cancellation deals directly with the resulting interference signals if and when they occur by attenuating them via cancellation techniques driven by the source signals.¹²

COUNT ONE **Infringement of the '134 Patent**

25. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

26. On March 18, 2008, the United States Patent and Trademark Office duly and legally issued the '134 Patent entitled “Radio Receiver.” A true and correct copy of the '134 Patent is attached as Exhibit 1 to this Complaint.

27. Finesse owns all rights, title, and interest in and to the '134, including the right to assert all causes of action under the '134 Patent and the right to any remedies for the infringement of the '134 Patent.

28. The '134 Patent generally relates to technology that removes interference in cellular wireless communications systems affected by PIM. The claims of the '134 Patent,

¹¹ Compare *id.* at 11:1–11 (describing how cancellation, unlike filtering, can mitigate interference in the band of the signal of interest).

¹² U.S. Patent No. 9,548,775 (issued Jan. 17, 2017), at 3:20–25; U.S. Patent No. 7,346,134 (issued Mar. 18, 2008), at 2:1–18.

including claim 1, recite novel and inventive systems and methods for the reduction and cancellation of PIM interference, including using a digital-signal processor-based approach in digital hardware to mitigate PIM on an on-going basis without the need for an on-site technician.

29. For example, claim 1 of the '134 Patent recites:

1. A method comprising:

over-sampling, at a desired frequency, a passband of received signals to create a bit stream, wherein the received signals include signals of interest and interference generating signals, the interference generating signals capable of generating intermodulation products inband of the signals of interest;

isolating signals of interest in the bit stream using one or more decimating filters;

isolating source signals that generate one or more intermodulation products inband of the signal of interest using one or more decimating filters;

computing an estimate of each of the one or more intermodulation products from the source signals that generate the one or more intermodulation products;

cancelling out one or more inband intermodulation products using the estimate of the intermodulation products; and

performing phase and amplitude adjustment on estimations of the intermodulation product interfering signals in a closed loop manner, wherein performing phase and amplitude adjustment of the estimations comprises performing sub-sample phase shifts to make a phase adjustment on the estimations of the intermodulation product interfering signals.

30. Verizon has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, one or more claims, including at least claim 1, of the '134 Patent in violation of 35 U.S.C. § 271(a). For example, Verizon has, without authorization, operated, used, and sold, and continues to operate, use, and sell, access to its 4G/LTE and 5G mobile network that includes the Verizon Base Stations ("134 Accused Instrumentalities"),

which are capable of mitigating interference caused by PIM by reducing or cancelling PIM in the manner described in the claims of the '134 Patent, thereby infringing at least claim 1 of the '134 Patent. Verizon's infringing use of the '134 Accused Instrumentalities includes its internal use and testing of the '134 Accused Instrumentalities.

31. The '134 Accused Instrumentalities satisfy all claim limitations of one or more of the claims of the '134 Patent, including at least claim 1.

32. By way of a non-limiting example, the '134 Accused Instrumentalities practice a method comprising over-sampling, at a desired frequency, a passband of received signals to create a bit stream, wherein the received signals include signals of interest and interference generating signals, the interference generating signals capable of generating IMPs inband of the signals of interest. The Verizon Base Stations include radios with passive intermodulation mitigation. Typical analog-to-digital converters (ADC) used in base stations oversample incoming signals to, among other reasons, increase the signal to noise ratio (SNR). The output of an ADC is a bit stream. As Verizon's mobile network is designed for 5G and 4G/LTE operation, the Verizon Base Station will necessarily operate in frequency bands where PIM is of significant concern.¹³

33. Further, the method practiced by the '134 Accused Instrumentalities comprises isolating signals of interest in the bit stream using one or more decimating filters. The signals of interest are mobile traffic—in other words, the data being transmitted and not the interference signal. The decimating filters are filters that reduce the sampling rate. The signal passes through

