UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF VIRGINIA

GEOSCOPE TECHNOLOGIES PTE. LTD., Plaintiff, v. APPLE, INC., Defendant.	Civil Action No. _____ **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Geoscope Technologies Pte. Ltd. ("Geoscope") files this complaint for patent infringement pursuant to 35 U.S.C. §§ 100 *et seq*. against Defendant Apple, Inc. ("Apple" or "Defendant"), for infringement of U.S. Patent Nos. 7,561,104 ("the '104 Patent"), 8,400,358 ("the '358 Patent"), 8,786,494 ("the '494 Patent"), 8,406,753 ("the '753 Patent), 9,097,784 ("the '784 Patent"), and 8,320,264 ("the '264 Patent") (collectively, "the Asserted Patents") and alleges as follows:

I. THE PARTIES

1. Geoscope is a company organized under the laws of Singapore and registered to do business in the Commonwealth of Virginia, having places of business at 160 Robinson Road, #24-09, Singapore, 068914 and in Leesburg, VA.

2. Geoscope is the sole and exclusive rightful owner of the Asserted Patents and holds, *inter alia*, the sole and exclusive right to sue and collect damages for past infringement of the Asserted Patents.

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3. Defendant Apple is a California corporation with its principal place of business at 1 Infinite Loop, Cupertino, California 95014. Apple conducts and has conducted business operations within the Eastern District of Virginia, including through its numerous physical retail and customer service locations in this District.

II. JURISDICTION AND VENUE

4. This is an action for patent infringement arising under the Patent Laws of the United States, 35 U.S.C. §§ 271 and 281, *et seq.*

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

6. This Court has personal jurisdiction over Apple in this action. Apple has committed and continues to commit acts within the Eastern District of Virginia giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Apple would not offend traditional notions of fair play and substantial justice. In particular, Apple has committed and continues to commit acts of direct and indirect infringement of the Asserted Patents in this District and has purposefully conducted and continues to purposefully conduct business in this District, as demonstrated by (a) Apple's maintenance of regular and established places of business in this District, including multiple physical retail and customer service locations such as the one at 11937 Market Street, Reston, VA 20190, and (b) Apple's advertisement of job postings in this District, in retail, customer service, and technical roles, via listings for searchable locations including, *inter alia*, Virginia Beach, VA. (*See* https://jobs.apple.com/en-us/search). Apple has previously submitted to the jurisdiction of this Court.

7. Venue is proper in this District as to Apple pursuant to 28 U.S.C. §§ 1391 and 1400(b) because a substantial part of the acts and events giving rise to the claims occurred in

this District—namely, Apple has committed and continues to commit acts of direct and indirect infringement in this District. For example, Apple has provided and continues to provide infringing products and/or services to residents in this District, including its Location Services feature. (*See* https://www.apple.com/legal/privacy/data/en/location-services/). Additionally, Apple maintains regular and established places of business in this District, including its physical retail and customer service locations such as the one located at 11937 Market Street, Reston, VA 20190. On information and belief, Apple employs hundreds of employees across its physical retail and customer service locations in this District and, as explained above, advertises job postings for retail, customer service, and technical roles in this District. Furthermore, Apple is registered to do business in Virginia.

8. The named inventors of the Asserted Patents—Martin Alles, John Carlson, George Maher, Selcuk Mazlum, and John Arpee—reside in this District. These inventors are likely to be relevant witnesses in this case.

9. Brad Close, Geoscope's Director of Licensing and Intellectual Property, resides in this District. Mr. Close performs duties in his capacity as an officer of Geoscope in this District, including at a place of business for Geoscope in Leesburg, VA.

10. The patented technology giving rise to the claims was developed in this District. For example, a provisional U.S. patent application to which five of the six Asserted Patents claim priority states: "The material contained in this report enumerates the various inventions developed within the signal processing group of Andrew Network Solutions based in Ashburn Virginia." Additionally, the named inventors of the Asserted Patents are identified in the patents as residing in Vienna, VA; Dulles, VA; Herndon, VA; and Leesburg, VA. On information and belief, the locations of the named inventors identified in the Asserted Patents is representative

of their locations when the patents were filed. Accordingly, on information and belief, relevant evidence, documentation, and other sources of proof are currently located in this District, including that which may only be sought from third parties.

11. In addition to being a proper venue under 28 U.S.C. §§ 1391 and 1400(b), this District is a convenient venue for the parties and witnesses, and has an interest in the subject matter of this case.

III. THE PATENTS-IN-SUIT

12. The ’104 Patent, entitled “METHOD TO MODIFY CALIBRATION DATA USED TO LOCATE A MOBILE UNIT,” was lawfully issued by the United States Patent and Trademark Office on July 14, 2009. The ’104 Patent claims priority to U.S. Provisional Patent Application No. 60/899,379 (“the ’379 Provisional”), filed on February 5, 2007. A true and correct copy of the ’104 Patent is attached as **Exhibit A**.

13. The ’104 Patent is valid and enforceable and was duly issued in full compliance with Title 35 of the United States Code.

14. Geoscope is the owner, by assignment, of all right, title, and interest in the ’104 Patent.

15. The ’358 Patent, entitled “METHOD TO MODIFY CALIBRATION DATA USED TO LOCATE A MOBILE UNIT,” was lawfully issued by the United States Patent and Trademark Office on March 19, 2013. The patent application that issued as the ’358 Patent is a continuation of the application that issued as the ’104 Patent. The ’358 Patent claims priority to the ’379 Provisional, filed on February 5, 2007. A true and correct copy of the ’358 Patent is attached as **Exhibit B**.

16. The ’358 Patent is valid and enforceable and was duly issued in full compliance with Title 35 of the United States Code.

17. Geoscope is the owner, by assignment, of all right, title, and interest in the ’358 Patent.

18. The ’494 Patent, entitled “METHOD TO MODIFY CALIBRATION DATA USED TO LOCATE A MOBILE UNIT,” was lawfully issued by the United States Patent and Trademark Office on July 22, 2014. The patent application that issued as the ’494 Patent is a continuation of the application that issued as the ’358 Patent. The ’494 Patent claims priority to the ’379 Provisional, filed on February 5, 2007. A true and correct copy of the ’494 Patent is attached as **Exhibit C**.

19. The ’494 Patent is valid and enforceable and was duly issued in full compliance with Title 35 of the United States Code.

20. Geoscope is the owner, by assignment, of all right, title, and interest in the ’494 Patent.

21. The ’753 Patent, entitled “SYSTEM AND METHOD FOR GENERATING A LOCATION ESTIMATE USING UNIFORM AND NON-UNIFORM GRID POINTS,” was lawfully issued by the United States Patent and Trademark Office on March 26, 2013. The ’753 Patent claims priority to the ’379 Provisional, filed on February 5, 2007. A true and correct copy of the ’753 Patent is attached as **Exhibit D**.

22. The ’753 Patent is valid and enforceable and was duly issued in full compliance with Title 35 of the United States Code.

23. Geoscope is the owner, by assignment, of all right, title, and interest in the ’753 Patent.

24. The ’784 Patent, entitled “SYSTEM AND METHOD TO COLLECT AND MODIFY CALIBRATION DATA,” was lawfully issued by the United States Patent and

Trademark Office on August 4, 2015. The ’784 Patent claims priority to the ’379 Provisional, filed on February 5, 2007. A true and correct copy of the ’784 Patent is attached as **Exhibit E**.

25. The ’784 Patent is valid and enforceable and was duly issued in full compliance with Title 35 of the United States Code.

26. Geoscope is the owner, by assignment, of all right, title, and interest in the ’784 Patent.

27. The ’264 Patent, entitled “METHOD AND APPARATUS FOR DETERMINING PATH LOSS BY ACTIVE SIGNAL DETECTION,” was lawfully issued by the United States Patent and Trademark Office on November 27, 2012. The ’264 Patent claims priority to U.S. Provisional Patent Application No. 60/681,475 (“the ’475 Provisional”), filed on May 17, 2005. A true and correct copy of the ’264 Patent is attached as **Exhibit F**.

28. The ’264 Patent is valid and enforceable and was duly issued in full compliance with Title 35 of the United States Code.

29. Geoscope is the owner, by assignment, of all right, title, and interest in the ’264 Patent.

30. Geoscope asserts and alleges that Apple has infringed and continues to infringe at least one claim of each of the ’104, ’358, ’494, ’753, ’784, and ’264 Patents.

IV. FACTUAL ALLEGATIONS

A. <u>Introduction</u>

31. The inventions claimed in the Asserted Patents were developed by engineers at Andrew LLC f/k/a Andrew Corporation—Martin Alles, John Carlson, George Maher, Selcuk Mazlum, and John Arpee (collectively, “the Inventors”). Andrew Corporation was founded in 1937 to manufacture equipment for directional antennas used in AM radio broadcasts. Over the

decades, Andrew Corporation became a leading global supplier and developer of wireless network equipment, hardware, and infrastructure.

32. On June 27, 2007, CommScope, Inc.—a network infrastructure provider based in Hickory, North Carolina—announced its acquisition of Andrew Corporation for approximately $2.6 billion. As described in a 2007 press release: "The combined company will be a global leader in infrastructure solutions for communications networks, including structured cabling solutions for the business enterprise; broadband cable and apparatus for cable television applications; and antenna and cable products, base station subsystems, coverage and capacity systems, and network solutions for wireless applications." (https://www.commscope.com/press-releases/2007/commscope-to-acquire-andrew-for-$2.6-billion/).

33. Based on the work of the Inventors, Andrew Corporation (or its successor) applied for and was granted numerous patents that relate to the geolocation of mobile devices, including the Asserted Patents. As explained in detail below, the Asserted Patents claim novel inventions that provide technical solutions to specific problems in the field of geolocation of mobile devices. (*See infra* at § IV.B).

34. The Asserted Patents were subsequently assigned to Geoscope.

35. To the extent necessary, Geoscope has complied with all applicable requirements of 35 U.S.C § 287 at all relevant times for each of the Asserted Patents. To the extent necessary, on information and belief, each prior owner of the Asserted Patents has complied with all applicable requirements of 35 U.S.C. § 287 at all relevant times for each of the Asserted Patents.

B. Location-based Services, Geolocation of Mobile Devices, and the Asserted Patents

36. Location-based services are software services that utilize geographic data to provide information to a user, or perform another function for a user, based on the user's

location. Location-based services include, *inter alia*, maps, navigation services (*e.g.*, driving directions), local search (*e.g.*, looking for nearby restaurants), social networking, targeted advertising, and more. The market for location-based services surpassed $20 billion in 2019 and is expected to continue to grow over the coming years. (*See*, *e.g.*, https://www.researchandmarkets.com/reports/4622307/location-based-services-market-growth-trends).

37. Location-based services are particularly important for mobile devices such as smartphones because of their portability. Location-based services are some of the most widely-used features for smartphones. (*See*, *e.g.*, https://www.pewresearch.org/fact-tank/2016/01/29/us-smartphone-use/ (showing that, in 2015, 90% of U.S. smartphone owners ages 18 and over had used their smartphones to "Get directions, recommendations, other info related to [their] location")).

38. Apple has recognized and touted the importance and benefits of location-based services. For example, an Apple website describing Apple's location-based services states: "Location Services allows Apple and third-party apps and websites to gather and use information based on the current location of your iPhone or Apple Watch to provide a variety of location-based services. For example, an app might use your location data and location search query to help you find nearby coffee shops or theaters, or your device may set its time zone automatically based on your current location." (https://www.apple.com/legal/privacy/data/en/location-services/). As another example, in response to inquiries from members of the U.S. House of Representatives, Apple stated: "In response to increasing customer demand, Apple began to provide location-based services in January 2008. These services enable applications that allow customers to perform a wide variety of useful tasks such as getting directions to a

particular address from their current location, locating their friends or letting their friends know where they are, or identifying nearby restaurants or stores." (*See* Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf).

39. Location-based services for mobile devices such as smartphones generally rely on the mobile devices being able to determine their location (sometimes referred to as "geolocation"). One way a mobile device can geolocate itself is by observing different types of signals and using those signals, potentially in conjunction with other information or data, to calculate the device's location. For example, a mobile device can receive and use GPS signals—*i.e.*, signals from Global Positioning System satellites—to determine its location.

40. The use of GPS signals for geolocation, however, has drawbacks. Because GPS signals are transmitted by satellites orbiting the earth, the signals are subject to interference as they travel through the earth's atmosphere. Additionally, the signals can be obstructed by buildings, signs, trees, and other manmade or environmental structures. The use of GPS is particularly limited in indoor and underground environments in which a mobile device may be unable to receive GPS signals. These factors can reduce the accuracy of GPS-based geolocation and, in some cases, can even prevent GPS-based geolocation if a mobile device is not able to receive signals from a minimum number of GPS satellites needed to determine its location. Moreover, in certain situations, it may take several minutes or longer for a mobile device to receive the signals and information it needs from the GPS satellites for geolocation, negatively impacting how quickly the mobile device can geolocate itself. Thus, the use of GPS signals alone for geolocation may be insufficient to achieve quick and accurate geolocation of mobile devices.

41. The drawbacks of using GPS signals alone can be mitigated by using additional types of signals such as network signals—*e.g.*, Wi-Fi, cellular, and Bluetooth signals—for geolocation. Wi-Fi, cellular, and Bluetooth signals are typically propagated by Wi-Fi access points, cellular towers, and Bluetooth devices or "beacons," respectively, to enable Wi-Fi, cellular, and Bluetooth networks. These network signals can be received by a mobile device and used, potentially in conjunction with other information or data, to calculate the device's location using various techniques. Accordingly, existing Wi-Fi, cellular, and Bluetooth infrastructure can be used to aid in the geolocation of mobile devices. GPS can be used together with multiple types of network signals for geolocation purposes. This is sometimes referred to as "hybrid positioning."

42. Apple has recognized that using GPS signals alone may be insufficient for quick and accurate geolocation, and that the use of additional types of signals can improve geolocation. For example, an Apple website describing Apple's location-based services states: "GPS accuracy depends on the number of visible GPS satellites. Locating all visible satellites can take several minutes, with accuracy gradually increasing over time. To improve GPS accuracy: … Keep a clear view in several directions. Walls, vehicle roofs, tall buildings, mountains, and other obstructions can block line of sight to GPS satellites. When this happens, your device uses Wi-Fi or cellular networks to determine your position until the GPS satellites are visible again." (https://support.apple.com/en-us/HT203033). Consistent with this, Apple makes available to users a geolocation service that uses, *inter alia*, GPS in conjunction with network signals to determine the locations of users' mobile devices.

43. Geolocation techniques using Wi-Fi, cellular, and/or Bluetooth signals often involve a calibration requirement in which the properties of such signals transmitted from

known locations are received and measured. As an alternative, or sometimes additional, form of calibration, the properties of such signals may be received and measured at known locations. In this way, properties of Wi-Fi, cellular, and/or Bluetooth signals at known locations—*e.g.*, the locations of transmission or reception—can be determined, stored, and used as calibration information for geolocation. At a high level, a mobile device at an unknown location can receive and measure signals, and those measurements can be compared to the previously-obtained calibration information related to known locations, to geolocate the mobile device.

44. Although the use of network signals—*e.g.*, Wi-Fi, cellular, and Bluetooth signals—in conjunction with GPS signals and other information or data can improve the geolocation of mobile devices, quick and accurate geolocation using such signals presents a number of challenges. As one example, there may be disparities between the calibration information and information observed by a mobile device seeking its location that make a comparison between the two less reliable, resulting in reduced accuracy of geolocation. This can occur because the propagation of Wi-Fi, cellular, and Bluetooth signals, and thus the properties of those signals, are affected by environmental factors. For example, as recognized in the field, "[a]lthough signal strength measurements are quite simple to obtain, obtaining an accurate propagation model might be the opposite … [and] strongly depends on the specific scenario (indoors, outdoors, heavy clutter, etc.), frequency band, weather conditions, and sometimes even time of day." (*See* David Munoz *et al*., Position Location Techniques and Applications, 56 (2009)). As an example of this, a comparison of calibration information obtained outdoors to signal information measured by a device that is indoors may lead to inaccuracies in geolocation of that device because measurements of signals made indoors can differ from measurements made outdoors.

45. Another challenge presented by geolocation using network signals is that accurate geolocation generally requires a sufficient number or density of transmitters—*e.g.*, Wi-Fi access points, cellular towers, and Bluetooth beacons. The accuracy of geolocation may be reduced in areas with few transmitters as there may be limited signal information related to known locations from which the device can determine its location. Even areas with a relatively high number or density of transmitters can benefit from having additional known locations or regions associated with signal data as this can provide more information and potentially better information that a mobile device can use to geolocate itself, improving accuracy.

46. Moreover, there can be challenges in consistently collecting accurate calibration information that may be used to geolocate a mobile device using network signals, particularly because the propagation of network signals can be affected by a variety of environmental factors. Additionally, collecting accurate calibration information and verifying its accuracy can be time-consuming and costly. Inaccuracies in the calibration information used for geolocation can greatly reduce the accuracy of geolocation using network signals.

47. The Asserted Patents describe and claim novel inventions that address, *inter alia*, the foregoing challenges and improve the accuracy, speed, and efficiency of geolocation of mobile devices using network signals. The inventions of the Asserted Patents are critically important to geolocation services, including the geolocation service provided by Apple which incorporates the patented technology.

48. The related ’104, ’358, and ’494 Patents are directed to methods and systems for “determining a location of a mobile station” that involve, *inter alia*, modifying the signal data observed and measured by a mobile device seeking its location at a particular time (referred to herein as “observed data” for simplicity and to distinguish it from previously-gathered

calibration data).[1] As explained in further detail below, the claims of the ’104, ’358, and ’494 Patents cover specific improvements in the field of geolocation that go beyond what was well-understood, routine, and conventional to solve then-existing problems in the field.

49. The inventions claimed in the ’104, ’358, and ’494 Patents directly addressed problems in the prior art. Prior art systems involving geolocation using network signals were subject to reduced accuracy because there could be disparities between calibration data and observed data that were not accounted for when comparing the two for geolocation purposes. These disparities could be caused by various environmental factors, including what environment (*e.g.*, indoors or outdoors) the calibration data and observed data were acquired in, particularly given that “[c]alibration data is typically collected in an outdoor environment” (Exhibit A at 1:24-25)[2] but mobile devices seeking their location may often be indoors. Disparities between the calibration data and observed data could result in an “apples and oranges” comparison between calibration data obtained under one set of environmental conditions and observed data obtained under a different set of environmental conditions, leading to inaccuracies in geolocation if not accounted for. For example, as the ’104, ’358, and ’494 Patents explain: “When a wireless device is located indoors, the signal strengths of signals received from the serving and/or neighboring base stations tend to be lower than the strength of the signals received by a wireless device located outdoors. As a result of these lower signal strengths, performing comparisons between the received signal strengths of the indoor wireless device and

[1] Although the Complaint distinguishes between “observed data” and calibration data as part of an illustrative example to help explain the purpose and benefits of the ’104, ’358, and ’494 Patents, this is not intended to be limiting. For example, observed data at one moment in time may become or act as calibration data for geolocation requests at a future moment in time.

[2] For simplicity, only citations to the ’104 Patent are provided. The same cited language can be found in the ’358 and ’494 Patents.

signal strength data stored in a calibration database may result in a poor estimated location accuracy." (Exhibit A at 1:33-40).

50. The applicants for the '104, '358, and '494 Patents similarly identified this problem in the prior art while arguing for the patentability of the claims during prosecution of the patents before the United States Patent & Trademark Office ("USPTO"). For example, during prosecution of the '358 Patent, the applicants explained: "When a mobile station is located indoors, the signal strength of signals received and/or transmitted by the mobile station have the tendency to be lower than the strength of the signals received by a mobile station located outdoors. As a result of these lower signal strengths, geo-location efforts which rely on signal strengths may result in unsatisfactory location accuracy."

51. The inventions of the '104, '358, and '494 Patents improved on conventional methods for geolocation using network signals by, *inter alia*, modifying the observed data prior to comparison to the previously-gathered calibration data in order to account for inconsistencies between the sets of data that may be caused by environmental factors or other factors. Whereas prior art geolocation systems were subject to inaccuracies because of these inconsistencies, the '104, '358, and '494 Patents inventively employed modifications to the observed data to account for such inconsistencies and mitigate their negative impact on the accuracy of geolocation. Accordingly, the '104, '358, and '494 Patents explain that "network measurement data [*e.g.*, observed data] may be modified for comparison with the outdoor calibration data" as part of "[r]eliably locating a mobile station located indoors, even when the calibration data has been obtained in an outdoor environment." (Exhibit A at 3:43-49). Similarly, the '104, '358, and '494 Patents teach that observed data may be modified to "simulate an indoor facility". (Exhibit A at 5:22-25). The '104, '358, and '494 Patents extensively describe exemplary forms of modifying

the observed data prior to comparison to the previously-gathered calibration data. For example, the ’104, ’358, and ’494 Patents teach that “[observed] data may also be modified to adjust the power levels received from the serving and/or neighboring cell (NC) base stations” based on “differences in parameters between the serving cell and the NC.” (Exhibit A at 5:5-9; *see also id*. at 5:10-57). As another example, the ’104, ’358, and ’494 Patents teach that observed data may be modified based on “differences between the NC having the highest cell power and the cell powers of the remaining NC-BSs.” (Exhibit A at 5:58-64; *see also id*. at 5:65-6:52). As yet another example, the ’104, ’358, and ’494 Patents teach that observed data may be modified “by an average signal power or parameter level based on one or more of the measured NC signal power levels.” (Exhibit A at 6:53-6:67; *see also id*. at 7:1-30). The ’104, ’358, and ’494 Patents further state that combinations of these exemplary “modification procedures may be performed to increase the accuracy of mobile station location estimates” (Exhibit A at 7:31-33) and explain the circumstances under which these different types of modifications may be appropriate (Exhibit A at 7:40-59).

52. The applicants for the ’104, ’358, and ’494 Patents identified this aspect of the inventions as distinguishing the prior art during prosecution of the patents before the USPTO. For example, during prosecution of the ’358 Patent, the applicants explained that prior art references relied on by the Examiner failed to teach, *inter alia*, “modifying the observed network measurement data and comparing the modified network measurement data with a database of calibration data to determine the location of a mobile station.” Notably, the ’358 Patent was issued by the USPTO after consideration of approximately 200 prior art references that are cited on the face of the patent.

53. The ’104, ’358, and ’494 Patents also teach why alternatives to the claimed solutions have significant disadvantages and are not feasible. For example, the ’104, ’358, and ’494 Patents explain that “[c]alibration data is typically collected in an outdoor environment” which can present problems when attempting to geolocate a mobile device that is indoors. (Exhibit A at 1:24-25, 1:33-40). The ’104, ’358, and ’494 Patents further explain why collecting calibration data indoors is not a sufficient solution to these problems: “The primary reason for collecting calibration data outdoors is the greater ease of performing automated calibration collection procedures or, in some instances, manual collection procedures along roads. It is more time-consuming to perform calibration procedures indoors due to the required access to buildings and the inability to utilize automated collection procedures designed for outdoor environments.” (Exhibit A at 1:25-32). Thus, the ’104, ’358, and ’494 Patents make clear why the claimed solutions involving modifying the observed data are superior to alternative approaches to addressing the problem.

54. The independent claims of the ’104, ’358, and ’494 Patents expressly recite this inventive feature of modifying the observed data, including in specific manners, and the dependent claims of the patents cover further specific refinements to the claimed inventions, including additional limitations on how the calibration data is collected and how the observed data is modified. For example, Claim 1 of the ’104 Patent recites, *inter alia*, “determining which of said first and second signal characteristics has a greater magnitude [from ‘collect[ed] observed network measurement data’],” “modifying said observed network measurement data using the greater magnitude signal characteristic,” and “comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station.”

55. Claim 1 of the ’358 Patent recites, *inter alia*, “modifying said observed network measurement data” and “comparing said modified network measurement data with said database of calibration data by positioning determining equipment to thereby determine the location of the mobile station.” Claim 41 of the ’358 Patent recites, *inter alia*, “determining an average value for select ones of said signal characteristics [from ‘collect[ed] observed network measurement data’],” “modifying said observed network measurement data using said average value,” and “comparing said modified network measurement data with said database of calibration data by positioning determining equipment to thereby determine the location of the mobile station.”

56. Claim 1 of the ’494 Patent recites, *inter alia*, “modifying said observed network measurement data” and “comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station.” Claim 25 of the ’494 Patent recites, *inter alia*, “determining an average value for select ones of said signal characteristics [from ‘collect[ed] observed network measurement data’],” “modifying said observed network measurement data using said average value,” and “comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station.”

57. For at least the foregoing reasons, the elements of the claims of the ’104, ’358, and ’494 Patents, individually or as part of an ordered combination, cover non-routine, unconventional, inventive features that provide specific technical improvements to solve a particular problem in the field of geolocation of mobile devices that was not resolved by the prior art. These improvements help mitigate the negative effects of disparities between calibration data and observed data that can arise due to environmental factors, including the

environment in which signal measurements were made, by modifying the observed data to account for those disparities. As a result, the inventions claimed by the ’104, ’358, and ’494 Patents improve, *inter alia*, the accuracy of geolocation of mobile devices.

58. The ’753 Patent is directed to a method and system for “determining the location of a mobile device” that involve, *inter alia*, generating “grid points” based on calibration data and using those grid points to geolocate a mobile device. As explained in further detail below, the claims of the ’753 Patent cover specific improvements in the field of geolocation that go beyond what was well-understood, routine, and conventional to solve then-existing problems in the field.

59. The inventions claimed in the ’753 Patent directly addressed problems in the prior art. Prior art systems involving geolocation used signals from cell towers to try to locate mobile devices. For example, a mobile device would try to measure the time of arrival, angle of arrival, or strength of signals from cell towers at known locations. Then, using complex calculations, the devices would try to use those signals and signal measurements to calculate the location of the device. These were complex calculations, requiring sophisticated hardware and significant processing power to use limited information and measurements of signals from a reference point to accurately calculate a location of the device. The further the device was from a reference point, the greater the uncertainty and error associated with the calculation. These reference points could be relatively sparse throughout a region, and there was limited information that could be used to geolocate a mobile device at an unknown location. For example, the only known location associated with network signal data might be very far from a mobile device seeking its location. As a result, the accuracy and efficiency of geolocation of the mobile device is diminished by not having more known locations associated with network signal

data that are also closer to the mobile device. Thus, as the ’753 Patent explains: “[T]here is a need to streamline the process in order to efficiently and effectively handle the vast amount of data being sent between the wireless communications network and the large number of mobile devices for which locations are to be determined.” (Exhibit D at 2:21-26).

60. The inventions of the ’753 Patent improved on conventional methods for geolocation using network signals by, *inter alia*, using calibration data to generate additional non-uniform “grid points” that could be selected from and used to determine the location of a mobile device. Part of the value of the ’753 Patent’s solution was that any set of calibration data could be used, *e.g.*, because the invention employed non-uniform grid points. The ’753 Patent inventively employed the generation and use of such non-uniform grid points to create a more robust and denser “map” of known locations associated with network signal data that could be used to locate a mobile device. As a result, geolocation need not rely solely on calculations with regard to cell towers, which might be sparse and located far from a mobile device seeking its location. Rather, a network measurement report of all observed signals could be compared to the calibration data for a set of grid points, with the best matches used to geolocate a mobile device using those grid points and the data associated with them. This was another significant advantage of the ’753 Patent, ensuring more accurate geolocation with simpler calculations. Accordingly, the ’753 Patent teaches: “The location of a wireless mobile device may be estimated by comparing data reported by the mobile device to be geolocated with the data (and more particularly the characteristics derived from this data) associated with the various grid points to thereby estimate the location of the mobile.” (Exhibit D at 9:43-48). The ’753 Patent further explains how non-uniform grid points can be generated based on the calibration data. (*See, e.g.*, Exhibit D at 10:29-11:21, 12:15-67).

61. The applicants for the ’753 Patent pointed to these inventive features in distinguishing the prior art during prosecution of the patent before the USPTO. For example, the applicants explained that, *inter alia*, in the prior art reference relied on by the Examiner “no grid points are generated within any geographic region” despite “[t]he claim [of the ’753 Patent] specifically requir[ing] both calibration points and grid points.” Viewed another way, these inventive grid points helped fill in the map between cell towers, and allowed geolocation based on a comparison of a characterizing parameter of the measured signals rather than the complicated and inaccurate calculations of the prior art approaches.

62. The independent claims of the ’753 Patent expressly recite this inventive feature of generating grid points using calibration data, and selecting from those grid points to geolocate a mobile device. The dependent claims of the ’753 Patent cover further specific refinements to the claimed inventions, including additional limitations on how such grid points are generated and how such grid points are selected and used to determine the location of a mobile device. For example, claim 1 of the ’753 Patent recites, *inter alia*, “generating one or more sets of grid points for said calibration data,” “evaluating said at least one network measurement report with each of said sets of grid points as a function of select ones of said characterizing parameters,” “selecting a set of grid points as a function of a predetermined criteria,” and “determining the location of a mobile device in said geographic region as a function of said selected set of grid points.”

63. For at least the foregoing reasons, the elements of the claims of the ’753 Patent, individually or as part of an ordered combination, cover non-routine, unconventional, inventive features that provide specific technical improvements to solve a particular problem in the field of geolocation of mobile devices that was not resolved by the prior art. These improvements

help improve the accuracy of geolocation, while improving the speed of geolocation and reducing the cost and hardware required for the process. As a result, the inventions claimed by the ’753 Patent improve, *inter alia*, the efficiency and accuracy of geolocation of mobile devices.

64. The ’784 Patent is directed to a method and system for “generating a calibration database” that involve, *inter alia*, using data about the locations of streets to verify and improve calibration data that can be used for geolocation. As explained in further detail below, the claims of the ’784 Patent cover specific improvements in the field of geolocation that go beyond what was well-understood, routine, and conventional to solve then-existing problems in the field.

65. The inventions claimed in the ’784 Patent directly addressed problems in the prior art. The accuracy of prior art systems involving geolocation using network signals can be degraded by errors and imprecision in the calibration data used for geolocation. Such errors and imprecision could occur for a number of reasons including, for example, malfunctions or limitations of the equipment used to generate calibration data, signal degradation at particular times, and flaws in the techniques used to generate calibration data. Prior art systems lacked a reliable, efficient method to verify that calibration data used for geolocation was correct and to fix errors in the calibration data, allowing these errors to persist and result in inaccurate geolocation. For example, as the ’784 Patent explains: “Determining precise ground truth measurements is important when generating an accurate calibration database. Without accurate ground truth information, the calibration database will contain significant errors which will in turn be reflected by poor location estimates. Any device used to retrieve ground truth data may produce some degree of signal degradation or drop-out. In the case of a GPS receiver used to collect ground truth data, degradation or drop-out could occur, for example, due to poor satellite

visibility or high dilution of precision (DOP)." (Exhibit E at 1:28-37). The '784 Patent also summarizes this problem as follows: "Calibration data measured via a calibration data collection device may contain errors due to the physical limitations of the collection device and/or the collection process. Any data collection device may produce some degree of signal degradation or drop-out." (Exhibit E at Abstract).

66. The inventions of the '784 Patent improved on conventional methods for geolocation using network signals by, *inter alia*, using the locations of streets in an area (and ancillary information about those streets) as supplemental information to check the integrity of the calibration data. Contrary to prior art systems, the '784 Patent inventively employed the use of additional geographic information regarding the locations of streets to assess and correct errors in the calibration data. Accordingly, the '784 Patent teaches: "Ground truth data observed from a data collection device (i.e., a GPS receiver) may be collected and stored in a calibration database and compared to a street database to modify and enhance the calibration data for increased accuracy. Increasing the accuracy of the ground truth data may in turn provide more accurate location results." (Exhibit E at 3:23-28). Similarly, the '784 Patent explains: "In a geographical area that contains multiple streets, highways, etc. having corresponding intersections, there may be a probability of collecting erroneous location point data regardless of the type of data collection device. A street database may be used as a supplemental data source to compare and/or check the integrity of collected location data." (Exhibit E at 3:39-44). The '784 Patent further explains specific, exemplary ways in which a "street database" can be used to check and correct errors in calibration data. (*See, e.g.,* Exhibit E at 4:7-67). As taught by the '784 Patent, this includes, *inter alia*, comparing a progression of measurements to a likely path derived from a street database showing, *e.g.*, "the direction of one-way streets, off-street

territories, etc." (Exhibit E at 3:44-48; *see also id*. at 4:19-28). Thus, the '784 Patent describes using multiple different types of supplemental information—*e.g.*, the latitude and longitude of points along a street as well as directions of travel permitted along a street—to check the integrity of calibration data.