¹³ Bo Göransson, Ph.D., Ericsson, *5G – The Multi Antenna Advantage* (Oct. 6, 2016), at 35, available at <http://www.1com.net/wp-content/uploads/2018/05/5G-multi-antenna-advantage.pdf>; Nokia, *Nokia AirScale Base Station – Executive Summary* (2017), available at <https://www.scribd.com/document/363890869/Nokia-AirScale-Base-Station-Executive-Summary-En>.

the ADC and into the decimating filter(s). All of the signals of interest are known as they are from the baseband.¹⁴

34. In addition, the method practiced by the '134 Accused Instrumentalities comprises isolating source signals that generate one or more IMPs inband of the signal of interest using one or more decimating filters. The PIM mitigation in the Verizon Base Stations is configured as an element that resides between the baseband and the radios. The PIM mitigation system is identifying and isolating IMPs inband of the signal of interest—*i.e.*, from the uplink signal—to identify PIM caused by downlink signals. That is, the IMPs and signal of interest are in the same signal, so the PIM must be known and isolated to cancel out the PIM.¹⁵

35. Further, the method practiced by the '134 Accused Instrumentalities comprises computing an estimate of each of the one or more IMPs from the source signals that generate the one or more IMPs. The PIM must be estimated in order to develop an IMP cancellation signal ("ICS"). The '134 Accused Instrumentalities adaptively calculate the transfer function of the PIM signal created by mixing the source signals and using this to create an image of the inband interferer. This includes intercepting the uplink signals and cancelling any PIM that may be due

¹⁴ Dimitrios Efstathiou et al., *Recent Developments in Enabling Technologies for Software Defined Radio*, 37 IEEE Comm'ns Magazine, Sept. 1999, no. 8, at 112–17 fig. 3, available at https://www.researchgate.net/figure/Wideband-base-station-architecture_fig2_3196099 (showing exemplary standard wideband base station architecture, with the signal passing through the ADC converter and into the decimating filter(s)); Göransson, *supra* note 13, at 36; Nokia Solutions and Networks, *AHNB-01 Nokia AirScale Radio Description*, FCC 75933222 Report 01 Issue 6 (2018), at 120 fig. 36.

¹⁵ Göransson, *supra* note 13, at 33, 35–36; Job Posting: FPGA Development Engineer, available at <https://web.archive.org/web/20170916171317/https://bbs.sjtu.edu.cn/bbstcon,board,JobInfo,reid,1504970443.html> (last visited Sept. 16, 2017).

to downlink signals before passing on the cleaned uplink channel. To undertake integrated PIM cancellation, the '134 Accused Instrumentalities generate a copy of the signal.¹⁶

36. In addition, the method practiced by the '134 Accused Instrumentalities comprises cancelling out one or more inband IMPs using the estimate of the IMPs. That is, the Verizon Base Stations incorporate a “cancelling”—rather than filtering—technology. In order to cancel, it is necessary to create a copy of the interferer inband and cancel (subtract) it from the received signal.¹⁷

37. Finally, the method practiced by the '134 Accused Instrumentalities comprises performing phase and amplitude adjustment on estimations of the IMP interfering signals in a closed loop manner, wherein performing phase and amplitude adjustment of the estimations comprises performing sub-sample phase shifts to make a phase adjustment on the estimations of the IMP interfering signals. The technology in the Verizon Base Stations is a closed-loop system, meaning that cancellation is automatically carried out within the system without human intervention. Because the Verizon Base Stations mitigate PIM from both static and dynamic sources, they perform phase and amplitude adjustment to account for changes in the PIM sources.¹⁸

38. Since having notice of the '134 Patent, Verizon has indirectly infringed and continues to indirectly infringe the '134 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-

¹⁶ Göransson, *supra* note 13, at 36; Job Posting, *supra* note 15; Nokia, *Nokia AirScale Base Station – Datasheet* (2017), at 5, available at <https://docplayer.net/44953613-Nokia-airscale-base-station-changes-the-way-to-build-networks.html>.

¹⁷ Göransson, *supra* note 13, at 36; Job Posting, *supra* note 15; Nokia, *Datasheet*, *supra* note 16, at 5; Mani Iyer, *Senior System Engineer at L3Harris Technologies*, LinkedIn, <https://www.linkedin.com/in/mani-iyer-nj> (last visited Feb. 22, 2021) (log-in required).

¹⁸ Göransson, *supra* note 13, at 35–36; Job Posting, *supra* note 15.

subsidiaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination and maintenance of the '134 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '134 Patent.

39. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '134 Patent, including by selling access to its 4G/LTE and 5G mobile network and encouraging users to operate devices on that network, despite knowing of the '134 Patent and the fact that such usage of its network will require reduction or cancellation of PIM in a manner that infringes the '134 Patent. The infringing aspects of the '134 Accused Instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

40. Such active steps include, for example, advertising and marketing Verizon's mobile network, marketing and selling of devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that will require reduction or cancellation of PIM in a manner that directly infringes at least claim 1 of the '134 Patent.

41. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '134 Patent and how those steps induce infringement of the '134 Patent.

42. Verizon's acts of infringement have caused and continue to cause damage to Finesse, and Finesse is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial, but in no event less than a reasonable royalty for the use made of the invention in the '134 Patent, together with interest and costs as fixed by the Court. Verizon's infringement of Finesse's rights under the '134 Patent will continue to damage Finesse, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

43. Verizon has had notice of the '134 Patent at least as of the date of this Complaint.

COUNT TWO
Infringement of the '775 Patent

44. Plaintiff repeats and incorporates by reference each preceding paragraph as if fully set forth herein and further states:

45. On January 17, 2017, the United States Patent and Trademark Office duly and legally issued the '775 Patent entitled "Mitigation of transmitter passive and active IMPs in real and continuous time in the transmitter and co-located receiver." A true and correct copy of the '775 Patent is attached as Exhibit 2 to this Complaint.

46. Finesse owns all rights, title, and interest in and to the '775 Patent, including the right to assert all causes of action under the '775 Patent and the right to any remedies for the infringement of the '775 Patent.

47. The '775 Patent generally relates to technology that removes interference in cellular wireless communications systems affected by PIM. The claims of the '775 Patent, including claim 1, recite novel and inventive systems and methods for the reduction and cancellation of PIM interference, including using a digital-signal processor-based approach in digital hardware to mitigate PIM on an on-going basis without the need for an on-site technician.

48. For example, claim 1 of the '775 Patent recites:

1. A method for performing interference cancellation in a receiver, with a transmitter and the receiver being co-located with each other, the method comprising:

generating intermodulation product (IMP) cancellation signals (ICSs) to cancel passive IMPs in the receiver, continuously and near real time, using copies of transmitter signals of the transmitter, wherein the passive IMPs are generated in passive transmitter components of the transmitter and receiver components of the receiver after a high powered amplifier (HPA) and transmitter filter of the transmitter, wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter, wherein generating the ICSs is based on a power series description of a non-linear process for generating the IMPs, and includes generating an n-th order ICS by, given three signals S1, S2 and S3, digitally multiplying and filtering $S1 \times S1 \times S2$ and $S1 \times S2 \times S2$ and $S1 \times S2 \times S3$ and $S1 \times S1 \times S3$ and $S2 \times S2 \times S3$ and $S1 \times S3 \times S3$ and $S2 \times S3 \times S3$, where n is an integer.