67. During prosecution of the '784 Patent, the Examiner recognized that the prior art failed to teach limitations of the claims directed to this novel method of using information about streets to correct errors in the calibration data. For example, the Examiner stated that the prior art failed to teach "determining from said status a most likely one of said plural streets upon which said wireless device is located" and "determining said most likely street as a first one of said plural geographic locations," as recited in the independent claims of the '784 Patent. Notably, the '784 Patent was issued by the USPTO after consideration of approximately 200 prior art references that are cited on the face of the patent.

68. The '784 Patent also describes the significant drawbacks to alternatives to the claimed solutions. For example, the '784 Patent explains that a "dead-reckoning device," which "attempt[s] to calculate the location of [a] vehicle when GPS location signaling obtained from a GPS satellite 70 becomes unavailable," may be used to "collect data during periods of signal degradation or drop-out" that occur with other types of devices used to collect calibration data, such as GPS receivers. (Exhibit E at 1:44-52). However, the '784 Patent goes on to explain why this is not a sufficient solution to correcting errors in calibration data caused by, *inter alia*, signal degradation: "Dead reckoning schemes often produce data results that may be unsatisfactory when attempting to perform a location estimate. … During a dead reckoning operation, there may be an increased chance of location error and the vehicle's estimated position (T) may be erroneous with respect to the actual position of the vehicle." (Exhibit E at 1:53-60). Thus, the

’784 Patent sheds light on why the claimed solutions involving the use of supplemental information regarding streets in a geographic area are superior to alternative approaches to addressing the problem.

69. The independent claims of the ’784 Patent expressly recite this inventive feature of using supplemental street information to generate a more accurate database of calibration data. The dependent claims of the ’784 Patent cover further specific refinements to the claimed inventions, including additional limitations on the nature of the inputs used for the process. For example, claim 1 of the ’784 Patent recites, *inter alia*, “determining from said status [of a wireless device] a most likely one of said plural streets upon which said wireless device is located,” “determining said most likely street as a first one of said plural geographic locations,” and “entering said first point in said calibration database and associating the location data for the first one of said plural geographic locations determined by said wireless device with the first point.”

70. For at least the foregoing reasons, the elements of the claims of the ’784 Patent, individually or as part of an ordered combination, cover non-routine, unconventional, inventive features that provide specific technical improvements to solve a particular problem in the field of geolocation of mobile devices that was not resolved by the prior art. These improvements help mitigate the negative effects of errors in the calibration data caused by a variety of factors, including shortcomings in the equipment and techniques used to generate calibration data, by using information about the locations of streets (and ancillary information about those streets) to correct those errors. As a result, the inventions claimed by the ’784 Patent improve, *inter alia*, the accuracy of geolocation of mobile devices.

71. The ’264 Patent is directed to a method and system for “determining a path loss value of a signal transmitted by a wireless device and received by a receiver” that involve, *inter alia*, allowing such a determination while the wireless device and receiver are actively communicating and without disabling any other communication channel. As explained in further detail below, the claims of the ’264 Patent cover specific improvements in the field of geolocation that go beyond what was well-understood, routine, and conventional to solve then-existing problems in the field.

72. The inventions claimed in the ’264 Patent directly addressed problems in the prior art. Prior art systems involving path loss measurements dedicated specific frequency channels for such measurements, which inefficiently required changes to how remaining channels could be used by a wireless device. Additionally, this could involve disabling interfering channels, reducing the number of frequency channels available for use. For example, as the ’264 Patent explains: “Dedicating a specific channel for path loss measurements and rearranging the remaining channels on the frequency use plan to accommodate the path loss-dedicated frequency channel is both costly and inefficient. Thus, there is a need for a method and apparatus for assessing path loss without setting aside an otherwise active frequency channel or disturbing the frequency use plan.” (Exhibit F at 1:55-61). Similarly, the ’264 Patent teaches: “[C]onventional systems determine the path loss value by assigning a dedicated frequency channel to the wireless device and disabling interfering frequency channels within the wireless communication system. Setting aside a dedicated frequency channel also requires revising the frequency use plan for the entire geographic area which is costly and inefficient.” (Exhibit F at 3:39-45).

73. The applicants for the ’264 Patent also identified this problem in the prior art while arguing for the patentability of the claims during prosecution of the patent before the USPTO. For example, during prosecution of the ’264 Patent, the applicants distinguished prior art systems that “require[d] a frequency channel dedicated to the path loss measurement,” noting that this approach employed by conventional systems “require[d] revising a frequency use plan for the respective geographic area which is costly and inefficient.”

74. The inventions of the ’264 Patent improved on conventional methods for determining path loss values for geolocation purposes by, *inter alia*, enabling path loss values to be determined for geolocation purposes by using an active communication channel as opposed to a distinct channel dedicated specifically to making such determinations. This inventive feature also allows path loss values to be determined without having to disable other communication channels, whereas prior art systems generally required disabling interfering frequency channels. Accordingly, the ’264 Patent explains that “[u]sing an existing channel engaged in active communication [for determination of a path loss value] obviates the need for a dedicated channel and a revised frequency use plan.” (Exhibit F at 3:58-60). The ’264 Patent further explains that “[b]y using an active communication channel, the path loss measurement can be conducted without disrupting an existing frequency use plan to allocate a specific frequency channel for path loss calculations. In addition, because the disclosed embodiment determines path loss on an otherwise interference-free communication channel, the results can be as reliable as using a dedicated frequency channel for beacon signaling.” (Exhibit F at 4:60-67). The ’264 Patent provides additional detail about how the inventive method and system are used to determine path loss values in a manner that overcomes the disadvantages of prior art approaches. (*See, e.g.,* Exhibit F at 4:35-59).

75. The applicants for the ’264 Patent relied on these inventive features in arguing for the patentability of the claims during prosecution of the ’264 Patent. For example, the applicants told the USPTO that the prior art failed to teach, *inter alia*, determining path loss values “utilizing an active communications channel and/or using measurements from an active communications channel without disabling any other communications channel.” Notably, the ’264 Patent was issued by the USPTO after consideration of approximately 200 prior art references that are cited on the face of the patent.

76. The independent claims of the ’264 Patent expressly recite this inventive feature of determining path loss values using an active communication channel, as opposed to a distinct channel dedicated specifically to making such determinations, without disabling any other communication channels. The dependent claims of the ’264 Patent cover further specific refinements to the claimed inventions, including additional limitations on how such path loss values are generated and used. For example, claim 1 of the ’264 Patent recites, *inter alia*, “identifying a first cell, a first sector, and a first frequency channel associated with the geographic area wherein said wireless device is actively communicating with said receiver using said first frequency channel without disabling any other communication channel.”

77. For at least the foregoing reasons, the elements of the claims of the ’264 Patent, individually or as part of an ordered combination, cover non-routine, unconventional, inventive features that provide specific technical improvements to solve a particular problem in the field of determining path loss values for geolocation of mobile devices that was not resolved by the prior art. These improvements avoid the inefficiencies and costs associated with disrupting and revising existing frequency use plans for a geographic area by forgoing the use of dedicated channels for path loss measurements that may require disabling other frequency channels. As a

result, the inventions claimed by the ’264 Patent improve, *inter alia*, the efficiency of path loss measurements and geolocation of mobile devices.

78. As explained in detail below, Apple’s geolocation service infringes all of the Asserted Patents.

C. **The Accused Instrumentality**

79. Apple provides to its customers and end-users a service that can geolocate the customers’ and end-users’ mobile devices, *inter alia*, to enable location-based services on those mobile devices. This geolocation service is referred to as “Location Services.” (*See* https://www.apple.com/legal/privacy/data/en/location-services/ (“Location Services allows Apple and third-party apps and websites to gather and use information based on the current location of your iPhone or Apple Watch to provide a variety of location-based services.”)). Apple provides Location Services to customers and end-users in the United States, including customers and end-users in this District.

80. Apple’s Location Services uses network signals (*e.g.*, Wi-Fi signals, cellular signals, and Bluetooth signals) in conjunction with other information (*e.g.*, information from sensors on a mobile device) to determine the location of a customer’s or end-user’s mobile device. (*See, e.g.*, https://www.apple.com/legal/privacy/data/en/location-services/). As explained by Apple, “Location Services uses GPS and Bluetooth (where those are available) along with crowd-sourced Wi-Fi hotspot and cell tower locations to determine your device’s approximate location.” (*Id.*).

81. Apple’s Location Services comprises, *inter alia*, multiple hardware and software components that are used to provide the feature’s functionality. For example, on information and belief, Apple’s Location Services comprises at least servers maintained by Apple or portions thereof, and software developed by Apple thereon that controls the operation of such hardware,

as well as mobile devices (*e.g.*, iPhones) or portions thereof, and software developed by Apple thereon that controls the operation of such hardware, that enable the functionality of Apple's Location Services. Additionally, Apple makes the functionality of Apple's Location Services available for at least iOS applications via at least the Core Location API. (*See* https://developer.apple.com/documentation/corelocation ("Core Location provides services that determine a device's geographic location, altitude, and orientation, or its position relative to a nearby iBeacon device. The framework gathers data using all available components on the device, including the Wi-Fi, GPS, Bluetooth, magnetometer, barometer, and cellular hardware.")). Apple's Location Services, including such comprising hardware and software and associated APIs, is under the control of Apple. Apple's Location Services, including such comprising hardware and software and associated APIs, is referred to herein as the "Accused Instrumentality."

82. As described in detail below, the Accused Instrumentality embodies inventions claimed in the Asserted Patents, and thus infringes the Asserted Patents.

D. Apple's Acts of Infringement

83. Apple has made, used, sold, offered to sell, and/or imported infringing instrumentalities, and continues to do so, including the Accused Instrumentality.

84. By doing so, Apple has directly infringed, and continues to directly infringe, the Asserted Patents.

85. Apple has engaged and continues to engage in a pattern of conduct intended to induce and/or contribute to the infringement of others, such as its customers and end-users. These actions have included and include making, selling, offering to sell, and/or importing instrumentalities that infringe the Asserted Patents.

86. Through its actions, Apple induces and/or contributes to the infringement of the Asserted Patents, and thus indirectly infringes the Asserted Patents.

87. There is an actual, substantial, and continuing justiciable controversy between Geoscope and Apple regarding Apple's infringement of the Asserted Patents. Absent a judgment from this Court, Apple will continue to infringe the Asserted Patents and continue to cause damage to Geoscope.

88. On information and belief, Apple has had actual knowledge of the '753 Patent since prior to the filing of this Complaint. For example, U.S. Patent Application Publication No. 2008/0188237 ("the '237 Application"), the publication of the application that issued as the '753 Patent, appeared on a "List of references cited by examiner" sent electronically to Apple on March 9, 2012 during prosecution of Apple's U.S. Patent No. 8,347,210. Additionally, the '237 Application appeared on a "List of references cited by examiner" sent electronically to Apple on July 12, 2018 during prosecution of Apple's U.S. Patent No. 10,243,710. This July 12, 2018 "List of references cited by examiner," which appears in the file history of Apple's U.S. Patent No. 10,243,710, postdates the '753 Patent's issuance on March 26, 2013.

89. On information and belief, Apple has had actual knowledge of the '264 Patent since prior to the filing of this Complaint. For example, U.S. Patent Application Publication No. 2009/0149171 ("the '171 Application"), the publication of the application that issued as the '264 Patent, appeared on a "List of references cited by examiner" sent electronically to Apple on September 19, 2014 during prosecution of Apple's U.S. Patent No. 9,179,244. This September 19, 2014 "List of references cited by examiner," which appears in the file history of Apple's U.S. Patent No. 9,179,244, postdates the '264 Patent's issuance on November 27, 2012.

90. On information and belief, Apple has had actual knowledge of other patents related to the Asserted Patents via a claim of priority to the ’379 Provisional since prior to the filing of this Complaint. For example, U.S. Patent No. 8,311,018 (“the ’018 Patent”), appeared on a “List of references cited by examiner” sent electronically to Apple on March 4, 2014 during prosecution of Apple’s U.S. Patent No. 8,903,414. Additionally, the ’018 Patent was cited by Apple in an Invention Disclosure Statement on September 14, 2015 and appeared on a “List of References cited by applicant and considered by examiner” sent to Apple on March 24, 2016 during prosecution of Apple’s U.S. Patent No. 9,400,321.

91. As another example, the ’018 Patent was cited by Apple in an Invention Disclosure Statement on May 5, 2015 and appeared on a “List of References cited by applicant and considered by examiner” sent to Apple on December 2, 2015 during prosecution of Apple’s U.S. Patent No. 9,408,178. Additionally, the ’018 Patent was cited by Apple in an Invention Disclosure Statement on December 8, 2015 and appeared on a “List of References cited by applicant and considered by examiner” sent electronically to Apple on January 12, 2016 during prosecution of Apple’s U.S. Patent No. 9,791,572. The ’018 Patent, originally assigned to Andrew LLC and now also owned by Geoscope, is related to the ’104, ’358, ’494, ’753, and ’784 Patents as all of these patents claim priority to the ’379 Provisional.

92. On information and belief, Apple, as a large technology company, has had knowledge of or should have had knowledge of the ’104, ’358, ’494, ’784, and ’264, at least because they relate to the same field of subject matter as the ’753, ’264, and ’018 Patents. Additionally, the ’104, ’358, ’494, ’784 Patents are related to the ’753 and ’018 Patents as all of these patents claim priority to the ’379 Provisional, further indicating that Apple, as a large technology company, was aware or should have been aware of the ’104, ’358, ’494, and ’784

Patents because of their relation to patents that were cited during prosecution of Apple's own patents as well as patents that issued from applications, publications of which were cited during prosecution of Apple's own patents, as described above.

93. On information and belief, Apple, as a large technology company, has had knowledge of or should have had knowledge of the Asserted Patents, which were invented by engineers at Andrew Corporation (and/or its successor, CommScope) and originally assigned to Andrew LLC, at least because Apple was developing technology and applying for patents in the same fields as the Asserted Patents.

94. On information and belief, in the course of developing technology and applying for patents in the same fields as the Asserted Patents, Apple, as a large technology company, routinely monitored patents, patent applications, non-patent literature, and press related to those fields, including the Asserted Patents.

95. Although Apple has had knowledge of or should have had knowledge of the Asserted Patents, at least for the reasons explained above and in any event through the filing or service of this Complaint, as well as the value of and benefits of the technology claimed by the Asserted Patents, Apple has engaged, and continues to engage, in behavior that, as a large technology company, it knew or should have known had a high likelihood of infringing the Asserted Patents, including by incorporating Geoscope's patented technology in the Accused Instrumentality. To the extent Apple, as a large technology company, failed to investigate its infringement upon learning of the Asserted Patents, Apple has been willfully blind.

96. Apple's infringement of each Asserted Patent is and has been willful. Apple continues to commit acts of infringement despite awareness of the Asserted Patents and a high likelihood that its actions constitute infringement, and Apple knew or should have known that

its actions constituted an unjustifiably high risk of infringement, at least because of Apple's familiarity with the Asserted Patents and the fields to which they relate (including the fields to which Apple's Accused Instrumentality relates) including as part of its development of the Accused Instrumentality, and its monitoring of patents, patent applications, non-patent literature, and press in the same fields as the Asserted Patents, including the Asserted Patents themselves.

97. Apple's acts of infringement have been willful as of the date it became aware of the patented technology/invention(s) and/or the Asserted Patents, and no later than the filing of this Complaint for patent infringement and/or the date this Complaint for patent infringement was served on Apple.

V. COUNT ONE - (INFRINGEMENT OF U.S. PATENT NO. 7,561,104)

98. Geoscope realleges and incorporates by reference each of the preceding paragraphs.

99. Apple has and continues to directly and/or indirectly infringe one or more claims of the '104 Patent, including, without limitation, at least claims 1 and 11, in this District and elsewhere in Virginia and the United States.[3]

100. Claim 1 of the '104 Patent, for example, recites:[4]

(1.0) A method for determining a location of a mobile station, comprising:

[3] The identification of infringed claims for the '104 Patent in this Complaint is exemplary and not intended to be limiting. The Accused Instrumentality may infringe additional claims of the '104 Patent and any such additional claims will be identified in accordance with the governing rules and procedures of the Court, including during or after fact discovery.

[4] The numbering provided in parentheses in the claim below (and other claims shown in this Complaint) is added only to assist with further explanation of how the Accused Instrumentality meets each element of the claim.

(1.1) providing a database of previously-gathered calibration data for a predetermined region in a wireless network, wherein said network includes a first transmitter and a second transmitter;

(1.2) collecting observed network measurement data including a first signal characteristic from said first transmitter and a second signal characteristic from said second transmitter;

(1.3) determining which of said first and second signal characteristics has a greater magnitude;

(1.4) modifying said observed network measurement data using the greater magnitude signal characteristic; and

(1.5) comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station.

101. By way of example, the Accused Instrumentality infringes at least claim 1 of the ’104 Patent for at least the reasons explained below

102. To the extent the preamble (identified as limitation 1.0 above) is limiting, the Accused Instrumentality performs a method for determining the location of a mobile station such as a smart phone (*e.g.*, an iPhone). (*See* https://www.apple.com/legal/privacy/data/en/location-services/ (“Location Services uses GPS and Bluetooth (where those are available) along with crowd-sourced Wi-Fi hotspot and cell tower locations to determine your device’s approximate location.”)).

103. With respect to limitation 1.1 identified above, the Accused Instrumentality provides a database of previously-gathered calibration data for a predetermined region in a wireless network that includes at least a first and second transmitter (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons). For example, the Accused Instrumentality includes and provides a database to store previously-gathered information, from multiple transmitters, regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals from Wi-Fi access points, cell towers, and Bluetooth beacons in

different areas that is used in connection with determining the location of a mobile device. (*See* https://support.apple.com/en-us/HT203033 ("If Location Services is on, your device will periodically send the geo-tagged locations of nearby Wi-Fi hotspots and cell towers to Apple to augment Apple's crowd-sourced database of Wi-Fi hotspot and cell tower locations."); *see also* Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf ("To provide location-based services, Apple must be able to determine quickly and precisely where a device is located. To do this, Apple maintains a secure database containing information regarding known locations of cell towers and Wi-Fi access points.")). This calibration data is collected at least by iPhones, under the direction and control of Apple and the Accused Instrumentality, and sent to one or more servers operated by Apple to be stored in a database of such previously-gathered calibration data. (*See id*.).

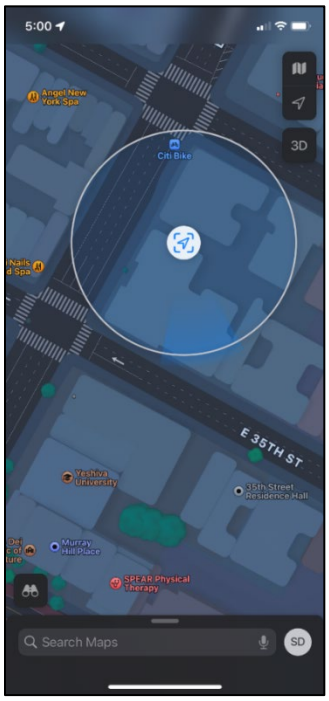
104. With respect to limitation 1.2 identified above, the Accused Instrumentality collects observed network measurement data from a plurality of transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons), with such data including at least one signal characteristic (*e.g.*, signal strength) from each transmitter, in connection with determining the location of a mobile device. For example, the Accused Instrumentality collects such data including, *inter alia*, the strengths of signals from a plurality of nearby Wi-Fi access points, cell towers, and Bluetooth beacons that are observed by a mobile device seeking its location. (*See* https://support.apple.com/en-us/HT203033 ("With your permission, Location Services allows apps and websites (including Maps, Camera, Weather, and other apps) to use information from cellular, Wi-Fi, Global Positioning System (GPS) networks, and Bluetooth to determine your approximate location."); https://developer.apple.com/documentation/corelocation ("Core

Location provides services that determine a device's geographic location, altitude, and orientation, or its position relative to a nearby iBeacon device. The framework gathers data using all available components on the device, including the Wi-Fi, GPS, Bluetooth, magnetometer, barometer, and cellular hardware.")). This observed network measurement data is collected, under the control and direction of Apple and the Accused Instrumentality, at the time a mobile device is seeking its location in order to determine that location. Such observed data may become part of the calibration data used in connection with future location requests.

105. With respect to limitation 1.3 identified above, the Accused Instrumentality determines which of at least two signal characteristics included in the observed network measurement data has a greater magnitude. For example, on information and belief, the Accused Instrumentality determines which measurement of, *inter alia*, signal strength information collected from at least two transmitters in the network measurement data observed by a mobile device has a greater magnitude, at least to modify the observed network measurement data using that signal characteristic with greater magnitude, as explained below in connection with limitation 1.4.

106. With respect to limitation 1.4 identified above, the Accused Instrumentality modifies the network measurement data observed by a mobile device using the signal characteristic (*e.g.*, signal strength) with greater magnitude in connection with determining the location of a mobile device. On information and belief, such modification helps account for inconsistencies and discrepancies in data collected from numerous different sources, with different types of signals (*e.g.*, Wi-Fi, cellular, and Bluetooth), in distinct and diverse locations, environments, and conditions (*e.g.*, indoors versus outdoors, differing numbers and types of obstructions, different weather conditions). (*See* https://support.apple.com/en-us/HT203033;

https://developer.apple.com/documentation/corelocation). On information and belief, the Accused Instrumentality modifies the observed data using the signal characteristic with greater magnitude at least to improve the accuracy of geolocation. Further, the Accused Instrumentality calculates "how precisely your location can be determined," which may be shown via a blue circle that changes in size depending on the estimated accuracy, as shown below. (*See* https://support.apple.com/en-us/HT203033). On information and belief, the manner in which the Accused Instrumentality calculates this estimated accuracy involves modification of the observed network measurement data using the signal characteristic with greater magnitude as part of determining the confidence in the estimated location of the mobile device.



107. With respect to limitation 1.5 identified above, the Accused Instrumentality compares the modified observed network measurement data with previously-gathered calibration data stored in a database to determine the location of the mobile device. For example, on information and belief, the Accused Instrumentality compares, *inter alia*, modified data regarding the strengths of signals received from Wi-Fi access points, cell towers, and Bluetooth

beacons by a mobile device seeking its location with previously-gathered calibration data regarding the strengths of those signals in various areas and the known locations of those Wi-Fi access points, cell towers, and Bluetooth beacons to determine the location of the device. (*See* https://support.apple.com/en-us/HT203033; Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). As an illustrative and simplified example, a comparison of the modified observed network measurement data to the previously-gathered calibration data may show that the signal strength of an observed Wi-Fi network at the device's current location is very close to its signal strength at a known location (based on the calibration data), allowing the Accused Instrumentality to determine that the mobile device is near that known location. This type of comparison, among others, is done for numerous different transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons) that are observed by a mobile device in an area to more accurately locate the device.

108. As another example, claim 11 of the '104 Patent depends from claim 1 and recites:

> (11.0) The method of claim 1, wherein the observed network measurement data includes received signal strength of said transmitters a[t] said mobile station.

109. By way of example, the Accused Instrumentality also infringes at least claim 11 of the '104 Patent. The Accused Instrumentality meets every limitation of claim 1, as explained above. Additionally, the Accused Instrumentality collects observed network measurement data that includes, *inter alia*, received signal strength. For example, the Accused Instrumentality collects data including the strengths of signals received at a mobile device from a plurality of nearby Wi-Fi access points, cell towers, and Bluetooth beacons that are observed by a mobile device seeking its location. (*See* Apple's July 12, 2010 Letter to Representatives Barton and

Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). This observed network measurement data is collected, under the control and direction of Apple and the Accused Instrumentality, at the time a mobile device is seeking its location in order to determine that location.

110. Each of the steps of claims 1 and 11 of the '104 Patent, as well as each step of the other infringed method claims of the '104 Patent, are performed directly by Apple which, via the Accused Instrumentality, dictates the performance of each step of such claims.

111. To the extent any step of such claims is not directly performed by Apple, it is performed under the direction or control of Apple. Receipt of the benefits of the Accused Instrumentality, including to provide a customer or end-user with a more accurate location, are necessarily conditioned on performance of the claimed steps, and Apple establishes the manner and/or timing of such performance by directing and controlling the operation of the Accused Instrumentality. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

112. For at least these reasons, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, one or more claims, including at least claims 1 and 11, of the '104 Patent pursuant to 35 U.S.C. § 271(a) by making, having made, using, selling, offering for sale, and/or importing systems and methods, including the Accused Instrumentality, within the United States and within this District.

113. In addition to its direct infringement, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has induced and continues to induce the direct infringement of the '104 Patent by users of the Accused Instrumentality pursuant to 35 U.S.C. § 271(b) in the United States and within this District. For example, Apple has induced and

continues to induce the direct infringement of the ’104 Patent by users of the Accused Instrumentality at least by making and providing users with the Accused Instrumentality, which infringes at least claims 1 and 11 of the ’104 Patent when used, and by activities related to selling, marketing, advertising, promotion, support, and distribution of the Accused Instrumentality. For example, Apple touts the benefits of, and encourages the use of, the Accused Instrumentality by its customers and end-users. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

114. On information and belief, Apple has had actual knowledge of the ’104 Patent prior to, and at least as of, the filing of this Complaint, as detailed above. (*See supra* at § IV.D). On information and belief, Apple has engaged in infringing activities with knowledge, or willful blindness, and intent that such activities would cause and/or encourage direct infringement of the ’104 Patent.

115. Apple, by itself and/or through its subsidiaries, affiliates, agents, and/or business partners, has contributed to and continues to contribute to the direct infringement by users of the Accused Instrumentality of claims of the ’104 Patent (including, without limitation, the claims addressed above) pursuant to 35 U.S.C. § 271(c) in the United States and within this District. For example, Apple has contributed to and continues to contribute to the direct infringement of the ’104 Patent at least by selling, offering to sell, and/or importing the Accused Instrumentality, or one or more components thereof, in the United States with knowledge that the Accused Instrumentality and/or such components constitute a material part of the inventions claimed in the ’104 Patent, and that the Accused Instrumentality and/or such components have no substantial non-infringing use, and knowing that the Accused Instrumentality and/or such

components are especially made or adapted for use in infringing one or more claims of the ’104 Patent.

116. As a consequence of each form of Apple’s infringement, both literal and under the doctrine of equivalents, of the ’104 Patent, Geoscope has been damaged in an amount not yet determined and is entitled to recover damages pursuant to 35 U.S.C. § 284.

117. On information and belief, as set forth in detail above, Apple’s infringement of the ’104 Patent has been and continues to be willful.

VI. COUNT TWO - (INFRINGEMENT OF U.S. PATENT NO. 8,400,358)

118. Geoscope realleges and incorporates by reference each of the preceding paragraphs.

119. Apple has and continues to directly and/or indirectly infringe one more claims of the ’358 Patent, including, without limitation, at least claims 1, 10, 41, and 52, in this District and elsewhere in Virginia and the United States.[5]

120. Claim 1 of the ’358 Patent, for example, recites:

(1.0) A method for determining a location of a mobile station, comprising:

(1.1) providing a database of previously-gathered calibration data for a predetermined region in a wireless network;

(1.2) collecting observed network measurement data;

(1.3) modifying said observed network measurement data; and

(1.4) comparing said modified network measurement data with said database of calibration data by positioning determining equipment to thereby determine the location of the mobile station.

[5] The identification of infringed claims for the ’358 Patent in this Complaint is exemplary and not intended to be limiting. The Accused Instrumentality may infringe additional claims of the ’358 Patent and any such additional claims will be identified in accordance with the governing rules and procedures of the Court, including during or after fact discovery.

121. By way of example, the Accused Instrumentality infringes at least claim 1 of the ’358 Patent for at least the reasons explained below.

122. To the extent the preamble (identified as limitation 1.0 above) is limiting, the Accused Instrumentality performs a method for determining the location of a mobile station such as a smart phone (*e.g.*, an iPhone). (*See* https://www.apple.com/legal/privacy/data/en/location-services/ (“Location Services uses GPS and Bluetooth (where those are available) along with crowd-sourced Wi-Fi hotspot and cell tower locations to determine your device’s approximate location.”)).

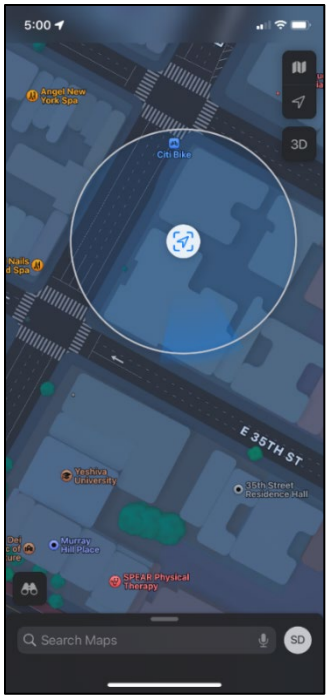
123. With respect to limitation 1.1 identified above, the Accused Instrumentality provides a database of previously-gathered calibration data for a predetermined region in a wireless network. For example, the Accused Instrumentality includes and provides a database to store previously-gathered information regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals from Wi-Fi access points, cell towers, and Bluetooth beacons in different areas, that is used in connection with determining the location of a mobile device. (*See* https://support.apple.com/en-us/HT203033 (“If Location Services is on, your device will periodically send the geo-tagged locations of nearby Wi-Fi hotspots and cell towers to Apple to augment Apple’s crowd-sourced database of Wi-Fi hotspot and cell tower locations.”); *see also* Apple’s July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf (“To provide location-based services, Apple must be able to determine quickly and precisely where a device is located. To do this, Apple maintains a secure database containing information regarding known locations of cell towers and Wi-Fi access points.”)). This calibration data is collected at least by iPhones, under the direction and control

of Apple and the Accused Instrumentality, and sent to one or more servers operated by Apple to be stored in a database of such previously-gathered calibration data. (*See id*.).

124. With respect to limitation 1.2 identified above, the Accused Instrumentality collects observed network measurement data from transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons) in connection with determining the location of a mobile device. For example, the Accused Instrumentality collects such data including, *inter alia*, the strengths of signals from nearby Wi-Fi access points, cell towers, and Bluetooth beacons that are observed by a mobile device seeking its location. (*See* https://support.apple.com/en-us/HT203033 ("With your permission, Location Services allows apps and websites (including Maps, Camera, Weather, and other apps) to use information from cellular, Wi-Fi, Global Positioning System (GPS) networks, and Bluetooth to determine your approximate location."); https://developer.apple.com/documentation/corelocation ("Core Location provides services that determine a device's geographic location, altitude, and orientation, or its position relative to a nearby iBeacon device. The framework gathers data using all available components on the device, including the Wi-Fi, GPS, Bluetooth, magnetometer, barometer, and cellular hardware.")). This observed network measurement data is collected, under the control and direction of Apple and the Accused Instrumentality, at the time a mobile device is seeking its location in order to determine that location. Such observed data may become part of the calibration data used in connection with future location requests.