49. Verizon has directly infringed and continues to directly infringe, literally and/or under the doctrine of equivalents, one or more claims, including at least claim 1, of the '775 Patent in violation of 35 U.S.C. § 271(a). For example, Verizon has, without authorization, operated, used, and sold, and continues to operate, use, and sell, access to its 4G/LTE and 5G mobile network that includes the Verizon Base Stations ("’775 Accused Instrumentalities"), which are capable of mitigating interference caused by PIM by reducing or cancelling PIM in the manner described in the claims of the '775 Patent, thereby infringing at least claim 1 of the '775 Patent. Verizon's infringing use of the '775 Accused Instrumentalities includes its internal use and testing of the '775 Accused Instrumentalities.

50. The '775 Accused Instrumentalities satisfy all claim limitations of one or more of the claims of the '775 Patent, including at least claim 1.

51. By way of a non-limiting example, upon information and belief, the Verizon Base Stations comprise a transmitter and a receiver being co-located with each other for performing interference cancellation in a receiver.¹⁹

52. The '775 Accused Instrumentalities generate ICSs to cancel passive IMPs in a receiver, continuously and near real time, using copies of transmitter signals of a transmitter. The Verizon Base Stations recognize the source transmission signal in a baseband and make a copy of the signal.²⁰ A PIM signal function of the known transmission signal is then generated to remove PIM from the receiving signal.²¹

53. The '775 Accused Instrumentalities generate ICSs, wherein the passive IMPs are generated in passive transmitter components of the transmitter and receiver components of the receiver after a high powered amplifier (HPA) and transmitter filter of the transmitter. The Verizon Base Stations implement cancellation of PIM distortion in the digital domain based on a known baseband transmitted signal.²² Estimated PIMs will be subtracted from a primary signal, and a desired baseband signal is obtained thereafter.²³

¹⁹ Nokia, *Nokia AirScale Base Station Brochure*, at 3, available at <https://onestore.nokia.com/asset/f/200024> (last visited Feb. 17, 2021).

²⁰ Göransson, *supra* note 13, at 36; Wojciech Zmyślony (Nokia), *Bringing the telecommunication solution to the next level: Passive Intermodulation Cancellation* (2019), at 92–93, available at https://nokiawroclaw.pl/wp-content/uploads/2019/08/Nokia_book4.pdf (published in the European Software and Engineering Center in Wrocław).

²¹ Matias Pihlman, *Passive Intermodulation in Passive Radio Frequency Filters*, Oulu Univ. of Applied Sciences (Spr. 2016), at 21–22, available at <https://core.ac.uk/download/pdf/38139141.pdf>.

²² Fan Chen (Ericsson AB), *Passive Inter-modulation Cancellation in FDD System*, Lund Univ. (Mar. 2017), at 17, available at <https://www.eit.lth.se/sprapport.php?uid=985>.

²³ *Id.*; *Nokia AirScale Radio Description* (DN09236379, Issue 02, Approval Jan. 25, 2017), at 27.

54. The '775 Accused Instrumentalities comprise a transmitter filter coupled between the HPA and an antenna used by the transmitter. The Verizon Base Stations generate the PIM between the downlink signal of the transmitter and the uplink signal of the receiver (*e.g.*, a transmitter filter coupled between the HPA and an antenna used by the transmitter).²⁴

55. The '775 Accused Instrumentalities generate the ICSs based on a power series description of a non-linear process for generating the IMPs, and generate an n-th order ICS (where n is an integer). Intermodulation intercept points (*i.e.*, measure of linearity of an RF device), particularly third-order intercept points, are calculated by Verizon's Base Stations owing to the third-order IMPs' (*e.g.*, an n-th order ICS) having the highest level and being nearest to the original signals.²⁵ The '775 Accused Instrumentalities achieve this n-th order ICS generation by digitally multiplying and filtering three signals (*e.g.*, S1, S2, and S3) accordingly: $S1 \times S1 \times S2$ and $S1 \times S2 \times S2$ and $S1 \times S2 \times S3$ and $S1 \times S1 \times S3$ and $S2 \times S2 \times S3$ and $S1 \times S3 \times S3$ and $S2 \times S3 \times S3$.²⁶