125. With respect to limitation 1.3 identified above, the Accused Instrumentality modifies the network measurement data observed by a mobile device in connection with determining the location of a mobile device. For example, on information and belief, the Accused Instrumentality modifies the observed network measurement data by, *inter alia*,

averaging and/or normalizing the observed data at least because such modification helps account for inconsistencies and discrepancies in data collected from numerous different sources, with different types of signals (*e.g.*, Wi-Fi, cellular, and Bluetooth), in distinct and diverse locations, environments, and conditions (*e.g.*, indoors versus outdoors, differing numbers and types of obstructions, different weather conditions). (*See* https://support.apple.com/en-us/HT203033; https://developer.apple.com/documentation/corelocation). On information and belief, the Accused Instrumentality also uses observed data such as barometric pressure to modify the observed data based on environmental conditions. On information and belief, the Accused Instrumentality modifies the observed data at least to improve the accuracy of geolocation. Further, the Accused Instrumentality calculates "how precisely your location can be determined," which may be shown via a blue circle that changes in size depending on the estimated accuracy, as shown below. (*See* https://support.apple.com/en-us/HT203033). On information and belief, the manner in which the Accused Instrumentality calculates this estimated accuracy involves modification of the observed network measurement data via at least averaging and/or normalization as part of determining the confidence in the estimated location of the mobile device.



126. With respect to limitation 1.4 identified above, the Accused Instrumentality compares the modified observed network measurement data with previously-gathered calibration data stored in a database to determine the location of the mobile device. The Accused Instrumentality uses positioning determining equipment to make such comparisons as part of determining the location of a mobile device. For example, on information and belief, the Accused Instrumentality, via its positioning determining equipment, compares, *inter alia*, modified data regarding the strengths of signals received from Wi-Fi access points, cell towers, and Bluetooth beacons by a mobile device seeking its location with previously-gathered calibration data regarding the strengths of those signals in various areas and the known locations of those Wi-Fi access points, cell towers, and Bluetooth beacons to determine the location of the device. (*See* https://support.apple.com/en-us/HT203033; Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). As an illustrative and simplified example, a comparison of the modified observed network measurement data to the previously-gathered

calibration data may show that the signal strength of an observed Wi-Fi network at the device's current location is very close to its signal strength at a known location (based on the calibration data), allowing the Accused Instrumentality to determine that the mobile device is near that known location. This type of comparison, among others, is done for numerous different transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons) that are observed by a mobile device in an area to more accurately locate the device.

127. As another example, claim 10 of the '358 Patent depends from claim 1 and recites:

> (10.0) The method of claim 1 wherein said previously-gathered calibration data includes information identifying a serving cell of a transmitter transmitting a signal received at a predetermined calibration point within said region.

128. By way of example, the Accused Instrumentality also infringes at least claim 10 of the '358 Patent. The Accused Instrumentality meets every limitation of claim 1, as explained above. Additionally, the Accused Instrumentality provides a database of previously-gathered calibration data that includes, *inter alia*, information identifying a serving cell for a transmitter transmitting a signal received at a calibration point. For example, Apple collects "Cell ID" information, which identifies the serving cell for a particular cell tower, which is stored as part of the previously-gathered calibration data. (*See* Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf).

129. As another example, claim 41 of the '358 Patent recites:

> (41.0) A method for determining a location of a mobile station, comprising:
>
> (41.1) providing a database of previously-gathered calibration data for a predetermined region in a wireless network;

(41.2) collecting observed network measurement data from each of a plurality of transmitters including a signal characteristic from each one of said plural transmitters;

(41.3) determining an average value for select ones of said signal characteristics;

(41.4) modifying said observed network measurement data using said average value; and

(41.5) comparing said modified network measurement data with said database of calibration data by positioning determining equipment to thereby determine the location of the mobile station.

130. By way of example, the Accused Instrumentality also infringes at least claim 41 of the ’358 Patent for at least the reasons explained below.

131. To the extent the preamble (identified as limitation 41.0 above) is limiting, the Accused Instrumentality meets this limitation for at least the same reasons explained above in connection with identical limitation 1.0 in claim 1 of the ’358 Patent.

132. With respect to limitation 41.1 identified above, the Accused Instrumentality meets this limitation for at least the same reasons explained above in connection with identical limitation 1.1 in claim 1 of the ’358 Patent.

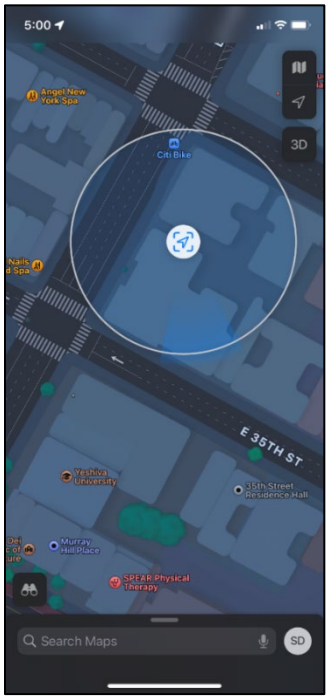
133. With respect to limitation 41.2 identified above, the Accused Instrumentality collects observed network measurement data from a plurality of transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons), with such data including at least one signal characteristic (*e.g.*, signal strength) from each transmitter, in connection with determining the location of a mobile device. For example, the Accused Instrumentality collects such data including, *inter alia*, the strengths of signals from a plurality of nearby Wi-Fi access points, cell towers, and Bluetooth beacons that are observed by a mobile device seeking its location. (*See* https://support.apple.com/en-us/HT203033 (“With your permission, Location Services allows apps and websites (including Maps, Camera, Weather, and other apps) to use information from

cellular, Wi-Fi, Global Positioning System (GPS) networks, and Bluetooth to determine your approximate location."); https://developer.apple.com/documentation/corelocation ("Core Location provides services that determine a device's geographic location, altitude, and orientation, or its position relative to a nearby iBeacon device. The framework gathers data using all available components on the device, including the Wi-Fi, GPS, Bluetooth, magnetometer, barometer, and cellular hardware.")). This observed network measurement data is collected, under the control and direction of Apple and the Accused Instrumentality, at the time a mobile device is seeking its location in order to determine that location. Such observed data may become part of the calibration data used in connection with future location requests.

134. With respect to limitation 41.3 identified above, the Accused Instrumentality determines an average value for at least one of the signal characteristics included in the observed network measurement data. For example, on information and belief, the Accused Instrumentality determines an average value of, *inter alia*, signal strength information in the network measurement data observed by a mobile device, at least to modify the observed network measurement data using that average value, as explained below in connection with limitation 41.4.

135. With respect to limitation 41.4 identified above, the Accused Instrumentality modifies the network measurement data observed by a mobile device using a determined average value in connection with determining the location of a mobile device. On information and belief, such modification helps account for inconsistencies and discrepancies in data collected from numerous different sources, with different types of signals (*e.g.*, Wi-Fi, cellular, and Bluetooth), in distinct and diverse locations, environments, and conditions (*e.g.*, indoors versus outdoors, differing numbers and types of obstructions, different weather conditions). (*See*

https://support.apple.com/en-us/HT203033; https://developer.apple.com/documentation/corelocation). On information and belief, the Accused Instrumentality modifies the observed data using a determined average value at least to improve the accuracy of geolocation. Further, the Accused Instrumentality calculates "how precisely your location can be determined," which may be shown via a blue circle that changes in size depending on the estimated accuracy, as shown below. (*See* https://support.apple.com/en-us/HT203033). On information and belief, the manner in which the Accused Instrumentality calculates this estimated accuracy involves modification of the observed network measurement data using a determined average value as part of determining the confidence in the estimated location of the mobile device.



136. With respect to limitation 41.5 identified above, the Accused Instrumentality meets this limitation for at least the same reasons explained above in connection with identical limitation 1.4 in claim 1 of the '358 Patent.

137. As another example, claim 52 of the '358 Patent depends from claim 41 and recites:

(52.0) The method of claim 41 wherein at least one of said plurality of transmitters is not a member of said wireless network.

138. By way of example, the Accused Instrumentality also infringes at least claim 52 of the ’358 Patent. The Accused Instrumentality meets every limitation of claim 41, as explained above. Additionally, the Accused Instrumentality collects network measurement data from a plurality of transmitters (*e.g.*, Wi-Fi access points and cell towers), with some of those transmitters not being a member of the same wireless network. (*See* Apple’s July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). For example, the network associated with a particular Wi-Fi access point is different from the network associated with a particular cell tower, such that the cell tower is not a member of the same network as the Wi-Fi access point.

139. Each of the steps of claims 1, 10, 41, and 52 of the ’358 Patent, as well as each step of the other infringed method claims of the ’358 Patent, are performed directly by Apple which, via the Accused Instrumentality, dictates the performance of each step of such claims.

140. To the extent any step of such claims is not directly performed by Apple, it is performed under the direction or control of Apple. Receipt of the benefits of the Accused Instrumentality, including to provide a customer or end-user with a more accurate location, are necessarily conditioned on performance of the claimed steps, and Apple establishes the manner and/or timing of such performance by directing and controlling the operation of the Accused Instrumentality. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

141. For at least these reasons, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, one or more claims, including at least claims 1, 10, 41, and 52, of the ’358 Patent pursuant to 35 U.S.C. § 271(a) by making, having made, using, selling,

offering for sale, and/or importing systems and methods, including the Accused Instrumentality, within the United States and within this District.

142. In addition to its direct infringement, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has induced and continues to induce the direct infringement of the ’358 Patent by users of the Accused Instrumentality pursuant to 35 U.S.C. § 271(b) in the United States and within this District. For example, Apple has induced and continues to induce the direct infringement of the ’358 Patent by users of the Accused Instrumentality at least by making and providing users with the Accused Instrumentality, which infringes at least claims 1, 10, 41, and 52 of the ’358 Patent when used, and by activities related to selling, marketing, advertising, promotion, support, and distribution of the Accused Instrumentality. For example, Apple touts the benefits of, and encourages the use of, the Accused Instrumentality by its customers and end-users. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

143. On information and belief, Apple has had actual knowledge of the ’358 Patent prior to, and at least as of, the filing of this Complaint, as detailed above. (*See supra* at § IV.D). On information and belief, Apple has engaged in infringing activities with knowledge, or willful blindness, and intent that such activities would cause and/or encourage direct infringement of the ’358 Patent.

144. Apple, by itself and/or through its subsidiaries, affiliates, agents, and/or business partners, has contributed to and continues to contribute to the direct infringement by users of the Accused Instrumentality of claims of the ’358 Patent (including, without limitation, the claims addressed above) pursuant to 35 U.S.C. § 271(c) in the United States and within this District. For example, Apple has contributed to and continues to contribute to the direct

infringement of the ’358 Patent at least by selling, offering to sell, and/or importing the Accused Instrumentality, or one or more components thereof, in the United States with knowledge that the Accused Instrumentality and/or such components constitute a material part of the inventions claimed in the ’358 Patent, and that the Accused Instrumentality and/or such components have no substantial non-infringing use, and knowing that the Accused Instrumentality and/or such components are especially made or adapted for use in infringing one or more claims of the ’358 Patent.

145. As a consequence of each form of Apple’s infringement, both literal and under the doctrine of equivalents, of the ’358 Patent, Geoscope has been damaged in an amount not yet determined and is entitled to recover damages pursuant to 35 U.S.C. § 284.

146. On information and belief, as set forth in detail above, Apple’s infringement of the ’358 Patent has been and continues to be willful.

VII. COUNT THREE - (INFRINGEMENT OF U.S. PATENT NO. 8,786,494)

147. Geoscope realleges and incorporates by reference each of the preceding paragraphs.

148. Apple has and continues to directly and/or indirectly infringe one or more claims of the ’494 Patent, including, without limitation, at least claims 1, 9, 25, and 35, in this District and elsewhere in Virginia and the United States.[6]

149. Claim 1 of the ’494 Patent, for example, recites:

(1.0) A method for determining a location of a mobile station, comprising:

[6] The identification of infringed claims for the ’494 Patent in this Complaint is exemplary and not intended to be limiting. The Accused Instrumentality may infringe additional claims of the ’494 Patent and any such additional claims will be identified in accordance with the governing rules and procedures of the Court, including during or after fact discovery.

(1.1) providing a database of previously-gathered calibration data for a predetermined region in a wireless network;

(1.2) collecting observed network measurement data, the observed network measurement data collected by the mobile station and transmitted to the network or collected by the network;

(1.3) modifying said observed network measurement data; and

(1.4) comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station.

150. By way of example, the Accused Instrumentality infringes at least claim 1 of the ’494 Patent for at least the reasons explained below.

151. To the extent the preamble (identified as limitation 1.0 above) is limiting, the Accused Instrumentality performs a method for determining the location of a mobile station such as a smart phone (*e.g.*, an iPhone). (*See* https://www.apple.com/legal/privacy/data/en/location-services/ (“Location Services uses GPS and Bluetooth (where those are available) along with crowd-sourced Wi-Fi hotspot and cell tower locations to determine your device’s approximate location.”)).

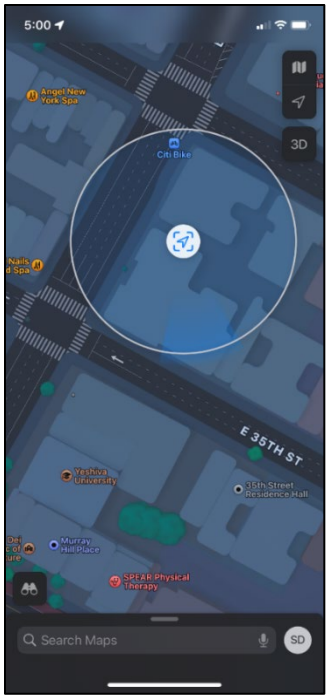
152. With respect to limitation 1.1 identified above, the Accused Instrumentality provides a database of previously-gathered calibration data for a predetermined region in a wireless network. For example, the Accused Instrumentality includes and provides a database to store previously-gathered information regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals from Wi-Fi access points, cell towers, and Bluetooth beacons in different areas, that is used in connection with determining the location of a mobile device. (*See* https://support.apple.com/en-us/HT203033 (“If Location Services is on, your device will periodically send the geo-tagged locations of nearby Wi-Fi hotspots and cell towers to Apple to augment Apple’s crowd-sourced database of Wi-Fi hotspot and cell tower locations.”); *see also* Apple’s July 12, 2010 Letter to Representative Barton and

Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf ("To provide location-based services, Apple must be able to determine quickly and precisely where a device is located. To do this, Apple maintains a secure database containing information regarding known locations of cell towers and Wi-Fi access points.")). This calibration data is collected at least by iPhones, under the direction and control of Apple and the Accused Instrumentality, and sent to one or more servers operated by Apple to be stored in a database of such previously-gathered calibration data. (*See id*.).

153. With respect to limitation 1.2 identified above, the Accused Instrumentality collects observed network measurement data from transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons) in connection with determining the location of a mobile device. The observed network measurement data is collected by the mobile device seeking its location, under the direction and control of Apple and the Accused Instrumentality, and transmitted to a network. For example, the Accused Instrumentality collects such data including, *inter alia*, the strengths of signals from nearby Wi-Fi access points, cell towers, and Bluetooth beacons that are observed by a mobile device seeking its location, and transmits it to a network. (*See* https://support.apple.com/en-us/HT203033 ("With your permission, Location Services allows apps and websites (including Maps, Camera, Weather, and other apps) to use information from cellular, Wi-Fi, Global Positioning System (GPS) networks, and Bluetooth to determine your approximate location."); https://developer.apple.com/documentation/corelocation ("Core Location provides services that determine a device's geographic location, altitude, and orientation, or its position relative to a nearby iBeacon device. The framework gathers data using all available components on the device, including the Wi-Fi, GPS, Bluetooth, magnetometer, barometer, and cellular hardware.")). This observed network measurement data is collected,

under the control and direction of Apple and the Accused Instrumentality, at the time a mobile device is seeking its location in order to determine that location. Such observed data may become part of the calibration data used in connection with future location requests.

154. With respect to limitation 1.3 identified above, the Accused Instrumentality modifies the network measurement data observed by a mobile device in connection with determining the location of a mobile device. For example, on information and belief, the Accused Instrumentality modifies the observed network measurement data by, *inter alia*, averaging and/or normalizing the observed data at least because such modification helps account for inconsistencies and discrepancies in data collected from numerous different sources, with different types of signals (*e.g.*, Wi-Fi, cellular, and Bluetooth), in distinct and diverse locations, environments, and conditions (*e.g.*, indoors versus outdoors, differing numbers and types of obstructions, different weather conditions). (*See* https://support.apple.com/en-us/HT203033; https://developer.apple.com/documentation/corelocation). On information and belief, the Accused Instrumentality also uses observed data such as barometric pressure to modify the observed data based on environmental conditions. On information and belief, the Accused Instrumentality modifies the observed data at least to improve the accuracy of geolocation. Further, the Accused Instrumentality calculates "how precisely your location can be determined," which may be shown via a blue circle that changes in size depending on the estimated accuracy, as shown below. (*See* https://support.apple.com/en-us/HT203033). On information and belief, the manner in which the Accused Instrumentality calculates this estimated accuracy involves modification of the observed network measurement data via at least averaging and/or normalization as part of determining the confidence in the estimated location of the mobile device.



155. With respect to limitation 1.4 identified above, the Accused Instrumentality compares the modified observed network measurement data with previously-gathered calibration data stored in a database to determine the location of the mobile device. For example, on information and belief, the Accused Instrumentality compares, *inter alia*, modified data regarding the strengths of signals received from Wi-Fi access points, cell towers, and Bluetooth beacons by a mobile device seeking its location with previously-gathered calibration data regarding the strengths of those signals in various areas and the known locations of those Wi-Fi access points, cell towers, and Bluetooth beacons to determine the location of the device. (*See* https://support.apple.com/en-us/HT203033; Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). As an illustrative and simplified example, a comparison of the modified observed network measurement data to the previously-gathered calibration data may show that the signal strength of an observed Wi-Fi network at the device's current location is very close to its signal strength at a known location (based on the calibration data), allowing the

Accused Instrumentality to determine that the mobile device is near that known location. This type of comparison, among others, is done for numerous different transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons) that are observed by a mobile device in an area to more accurately locate the device.

156. As another example, claim 9 of the ’494 Patent depends from claim 1 and recites:

(9.0) The method of claim 1 wherein said previously-gathered calibration data includes information identifying a serving cell of a transmitter transmitting a signal received at a predetermined calibration point within said region.

157. By way of example, the Accused Instrumentality also infringes at least claim 9 of the ’494 Patent. The Accused Instrumentality meets every limitation of claim 1, as explained above. Additionally, the Accused Instrumentality provides a database of previously-gathered calibration data that includes, *inter alia*, information identifying a serving cell for a transmitter transmitting a signal received at a calibration point. For example, Apple collects “Cell ID” information, which identifies the serving cell for a particular cell tower, which is stored as part of the previously-gathered calibration data. (*See* Apple’s July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf).

158. As another example, claim 25 of the ’494 Patent recites:

(25.0) A method for determining a location of a mobile station, comprising:

(25.1) providing a database of previously-gathered calibration data for a predetermined region in a wireless network;

(25.2) collecting observed network measurement data from each of a plurality of transmitters including a signal characteristic from each one of said plural transmitters, the observed network measurement data collected by the mobile station and transmitted to the network or collected by the network;

(25.3) determining an average value for select ones of said signal characteristics;

(25.4) modifying said observed network measurement data using said average value; and

(25.5) comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station.

159. By way of example, the Accused Instrumentality also infringes at least claim 25 of the ’494 Patent for at least the reasons explained below.

160. To the extent the preamble (identified as limitation 25.0 above) is limiting, the Accused Instrumentality meets this limitation for at least the same reasons explained above in connection with identical limitation 1.0 in claim 1 of the ’494 Patent.

161. With respect to limitation 25.1 identified above, the Accused Instrumentality meets this limitation for at least the same reasons explained above in connection with identical limitation 1.1 in claim 1 of the ’494 Patent.

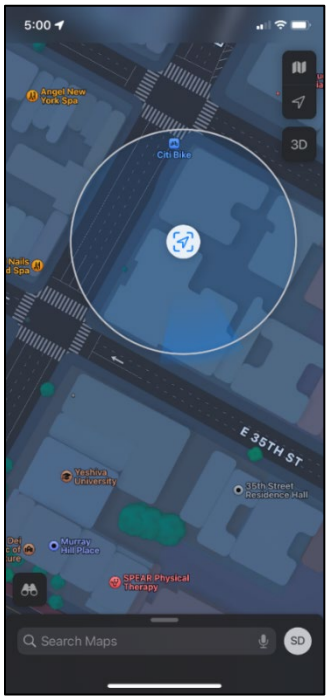
162. With respect to limitation 25.2 identified above, the Accused Instrumentality collects observed network measurement data from a plurality of transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons), with such data including at least one signal characteristic (*e.g.*, signal strength) from each transmitter, in connection with determining the location of a mobile device. The observed network measurement data is collected by the mobile device seeking its location, under the direction and control of Apple and the Accused Instrumentality, and transmitted to a network. For example, the Accused Instrumentality collects such data including, *inter alia*, the strengths of signals from a plurality of nearby Wi-Fi access points, cell towers, and Bluetooth beacons that are observed by a mobile device seeking its location, and transmits it to a network. (*See* https://support.apple.com/en-us/HT203033 (“With your permission, Location Services allows apps and websites (including Maps, Camera, Weather, and other apps) to use information from cellular, Wi-Fi, Global Positioning System (GPS) networks, and Bluetooth to determine your approximate location.”);

https://developer.apple.com/documentation/corelocation ("Core Location provides services that determine a device's geographic location, altitude, and orientation, or its position relative to a nearby iBeacon device. The framework gathers data using all available components on the device, including the Wi-Fi, GPS, Bluetooth, magnetometer, barometer, and cellular hardware.")). This observed network measurement data is collected, under the control and direction of Apple and the Accused Instrumentality, at the time a mobile device is seeking its location in order to determine that location. Such observed data may become part of the calibration data used in connection with future location requests.

163. With respect to limitation 25.3 identified above, the Accused Instrumentality determines an average value for at least one of the signal characteristics included in the observed network measurement data. For example, on information and belief, the Accused Instrumentality determines an average value of, *inter alia*, signal strength information in the network measurement data observed by a mobile device, at least to modify the observed network measurement data using that average value, as explained below in connection with limitation 25.4.

164. With respect to limitation 25.4 identified above, the Accused Instrumentality modifies the network measurement data observed by a mobile device using a determined average value in connection with determining the location of a mobile device. On information and belief, such modification helps account for inconsistencies and discrepancies in data collected from numerous different sources, with different types of signals (*e.g.*, Wi-Fi, cellular, and Bluetooth), in distinct and diverse locations, environments, and conditions (*e.g.*, indoors versus outdoors, differing numbers and types of obstructions, different weather conditions). (*See* https://support.apple.com/en-us/HT203033; https://developer.apple.com/documentation/

corelocation). On information and belief, the Accused Instrumentality modifies the observed data using a determined average value at least to improve the accuracy of geolocation. Further, the Accused Instrumentality calculates "how precisely your location can be determined," which may be shown via a blue circle that changes in size depending on the estimated accuracy, as shown below. (*See* https://support.apple.com/en-us/HT203033). On information and belief, the manner in which the Accused Instrumentality calculates this estimated accuracy involves modification of the observed network measurement data using a determined average value as part of determining the confidence in the estimated location of the mobile device.



165. With respect to limitation 25.5 identified above, the Accused Instrumentality meets this limitation for at least the same reasons explained above in connection with identical limitation 1.4 in claim 1 of the '494 Patent.

166. As another example, claim 35 of the '494 Patent depends from claim 25 and recites:

(35.0) The method of claim 25 wherein at least one of said plurality of transmitters is not a member of said wireless network.

167. By way of example, the Accused Instrumentality also infringes at least claim 35 of the ’494 Patent. The Accused Instrumentality meets every limitation of claim 25, as explained above. Additionally, the Accused Instrumentality collects network measurement data from a plurality of transmitters (*e.g.*, Wi-Fi access points and cell towers), with some of those transmitters not being a member of the same wireless network. (*See* Apple’s July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). For example, the network associated with a particular Wi-Fi access point is different from the network associated with a particular cell tower, such that the cell tower is not a member of the same network as the Wi-Fi access point.

168. Each of the steps of claims 1, 9, 25, and 35 of the ’494 Patent, as well as each step of the other infringed method claims of the ’494 Patent, are performed directly by Apple which, via the Accused Instrumentality, dictates the performance of each step of such claims.

169. To the extent any step of such claims is not directly performed by Apple, it is performed under the direction or control of Apple. Receipt of the benefits of the Accused Instrumentality, including to provide a customer or end-user with a more accurate location, are necessarily conditioned on performance of the claimed steps, and Apple establishes the manner and/or timing of such performance by directing and controlling the operation of the Accused Instrumentality. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

170. For at least these reasons, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, one or more claims, including at least claims 1, 9, 25, and 35, of the ’494 Patent pursuant to 35 U.S.C. § 271(a) by making, having made, using, selling,

offering for sale, and/or importing systems and methods, including the Accused Instrumentality, within the United States and within this District.

171. In addition to its direct infringement, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has induced and continues to induce the direct infringement of the ’494 Patent by users of the Accused Instrumentality pursuant to 35 U.S.C. § 271(b) in the United States and within this District. For example, Apple has induced and continues to induce the direct infringement of the ’494 Patent by users of the Accused Instrumentality at least by making and providing users with the Accused Instrumentality, which infringes at least claims 1, 9, 25, and 35 of the ’494 Patent when used, and by activities related to selling, marketing, advertising, promotion, support, and distribution of the Accused Instrumentality. For example, Apple touts the benefits of, and encourages the use of, the Accused Instrumentality by its customers and end-users. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

172. On information and belief, Apple has had actual knowledge of the ’494 Patent prior to, and at least as of, the filing of this Complaint, as detailed above. (*See supra* at § IV.D). On information and belief, Apple has engaged in infringing activities with knowledge, or willful blindness, and intent that such activities would cause and/or encourage direct infringement of the ’494 Patent.

173. Apple, by itself and/or through its subsidiaries, affiliates, agents, and/or business partners, has contributed to and continues to contribute to the direct infringement by users of the Accused Instrumentality of claims of the ’494 Patent (including, without limitation, the claims addressed above) pursuant to 35 U.S.C. § 271(c) in the United States and within this District. For example, Apple has contributed to and continues to contribute to the direct

infringement of the ’494 Patent at least by selling, offering to sell, and/or importing the Accused Instrumentality, or one or more components thereof, in the United States with knowledge that the Accused Instrumentality and/or such components constitute a material part of the inventions claimed in the ’494 Patent, and that the Accused Instrumentality and/or such components have no substantial non-infringing use, and knowing that the Accused Instrumentality and/or such components are especially made or adapted for use in infringing one or more claims of the ’494 Patent.

174. As a consequence of each form of Apple’s infringement, both literal and under the doctrine of equivalents, of the ’494 Patent, Geoscope has been damaged in an amount not yet determined and is entitled to recover damages pursuant to 35 U.S.C. § 284.

175. On information and belief, as set forth in detail above, Apple’s infringement of the ’494 Patent has been and continues to be willful.

VIII. COUNT FOUR - (INFRINGEMENT OF U.S. PATENT NO. 8,406,753)

176. Geoscope realleges and incorporates by reference each of the preceding paragraphs.

177. Apple has and continues to directly and/or indirectly infringe one or more claims of the ’753 Patent, including, without limitation, at least claims 1 and 9, in this District and elsewhere in Virginia and the United States.[7]

178. Claim 1 of the ’753 Patent, for example, recites:

(1.0) A method of determining the location of a mobile device in a geographic region comprising the steps of:

[7] The identification of infringed claims for the ’753 Patent in this Complaint is exemplary and not intended to be limiting. The Accused Instrumentality may infringe additional claims of the ’753 Patent and any such additional claims will be identified in accordance with the governing rules and procedures of the Court, including during or after fact discovery.

(1.1) (a) providing calibration data for each of one or more calibration points in a geographic region, said calibration data having one or more characterizing parameters;

(1.2) (b) generating one or more sets of grid points for said calibration data;

(1.3) (c) receiving at least one network measurement report from a mobile device at an unknown location in said geographic region;

(1.4) (d) evaluating said at least one network measurement report with each of said sets of grid points as a function of select ones of said characterizing parameters;

(1.5) (e) selecting a set of grid points as a function of a predetermined criteria; and

(1.6) (f) determining the location of a mobile device in said geographic region as a function of said selected set of grid points.

179. By way of example, the Accused Instrumentality infringes at least claim 1 of the ’753 Patent for at least the reasons explained below.

180. To the extent the preamble (identified as limitation 1.0 above) is limiting, the Accused Instrumentality performs a method for determining the location of a mobile device such as a smart phone (*e.g.*, an iPhone). (*See* https://www.apple.com/legal/privacy/data/en/location-services/ (“Location Services uses GPS and Bluetooth (where those are available) along with crowd-sourced Wi-Fi hotspot and cell tower locations to determine your device’s approximate location.”)).

181. With respect to limitation 1.1 identified above, the Accused Instrumentality provides calibration data with one or more characterizing parameters (*e.g.*, signal strength) for a plurality of calibration points in a region. For example, the Accused Instrumentality collects and provides information regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals from Wi-Fi access points, cell towers, and Bluetooth beacons in different areas that is used in connection with determining the location of a mobile device. (*See* https://support.apple.com/en-us/HT203033 (“If Location Services is on,

your device will periodically send the geo-tagged locations of nearby Wi-Fi hotspots and cell towers to Apple to augment Apple's crowd-sourced database of Wi-Fi hotspot and cell tower locations."); *see also* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf ("To provide location-based services, Apple must be able to determine quickly and precisely where a device is located. To do this, Apple maintains a secure database containing information regarding known locations of cell towers and Wi-Fi access points.")). This calibration data is associated with one or more calibration points, which can include, *inter alia*, a known location where such calibration data is collected. This calibration data is collected at least by iPhones, under the direction and control of Apple and the Accused Instrumentality, and sent to one or more servers operated by Apple. (*See id*.).

182. With respect to limitation 1.2 identified above, the Accused Instrumentality generates grid points for the collected calibration data. For example, on information and belief, the Accused Instrumentality uses the calibration data related to, *inter alia*, the strengths of signals from Wi-Fi access points, cell towers, and Bluetooth beacons to find additional locations that can be determined or calculated based on the calibration data and generates grid points associated with those locations. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). As explained further below in connection with limitations 1.4-1.6, these grids points and the data associated with them (*e.g.*, signal strength information) can be used to locate a mobile device at an unknown location.

183. With respect to limitation 1.3 identified above, the Accused Instrumentality receives network measurements reports comprising network measurement data collected by a

mobile device at an unknown location from a plurality of transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons), in connection with determining the location of the mobile device. For example, the Accused Instrumentality receives data including, *inter alia*, the strengths of signals from nearby Wi-Fi access points, cell towers, and Bluetooth beacons that are observed by a mobile device seeking its location. (*See* https://support.apple.com/en-us/HT203033 ("With your permission, Location Services allows apps and websites (including Maps, Camera, Weather, and other apps) to use information from cellular, Wi-Fi, Global Positioning System (GPS) networks, and Bluetooth to determine your approximate location."); https://developer.apple.com/documentation/corelocation ("Core Location provides services that determine a device's geographic location, altitude, and orientation, or its position relative to a nearby iBeacon device. The framework gathers data using all available components on the device, including the Wi-Fi, GPS, Bluetooth, magnetometer, barometer, and cellular hardware.")). This network measurement data is collected, under the control and direction of Apple and the Accused Instrumentality, at the time a mobile device is seeking its location in order to determine that location.

184. With respect to limitation 1.4 identified above, the Accused Instrumentality evaluates the network measurement reports as a function of a characterizing parameter to determine the grid points to select and use for locating a mobile device. For example, on information and belief, the Accused Instrumentality will evaluate, *inter alia*, signal strength information associated with a plurality of Wi-Fi access points, cell towers, and Bluetooth beacons in a network measurement report to determine which grids points are appropriate for use in locating the mobile because, as one example, those grid points are associated with signals from the same Wi-Fi access points, cell towers, and Bluetooth beacons. (*See* Apple's July 12,

2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf).