56. Since having notice of the '775 Patent, Verizon has indirectly infringed and continues to indirectly infringe the '775 Patent in violation of 35 U.S.C. § 271(b) by taking active steps to encourage and facilitate direct infringement by others, including OEMs, agent-subsidaries, affiliates, partners, service providers, manufacturers, importers, resellers, customers, and/or end users, in this district and elsewhere in the United States, through the dissemination and maintenance of the '775 Accused Instrumentalities and the creation and dissemination of promotional and marketing materials, supporting materials, instructions, product manuals, and/or

²⁴ Chen, *supra* note 22, at Fig. 4.2; *Nokia AirScale Radio Description*, *supra* note 23, at Fig. 6.

²⁵ Pihlman, *supra* note 21, at 22; Zmyslony, *supra* note 20, at 93.

²⁶ Chen, *supra* note 22, at 22; Zmyslony, *supra* note 20, at 93.

technical information relating to such products with knowledge and the specific intent that its efforts will result in the direct infringement of the '775 Patent.

57. For example, Verizon took active steps to encourage end users to utilize its mobile network in the United States in a manner it knows will directly infringe each element of at least claim 1 of the '775 Patent, including by selling access to its 4G/LTE and 5G mobile network and encouraging users to operate devices on that network, despite knowing of the '775 Patent and the fact that such usage of its network will require reduction or cancellation of PIM in a manner that infringes the '775 Patent. The infringing aspects of the '775 Accused Instrumentalities otherwise have no meaningful use, let alone any meaningful non-infringing use.

58. Such active steps include, for example, advertising and marketing Verizon's mobile network, marketing and selling of devices capable of or intended for use on that network, publishing manuals and promotional literature describing and instructing users to utilize its network, and offering support and technical assistance to its customers that encourage use of the network in ways that will require reduction or cancellation of PIM in a manner that directly infringes at least claim 1 of the '775 Patent.

59. Verizon undertook and continues to undertake the above-identified active steps after receiving notice of the '775 Patent and how those steps induce infringement of the '775 Patent.

60. Verizon's acts of infringement have caused and continue to cause damage to Finesse, and Finesse is entitled to recover from Verizon the damages it has sustained as a result of those wrongful acts in an amount subject to proof at trial, but in no event less than a reasonable royalty for the use made of the invention in the '775 Patent, together with interest and costs as fixed by the Court. Verizon's infringement of Finesse's rights under the '775 Patent will

continue to damage Finesse, causing irreparable harm for which there is no adequate remedy at law, unless enjoined by this Court.

61. Verizon has had notice of the '775 Patent at least as of the date of this Complaint.

DEMAND FOR JURY TRIAL

62. Finesse hereby demands a jury trial pursuant to Federal Rule of Civil Procedure 38.

FEES AND COSTS

63. To the extent that Verizon's willful and deliberate infringement or litigation conduct supports a finding that this is an "exceptional case," an award of attorneys' fees and costs to Finesse is justified pursuant to 35 U.S.C. § 285.

PRAYER FOR RELIEF

WHEREFORE, Finesse prays for relief against Verizon as follows:

a. Declaring that Verizon has infringed the Asserted Patents, contributed to the infringement of the Asserted Patents, and/or induced the infringement of the Asserted Patents;

b. Awarding Finesse damages arising out of this infringement of the Asserted Patents, including enhanced damages pursuant to 35 U.S.C. § 284, and prejudgment and post-judgment interest, in an amount according to proof;

c. Permanently enjoining Verizon, its respective officers, agents, servants, employees, and those acting in privity with it, from further infringement, including inducing infringement and contributory infringement, of the Asserted Patents;

d. Awarding attorneys' fees pursuant to 35 U.S.C. § 285 or as otherwise permitted by law; and

e. Awarding to Finesse such other costs and further relief as the Court deems just and proper.

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Respectfully submitted,

By: /s/ Joseph S. Grinstein

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