185. With respect to limitation 1.5 identified above, the Accused Instrumentality selects a set of grid points as a function of a predetermined criteria based on the evaluation described in connection with limitation 1.4. For example, on information and belief, grid points that are determined as likely to be sufficiently near the mobile device based on, *inter alia*, an assessment of signal strength information associated with the grid points and signal strength information in the network measurement reports are selected by the Accused Instrumentality for use in locating the mobile device. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). Other or additional criteria such as information regarding the mobile device's past known location may also be used in selecting the grid points to use for locating the mobile device at an unknown location.

186. With respect to limitation 1.6 identified above, the Accused Instrumentality uses the selected grid points, and the data associated with the selected grid points, to determine the location of a mobile device. For example, on information and belief, the Accused Instrumentality compares, *inter alia*, data regarding the strengths of signals received from Wi-Fi access points, cell towers, and Bluetooth beacons by a mobile device seeking its location with corresponding data for those Wi-Fi access points, cell towers, and Bluetooth beacons associated with the selected grid points to determine the location of the device. (*See* https://support.apple.com/en-us/HT203033; Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). As an illustrative and simplified example, a comparison of the

data collected by the mobile device, which is collected under the control and direction of Apple and the Accused Instrumentality, and the corresponding data associated with the selected grid points may show that the signal strength of an observed Wi-Fi network at the device's current location is very close to its signal strength at a known location (based on the data associated with one or more grid points), allowing the Accused Instrumentality to determine that the mobile device is near that known location. This type of comparison, among others, is done for numerous different transmitters (*e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons) that are observed by a mobile device in an area to more accurately locate the device.

187. As another example, claim 9 of the '753 Patent depends from claim 1 and recites:

(9.0) The method of claim 1 wherein said characterizing parameter is selected from the group consisting of: signal strength for a signal transmitted by a transmitter having a known location as received by a receiver at said grid point; signal strength of a signal transmitted by a transmitter located at said grid point as received by a receiver at a known location; round trip time for a signal traveling between said grid point and a known location; timing advance of a signal received by said mobile device at said grid point; time difference of arrival of plural signals at said grid point with respect to a pair of known locations as measured by a receiver at said grid point or at said known locations; the identification of a serving cell or serving sector of said mobile device located at said grid point; a state of a wireless network serving said mobile device, and combinations thereof.

188. By way of example, the Accused Instrumentality also infringes at least claim 9 of the '753 Patent. The Accused Instrumentality meets every limitation of claim 1, as explained above. Additionally, the Accused Instrumentality provides databases of calibration data that have at least one characterizing parameter. For example, on information and belief, these characterizing parameters include, *inter alia*, the strengths of signals received from Wi-Fi access points, cell towers, and Bluetooth beacons at known locations by a receiver at a grid point. (*See* Apple's July 12, 2010 Letter to Representatives Barton and Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf).

Further, on information and belief, these characterizing parameters include, *inter alia*, information regarding the identification of a serving cell or serving sector (*e.g.*, via a "Cell ID" parameter). (*See id*.).

189. Each of the steps of claims 1 and 9 of the '753 Patent, as well as each step of the other infringed method claims of the '753 Patent, are performed directly by Apple which, via the Accused Instrumentality, dictates the performance of each step of such claims.

190. To the extent any step of such claims is not directly performed by Apple, it is performed under the direction or control of Apple. Receipt of the benefits of the Accused Instrumentality, including to provide a customer or end-user with a more accurate location, are necessarily conditioned on performance of the claimed steps, and Apple establishes the manner and/or timing of such performance by directing and controlling the operation of the Accused Instrumentality. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

191. For at least these reasons, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, one or more claims, including at least claims 1 and 9, of the '753 Patent pursuant to 35 U.S.C. § 271(a) by making, having made, using, selling, offering for sale, and/or importing systems and methods, including the Accused Instrumentality, within the United States and within this District.

192. In addition to its direct infringement, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has induced and continues to induce the direct infringement of the '753 Patent by users of the Accused Instrumentality pursuant to 35 U.S.C. § 271(b) in the United States and within this District. For example, Apple has induced and continues to induce the direct infringement of the '753 Patent by users of the Accused

Instrumentality at least by making and providing users with the Accused Instrumentality, which infringes at least claims 1 and 9 of the ’753 Patent when used, and by activities related to selling, marketing, advertising, promotion, support, and distribution of the Accused Instrumentality. For example, Apple touts the benefits of, and encourages the use of, the Accused Instrumentality by its customers and end-users. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

193. On information and belief, Apple has had actual knowledge of the ’753 Patent prior to, and at least as of, the filing of this Complaint, as detailed above. (*See supra* at § IV.D). On information and belief, Apple has engaged in infringing activities with knowledge, or willful blindness, and intent that such activities would cause and/or encourage direct infringement of the ’753 Patent.

194. Apple, by itself and/or through its subsidiaries, affiliates, agents, and/or business partners, has contributed to and continues to contribute to the direct infringement by users of the Accused Instrumentality of claims of the ’753 Patent (including, without limitation, the claims addressed above) pursuant to 35 U.S.C. § 271(c) in the United States and within this District. For example, Apple has contributed to and continues to contribute to the direct infringement of the ’753 Patent at least by selling, offering to sell, and/or importing the Accused Instrumentality, or one or more components thereof, in the United States with knowledge that the Accused Instrumentality and/or such components constitute a material part of the inventions claimed in the ’753 Patent, and that the Accused Instrumentality and/or such components have no substantial non-infringing use, and knowing that the Accused Instrumentality and/or such components are especially made or adapted for use in infringing one or more claims of the ’753 Patent.

195. As a consequence of each form of Apple's infringement, both literal and under the doctrine of equivalents, of the '753 Patent, Geoscope has been damaged in an amount not yet determined and is entitled to recover damages pursuant to 35 U.S.C. § 284.

196. On information and belief, as set forth in detail above, Apple's infringement of the '753 Patent has been and continues to be willful.

IX. COUNT FIVE - (INFRINGEMENT OF U.S. PATENT NO. 9,097,784)

197. Geoscope realleges and incorporates by reference each of the preceding paragraphs.

198. Apple has and continues to directly and/or indirectly infringe one or more claims of the '784 Patent, including, without limitation, at least claims 1 and 2, in this District and elsewhere in Virginia and the United States.[8]

199. Claim 1 of the '784 Patent, for example, recites:

(1.0) A method for generating a calibration database, comprising:

(1.1) receiving at a wireless device an attribute of a signal transmitted by a wireless transmitter to a mobile station in a region;

(1.2) wirelessly transmitting from said wireless device said attribute to a controller unit;

(1.3) obtaining location data of a plurality of geographic locations situated within said region, wherein said location data is determined using said wireless device, and wherein said region contains plural streets and intersections of said plural streets;

(1.4) providing a location information database wherein said location database includes latitude and longitude information for each of a plurality of points within said region;

(1.5) determining a status of said wireless device;

[8] The identification of infringed claims for the '784 Patent in this Complaint is exemplary and not intended to be limiting. The Accused Instrumentality may infringe additional claims of the '784 Patent and any such additional claims will be identified in accordance with the governing rules and procedures of the Court, including during or after fact discovery.

(1.6) determining from said status a most likely one of said plural streets upon which said wireless device is located;

(1.7) determining said most likely street as a first one of said plural geographic locations;

(1.8) determining a first point of said plural points that is in proximity to said first geographic location; and

(1.9) entering said first point in said calibration database and associating the location data for the first one of said plural geographic locations determined by said wireless device with the first point.

200. By way of example, the Accused Instrumentality infringes at least claim 1 of the ’784 Patent for at least the reasons explained below.

201. To the extent the preamble (identified as limitation 1.0 above) is limiting, the Accused Instrumentality generates a calibration database. The database generated by the Accused Instrumentality stores calibration data regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals transmitted by Wi-Fi access points, cell towers, and Bluetooth beacons, and uses this information in connection with determining the location of a mobile device. (*See* https://support.apple.com/en-us/HT203033 (“If Location Services is on, your device will periodically send the geo-tagged locations of nearby Wi-Fi hotspots and cell towers to Apple to augment Apple’s crowd-sourced database of Wi-Fi hotspot and cell tower locations.”); *see also* Apple’s July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf (“To provide location-based services, Apple must be able to determine quickly and precisely where a device is located. To do this, Apple maintains a secure database containing information regarding known locations of cell towers and Wi-Fi access points.”)).

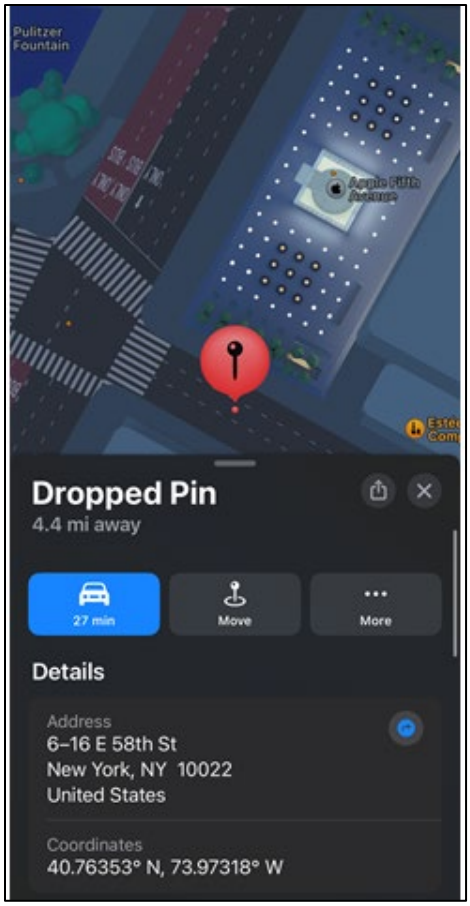
202. With respect to limitation 1.1 identified above, the Accused Instrumentality receives an attribute of a signal (*e.g.*, signal strength) that is transmitted by a wireless transmitter such as a Wi-Fi access point, cell tower, or Bluetooth beacon to a mobile device. For example, the Accused Instrumentality receives information regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals transmitted by Wi-Fi access points, cell towers, and Bluetooth beacons. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). This information is received under the direction and control of Apple and the Accused Instrumentality and sent to one or more servers operated by Apple. (*See id.*).

203. With respect to limitation 1.2 identified above, the Accused Instrumentality wirelessly sends the attributes of signals received from transmitters such as Wi-Fi access points, cell towers, and Bluetooth beacons to a controller unit. For example, after information regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals transmitted by Wi-Fi access points, cell towers, and Bluetooth beacons is received by the Accused Instrumentality, it is wirelessly transmitted, under the direction and control of Apple and the Accused Instrumentality, to one or more of Apple's servers constituting a controller unit. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf).

204. With respect to limitation 1.3 identified above, the Accused Instrumentality obtains location data for multiple geographic locations within an area that contains multiple streets and intersections of those streets. For example, the Accused Instrumentality obtains

information regarding, *inter alia*, the locations of Wi-Fi access points, cell towers, and Bluetooth beacons and the strengths of signals transmitted by Wi-Fi access points, cell towers, and Bluetooth beacons, as well as the locations of mobile devices at a given time, within an area that has multiple streets and intersections. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). This information is received under the direction and control of Apple and the Accused Instrumentality and sent to one or more servers operated by Apple. (*See id*.).

205. With respect to limitation 1.4 identified above, the Accused Instrumentality provides a location database that includes information regarding the latitude and longitude of multiple points within a region. For example, on information and belief, the Accused Instrumentality maintains and provides a database with, *inter alia*, information regarding the locations of streets in a region, including the latitude and longitude of points along those streets. (*See* https://techcrunch.com/2018/06/29/apple-is-rebuilding-maps-from-the-ground-up/). On information and belief, this database of information regarding the locations of streets is used, *inter alia*, in connection with Apple Maps (as shown below), and further used in improving the accuracy of the Accused Instrumentality's geolocation of a mobile device.



206. With respect to limitation 1.5 identified above, the Accused Instrumentality determines a status of a wireless device based on, *inter alia*, information from sensors on the device. For example, the Accused Instrumentality determines information about, *inter alia*, the device's orientation, direction of travel, and/or speed of travel from sensors on the device such as an accelerometer, compass, and magnetometer. (*See* https://www.apple.com/legal/privacy/data/en/location-services/; https://developer.apple.com/documentation/corelocation).

207. With respect to limitation 1.6 identified above, the Accused Instrumentality uses information regarding the status of the device to determine a street on which a wireless device is most likely located. For example, on information and belief, the Accused Instrumentality uses information regarding, *inter alia*, the device's direction and speed of travel, including in conjunction with other information and data, to determine whether a device is located on a street

and what street the device is likely located on. (*See* https://www.apple.com/legal/privacy/data/en/location-services/; https://developer.apple.com/documentation/corelocation).

208. With respect to limitation 1.7 identified above, the Accused Instrumentality determines a most likely street that corresponds to one of the geographic locations for which it obtained location data. For example, on information and belief, the Accused Instrumentality uses the wireless device's status along with the location data and location database to determine the most likely street associated with the geographic location.

209. With respect to limitation 1.8 identified above, the Accused Instrumentality also determines a point for which it has latitude and longitude information that is in proximity to the geographic location referred to in limitation 1.7. For example, on information and belief, the Accused Instrumentality associates the geographic location of the wireless device with a point derived from the location database (*e.g.*, Apple's street information database).

210. With respect to limitation 1.9 identified above, the Accused Instrumentality adds a point to the calibration database that is associated with the location data that has been obtained by the Accused Instrumentality. For example, on information and belief, the Accused Instrumentality enters points into the calibration database after determining the correspondence and relationship between the obtained location data and the information from the location database (*e.g.*, latitude and longitude information), and associates the obtained location data with those points. (*See* https://support.apple.com/en-us/HT203033 ("If Location Services is on, your device will periodically send the geo-tagged locations of nearby Wi-Fi hotspots and cell towers to Apple to augment Apple's crowd-sourced database of Wi-Fi hotspot and cell tower locations. If you're traveling (for example, in a car) and Location Services is on, a GPS-enabled iOS device will also periodically send GPS locations, travel speed, and barometric pressure

information to Apple to be used for building up Apple's crowd-sourced road-traffic and indoor pressure databases."); *see also* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf).

211. As another example, claim 2 of the '784 Patent depends from claim 1 and recites:

(2.0) The method of claim 1 wherein said attribute is selected from the group consisting of: signal strength, Cell global identity, broadcast control channel, base station identity code.

212. By way of example, the Accused Instrumentality also infringes at least claim 2 of the '784 Patent. The Accused Instrumentality meets every limitation of claim 1, as explained above. Additionally, the Accused Instrumentality receives signal strength information as an attribute of a signal transmitted by a wireless transmitter such as a Wi-Fi access point, cell tower, or Bluetooth beacon. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). This signal strength information is received under the direction and control of Apple and the Accused Instrumentality. (*See id*.).

213. Each of the steps of claims 1 and 2 of the '784 Patent, as well as each step of the other infringed method claims of the '784 Patent, are performed directly by Apple which, via the Accused Instrumentality, dictates the performance of each step of such claims.

214. To the extent any step of such claims is not directly performed by Apple, it is performed under the direction or control of Apple. Receipt of the benefits of the Accused Instrumentality, including to provide a customer or end-user with a more accurate location, are necessarily conditioned on performance of the claimed steps, and Apple establishes the manner

and/or timing of such performance by directing and controlling the operation of the Accused Instrumentality. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

215. For at least these reasons, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, one or more claims, including at least claims 1 and 2, of the ’784 Patent pursuant to 35 U.S.C. § 271(a) by making, having made, using, selling, offering for sale, and/or importing systems and methods, including the Accused Instrumentality, within the United States and within this District.

216. In addition to its direct infringement, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has induced and continues to induce the direct infringement of the ’784 Patent by users of the Accused Instrumentality pursuant to 35 U.S.C. § 271(b) in the United States and within this District. For example, Apple has induced and continues to induce the direct infringement of the ’784 Patent by users of the Accused Instrumentality at least by making and providing users with the Accused Instrumentality, which infringes at least claims 1 and 2 of the ’784 Patent when used, and by activities related to selling, marketing, advertising, promotion, support, and distribution of the Accused Instrumentality. For example, Apple touts the benefits of, and encourages the use of, the Accused Instrumentality by its customers and end-users. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

217. On information and belief, Apple has had actual knowledge of the ’784 Patent prior to, and at least as of, the filing of this Complaint, as detailed above. (*See supra* at § IV.D). On information and belief, Apple has engaged in infringing activities with knowledge, or willful

blindness, and intent that such activities would cause and/or encourage direct infringement of the ’784 Patent.

218. Apple, by itself and/or through its subsidiaries, affiliates, agents, and/or business partners, has contributed to and continues to contribute to the direct infringement by users of the Accused Instrumentality of claims of the ’784 Patent (including, without limitation, the claims addressed above) pursuant to 35 U.S.C. § 271(c) in the United States and within this District. For example, Apple has contributed to and continues to contribute to the direct infringement of the ’784 Patent at least by selling, offering to sell, and/or importing the Accused Instrumentality, or one or more components thereof, in the United States with knowledge that the Accused Instrumentality and/or such components constitute a material part of the inventions claimed in the ’784 Patent, and that the Accused Instrumentality and/or such components have no substantial non-infringing use, and knowing that the Accused Instrumentality and/or such components are especially made or adapted for use in infringing one or more claims of the ’784 Patent.

219. As a consequence of each form of Apple’s infringement, both literal and under the doctrine of equivalents, of the ’784 Patent, Geoscope has been damaged in an amount not yet determined and is entitled to recover damages pursuant to 35 U.S.C. § 284.

220. On information and belief, as set forth in detail above, Apple’s infringement of the ’784 Patent has been and continues to be willful.

X. COUNT SIX - (INFRINGEMENT OF U.S. PATENT NO. 8,320,264)

221. Geoscope realleges and incorporates by reference each of the preceding paragraphs.

222. Apple has and continues to directly and/or indirectly infringe one or more claims of the ’264 Patent, including, without limitation, at least claims 1 and 3, in this District and elsewhere in Virginia and the United States.[9]

223. Claim 1 of the ’264 Patent, for example, recites:

(1.0) A method for determining a path loss value of a signal transmitted from a wireless device and received by a receiver, where the wireless device and the receiver operate within a wireless communication system having at least one cell having at least one sector operating on at least one frequency channel, the method comprising the steps of:

(1.1) identifying a geographic area where the path loss value is to be determined;

(1.2) identifying a first cell, a first sector, and a first frequency channel associated with the geographic area wherein said wireless device is actively communicating with said receiver using said first frequency channel without disabling any other communication channel;

(1.3) receiving at said receiver the signal transmitted from said wireless device on said first frequency channel;

(1.4) receiving at said receiver an indication of transmission signal strength of said signal;

(1.5) measuring at said receiver the received signal strength of said signal; and

(1.6) determining the path loss value of said first frequency channel as a function of the indication of transmission signal strength and the received signal strength.

224. By way of example, the Accused Instrumentality infringes at least claim 1 of the ’264 Patent for at least the reasons explained below.

225. To the extent the preamble (identified as limitation 1.0 above) is limiting, the Accused Instrumentality performs a method to determine the path loss value of signals transmitted from a wireless device to a receiver as part of determining the location of a mobile

[9] The identification of infringed claims for the ’264 Patent in this Complaint is exemplary and not intended to be limiting. The Accused Instrumentality may infringe additional claims of the ’264 Patent and any such additional claims will be identified in accordance with the governing rules and procedures of the Court, including during or after fact discovery.

device such as a smart phone (*e.g.*, an iPhone). (*See* https://www.apple.com/legal/privacy/data/en/location-services/ ("Location Services uses GPS and Bluetooth (where those are available) along with crowd-sourced Wi-Fi hotspot and cell tower locations to determine your device's approximate location."); *see also* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). The wireless device may encompass at least a Wi-Fi access point, cell tower, or Bluetooth beacon and the receiver may encompass at least a mobile device such as a smart phone. (*See, e.g.,* Exhibit F at 5:39-45). The wireless device (*e.g.*, a Wi-Fi access point) and receiver (*e.g.*, a mobile device) operate within a wireless communication system that has at least one cell with at least one sector, operating on at least one frequency channel.

226. With respect to limitation 1.1 identified above, the Accused Instrumentality identifies a geographic area where the path loss value of one or more transmitted signals is to be determined. For example, on information and belief, the Accused Instrumentality uses recorded information or measurements to broadly identify a geographic area, *e.g.*, the geographic area in which a mobile device is located, before determining path loss values of signals in the geographic area. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). The Accused Instrumentality uses its determination of path loss values of signals in a geographic area to more accurately and precisely determine the location of the mobile device.

227. With respect to limitation 1.2 identified above, the Accused Instrumentality identifies a cell, a sector, and a frequency channel for communication that are associated with

the geographic area in which a wireless device (*e.g.*, a Wi-Fi access point, cell tower, or Bluetooth beacon) is transmitting signals to a receiver (*e.g.*, a mobile device). On information and belief, the Accused Instrumentality identifies a cell constituting, for example, a particular region that a given wireless device transmits signals within. Additionally, on information and belief, the Accused Instrumentality identifies a sector constituting, for example, a subsection of a cell. The Accused Instrumentality maintains, *inter alia*, information about the location of Wi-Fi access points, cell towers, and Bluetooth beacons, as well as a "Cell ID" parameter, to identify the cells and sectors associated with a geographic area. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf; https://support.apple.com/en-us/HT203033). The Accused Instrumentality also identifies a frequency channel used by the wireless device and receiver to communicate with each other, with such active communication involving the transmission of signals from the wireless device that are received by the receiver. On information and belief, the communication between the wireless device and the receiver on a first frequency channel does not require disabling any other communication channel at least because the communication is done via signals that are sent for another purpose (*e.g.*, to allow a receiver to connect to a network enabled by the wireless device). That purpose is not disrupted by the Accused Instrumentality determining a path loss value nor is a separate, designated channel or signal used for determining a path loss value. Rather, on information and belief, an existing communication channel is used for determining the path loss value. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/ 2011/04/applemarkeybarton7-12-10.pdf).

228. With respect to limitation 1.3 identified above, the Accused Instrumentality receives, at the receiver (*e.g.*, a mobile device), a signal transmitted by the wireless device (*e.g.*, a Wi-Fi access point, cell tower, or Bluetooth beacon) on the identified frequency channel. On information and belief, this signal includes information regarding the wireless device—*e.g.*, a signal from a cell tower may include "Cell ID" information whereas a signal from a Wi-Fi access point may include "MAC address" information. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). The reception of a signal from the wireless device by the receiver (*e.g.*, a mobile device) occurs under the control and direction of Apple and the Accused Instrumentality.

229. With respect to limitation 1.4 identified above, the Accused Instrumentality receives, at the receiver (*e.g.*, a mobile device), an indication of the transmission signal strength of the signal transmitted by the wireless device (*e.g.*, a Wi-Fi access point, cell tower, or Bluetooth beacon). On information and belief, this indication of transmission signal strength may be received directly from a wireless device or received indirectly including, as one example, through information from one or more of Apple's servers. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf; https://developer.apple.com/documentation/corelocation). The reception of an indication of transmission signal strength by the receiver (*e.g.*, a mobile device) occurs under the control and direction of Apple and the Accused Instrumentality.

230. With respect to limitation 1.5 identified above, the Accused Instrumentality measures, at the receiver (*e.g.*, a mobile device), the received signal strength of the signal

transmitted by the wireless device (*e.g.*, a Wi-Fi access point, cell tower, or Bluetooth beacon). For example, on information and belief, the receiver can measure the strengths of received signals, including signals from the wireless device. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf; https://developer.apple.com/documentation/corelocation). The measurement of the received signal strength by the receiver (*e.g.*, a mobile device) occurs under the control and direction of Apple and the Accused Instrumentality.

231. With respect to limitation 1.6 identified above, the Accused Instrumentality determines the path loss value based on the indication of transmission signal strength and the signal strength measured at the receiver (*e.g.*, a mobile device). For example, on information and belief, the Accused Instrumentality determines the difference between the transmission signal strength and the received signal strength, at least by comparing the indication of transmission signal strength with the signal strength measured at the receiver. (*See* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf). This determination of the path loss value occurs under the control and direction of Apple and the Accused Instrumentality.

232. As another example, claim 3 of the '264 Patent depends from claim 1 and recites:

(3.0) The method of claim 1, further comprising dete[r]mining the path loss value for a plurality of geographic areas to compile a database.

233. By way of example, the Accused Instrumentality also infringes at least claim 3 of the '264 Patent. The Accused Instrumentality meets every limitation of claim 1, as explained above. Additionally, the Accused Instrumentality creates and updates a database of calibration

data that comprises, *inter alia*, information regarding the path loss value, based on the strengths of signals transmitted by, *e.g.*, Wi-Fi access points, cell towers, and Bluetooth beacons, and received by a mobile device. (*See* https://support.apple.com/en-us/HT203033 ("If Location Services is on, your device will periodically send the geo-tagged locations of nearby Wi-Fi hotspots and cell towers to Apple to augment Apple's crowd-sourced database of Wi-Fi hotspot and cell tower locations."); *see also* Apple's July 12, 2010 Letter to Representative Barton and Representative Markey, *available at* https://www.wired.com/images_blogs/gadgetlab/2011/04/applemarkeybarton7-12-10.pdf ("To provide location-based services, Apple must be able to determine quickly and precisely where a device is located. To do this, Apple maintains a secure database containing information regarding known locations of cell towers and Wi-Fi access points.")). The path loss value for a plurality of geographic areas is determined, and information regarding this is stored in the database, to facilitate the geolocation of mobile devices in those geographic areas.

234. Each of the steps of claims 1 and 3 of the '264 Patent, as well as each step of the other infringed method claims of the '264 Patent, are performed directly by Apple which, via the Accused Instrumentality, dictates the performance of each step of such claims.

235. To the extent any step of such claims is not directly performed by Apple, it is performed under the direction or control of Apple. Receipt of the benefits of the Accused Instrumentality, including to provide a customer or end-user with a more accurate location, are necessarily conditioned on performance of the claimed steps, and Apple establishes the manner and/or timing of such performance by directing and controlling the operation of the Accused Instrumentality. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

236. For at least these reasons, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has directly infringed and continues to directly infringe, literally or under the doctrine of equivalents, one or more claims, including at least claims 1 and 3, of the ’264 Patent pursuant to 35 U.S.C. § 271(a) by making, having made, using, selling, offering for sale, and/or importing systems and methods, including the Accused Instrumentality, within the United States and within this District.

237. In addition to its direct infringement, Apple, by itself and/or through its subsidiaries, agents, and/or business partners, has induced and continues to induce the direct infringement of the ’264 Patent by users of the Accused Instrumentality pursuant to 35 U.S.C. § 271(b) in the United States and within this District. For example, Apple has induced and continues to induce the direct infringement of the ’264 Patent by users of the Accused Instrumentality at least by making and providing users with the Accused Instrumentality, which infringes at least claims 1 and 3 of the ’264 Patent when used, and by activities related to selling, marketing, advertising, promotion, support, and distribution of the Accused Instrumentality. For example, Apple touts the benefits of, and encourages the use of, the Accused Instrumentality by its customers and end-users. (*See* https://www.apple.com/legal/privacy/data/en/location-services/).

238. On information and belief, Apple has had actual knowledge of the ’264 Patent prior to, and at least as of, the filing of this Complaint, as detailed above. (*See supra* at § IV.D). On information and belief, Apple has engaged in infringing activities with knowledge, or willful blindness, and intent that such activities would cause and/or encourage direct infringement of the ’264 Patent.

239. Apple, by itself and/or through its subsidiaries, affiliates, agents, and/or business partners, has contributed to and continues to contribute to the direct infringement by users of the Accused Instrumentality of claims of the ’264 Patent (including, without limitation, the claims addressed above) pursuant to 35 U.S.C. § 271(c) in the United States and within this District. For example, Apple has contributed to and continues to contribute to the direct infringement of the ’264 Patent at least by selling, offering to sell, and/or importing the Accused Instrumentality, or one or more components thereof, in the United States with knowledge that the Accused Instrumentality and/or such components constitute a material part of the inventions claimed in the ’264 Patent, and that the Accused Instrumentality and/or such components have no substantial non-infringing use, and knowing that the Accused Instrumentality and/or such components are especially made or adapted for use in infringing one or more claims of the ’264 Patent.

240. As a consequence of each form of Apple’s infringement, both literal and under the doctrine of equivalents, of the ’264 Patent, Geoscope has been damaged in an amount not yet determined and is entitled to recover damages pursuant to 35 U.S.C. § 284.

241. On information and belief, as set forth in detail above, Apple’s infringement of the ’264 Patent has been and continues to be willful.

JURY DEMAND

242. Geoscope requests a trial by jury for all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Geoscope respectfully requests that the Court enter judgment against Apple:

1. determining that Apple has infringed, and continues to infringe, one or more claims of the ’104 Patent;

2. ordering Apple to account for and pay to Geoscope all damages suffered by Geoscope as a consequence of Apple's infringement of the '104 Patent, together with pre- and post-judgment interest and costs as fixed by the Court;

3. declaring that Apple's infringement of the '104 Patent was and is willful and trebling Geoscope's damages under 35 U.S.C. § 284 on that ground;

4. determining that Apple has infringed, and continues to infringe, one or more claims of the '358 Patent;

5. ordering Apple to account for and pay to Geoscope all damages suffered by Geoscope as a consequence of Apple's infringement of the '358 Patent, together with pre- and post-judgment interest and costs as fixed by the Court;

6. declaring that Apple's infringement of the '358 Patent was and is willful and trebling Geoscope's damages under 35 U.S.C. § 284 on that ground;

7. determining that Apple has infringed, and continues to infringe, one or more claims of the '494 Patent;

8. ordering Apple to account for and pay to Geoscope all damages suffered by Geoscope as a consequence of Apple's infringement of the '494 Patent, together with pre- and post-judgment interest and costs as fixed by the Court;

9. declaring that Apple's infringement of the '494 Patent was and is willful and trebling Geoscope's damages under 35 U.S.C. § 284 on that ground;

10. determining that Apple has infringed, and continues to infringe, one or more claims of the '753 Patent;

11. ordering Apple to account for and pay to Geoscope all damages suffered by Geoscope as a consequence of Apple's infringement of the '753 Patent, together with pre- and post-judgment interest and costs as fixed by the Court;

12. declaring that Apple's infringement of the '753 Patent was and is willful and trebling Geoscope's damages under 35 U.S.C. § 284 on that ground;

13. determining that Apple has infringed, and continues to infringe, one or more claims of the '784 Patent;

14. ordering Apple to account for and pay to Geoscope all damages suffered by Geoscope as a consequence of Apple's infringement of the '784 Patent, together with pre- and post-judgment interest and costs as fixed by the Court;

15. declaring that Apple's infringement of the '784 Patent was and is willful and trebling Geoscope's damages under 35 U.S.C. § 284 on that ground;

16. determining that Apple has infringed, and continues to infringe, one or more claims of the '264 Patent;

17. ordering Apple to account for and pay to Geoscope all damages suffered by Geoscope as a consequence of Apple's infringement of the '264 Patent, together with pre- and post-judgment interest and costs as fixed by the Court;

18. declaring that Apple's infringement of the '264 Patent was and is willful and trebling Geoscope's damages under 35 U.S.C. § 284 on that ground;

19. ordering that Apple be ordered to pay supplemental damages to Geoscope, including interest, with an accounting, as needed, of all infringements and/or damages not presented at trial;

20. declaring that this case is exceptional and awarding Geoscope its costs and attorney's fees in accordance with 35 U.S.C. § 285; and

21. granting Geoscope such other and further relief as the Court may deem just and proper.

Dated: December 1, 2022

Respectfully submitted,

/s/ John M. Erbach

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