UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

GEOSCOPE TECHNOLOGIES PTE. LTD.
Patent Owner

Case No. IPR2023-01210
U.S. Patent No. 8,400,358

DECLARATION OF MR. MARK ALAN STURZA

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LIST OF EXHIBITS

Exhibit No.	Petitioner's Exhibits
1001	U.S. Patent No. 8,400,358, issued on March 19, 2013 ("the '358 Patent")
1002	File History of U.S. Patent Application No. 12/424,320, filed on April 15, 2009 ("the '320 Application")
1003	File History of Reexamination Control No. 90/012,694 ("the '694 Reexam")
1004	Reexamination Certificate issued on August 18, 2014 (Reexamination Control No. 90/012,694)
1005	U.S. Provisional Application No. 60/899,379, filed on February 5, 2007 ("the '379 Provisional")
1006	U.S. Patent No. 7,706,811 ("Shkedi")
1007	U.S. Patent No. 9,097,784, issued on August 4, 2015 (the '784 Patent)
1008	U.S. Patent No. 8,406,753, issued on March 26, 2013 ("the '753 Patent")
1009	U.S. Patent Application Publication No. 2003/0064735, published on April 3, 2003 to D. Spain et al. ("Spain")
1010	Jian Zhu and G. D. Durgin, "Indoor/outdoor location of cellular handsets based on received signal strength," 2005 IEEE 61st Vehicular Technology Conference, Stockholm, Sweden, 2005, pp.92-96, Vol. 1, doi: 10.1109/VETECS.2005.1543256 ("Zhu")
1011	Heikki Laitinen, Jaakko Lähteenmäki, Tero Nordström, "Database Correlation Method for GSM Location", VTT Information Technology, IEEE, 2001. ("Laitinen")

1012	Declaration of David Hilliard Williams
1013	Curriculum Vitae of David Hilliard Williams
1014	Declaration of Dr. Sylvia Hall-Ellis
1015	Curriculum Vitae of Dr. Sylvia Hall-Ellis
1016	Complaint dated November 22, 2022, *Geoscope Technologies Pte. Ltd. v. Google LLC f/k/a Google Inc.*, Civ. Action No. 1:22-cv-01331 (EDVA) filed on November 22, 2022 ("the Related Litigation")
1017	Not Assigned
1018	U.S. Patent No. 7,561,104 ("the '104 Patent")
1019	File History of U.S. Patent Application No. 12/026,333, filed on February 5, 2008 ("the '333 Application")
1020-1023	Not Assigned
1024	Plaintiff Geoscope Technologies PTE. LTD.'s Opening Claim Construction Brief dated May 26, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC f/k/a Google Inc.*, Civ. Action No. 1:22-cv-01331 (EDVA) filed on November 22, 2022
1025	Google LLC's Opening Claim Construction Brief dated May 26, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC f/k/a Google Inc.*, Civ. Action No. 1:22-cv-01331 (EDVA) filed on November 22, 2022
1026	Not Assigned
1027	Appendix B to Plaintiff Geoscope Technologies Pte. Ltd.'s Preliminary Infringement Contentions dated April 7, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC f/k/a Google Inc.*, Civ. Action No. 1:22-cv-01331 (EDVA) filed on

	November 22, 2022
1028	Claim Construction Memorandum Opinion & Order dated July 19, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC f/k/a Google Inc.*, Civ. Action No. 1:22-cv-01331 (EDVA) filed on November 22, 2022
	Patent Owner's Exhibits
2001	Declaration of Christopher M. Gerson in Support of Patent Owner's Motion for Pro Hac Vice Admission of Christopher M. Gerson Under 37 C.F.R. § 42.10(c)
2002	*Not Assigned*
2003	Memorandum Opinion on Google's Motion for Judgment on the Pleadings on Patent Eligibility dated September 18, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC*, Civ. Action No. 1:22-cv-01331 (EDVA)
2004	Memorandum Opinion on Apple's Motion for Judgment on the Pleadings on Patent Eligibility dated September 18, 2023, *Geoscope Technologies Pte. Ltd. v. Apple Inc.*, Civ. Action No. 1:22-cv-01373 (EDVA)
2005	Final Judgment dated October 6, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC*, Civ. Action No. 1:22-cv-01331 (EDVA)
2006	Final Judgment dated October 5, 2023, *Geoscope Technologies Pte. Ltd. v. Apple Inc.*, Civ. Action No. 1:22-cv-01373 (EDVA)
2007	Order dated June 26, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC*, Civ. Action No. 1:22-cv-01331 (EDVA)
2008	Email from Saunak Desai to Stephen E. Noona, "Geoscope v. Google - Claim Narrowing" (June 12, 2023)
2009	Claim Construction Memorandum Opinion & Order dated July 19, 2023, *Geoscope Technologies Pte. Ltd. v. Apple Inc.*, Civ.

	Action No. 1:22-cv-01373 (EDVA)
2010	Order dated June 26, 2023, *Geoscope Technologies Pte. Ltd. v. Apple Inc.*, Civ. Action No. 1:22-cv-01373 (EDVA)
2011	Defendant Google LLC's Final Invalidity Contentions dated July 3, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC*, Civ. Action No. 1:22-cv-01331 (EDVA)
2012	Geoscope's Opening Appeal Brief dated November 17, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC, Apple Inc.,* Case Nos. 24-1003 (Lead) 24-1018 (member) (Fed. Cir.)
2013-2016	*Not Assigned*
2017	Preliminary Identification of Asserted Claims dated March 27, 2023, *Geoscope Technologies Pte. Ltd. v. Google LLC*, Civ. Action No. 1:22-cv-01331 (EDVA)
2018	Declaration of Saunak K. Desai in Support of Patent Owner's Motion for Pro Hac Vice Admission of Christopher M. Gerson Under 37 C.F.R. § 42.10(c)
2019	*Not Assigned*
2020	Declaration of Mark Alan Sturza
2021	*Curriculum Vitae* of Mark Alan Sturza
2022	Deposition Transcript of David Hilliard Williams for U.S. Pat. No. 8,406,753 (April 23, 2024)
2023	Deposition Transcript of David Hilliard Williams for U.S. Pat. Nos. 7,561,104, 8,786,494 and 8,400,358 (April 23, 2024)
2024	Patent Owner's Statutory Disclaimer of Claims 1, 15, 41, and 52 of the '358 Patent

I, Mark Alan Sturza, declare as follows:

I. INTRODUCTION

1. My name is Mark Alan Sturza. I have been retained by Patent Owner Geoscope Technologies Pte. Ltd. ("Patent Owner" or "Geoscope") as an independent expert consultant in this proceeding and asked to submit this declaration in connection with U.S. Patent No. 8,400,358 ("the '358 Patent"). I understand the '358 Patent is the subject of an *inter partes* review and petition ("the Petition") in front of the Patent Trial and Appeal Board of the United States Patent and Trademark Office, filed by Petitioner Google LLC ("Google" or "Petitioner").

2. I have been asked to provide my opinions on the technology claimed in, and the patentability or nonpatentability of, Claim 18 of the '358 Patent. This declaration is directed to Claim 18 of the '358 Patent and sets forth certain opinions I have formed, the conclusions I have reached, and the bases for each.

3. I am being compensated at my standard consulting rate of $500 per hour. My compensation is not contingent on the substance of my opinions or testimony, nor is it contingent on the outcome of this proceeding. I have no other financial interest in this proceeding.

4. Based on my experience, knowledge of the field at the relevant

time, review of materials including the ’358 Patent and prior art references relied on by Petitioner, and the understanding a person of ordinary skill in the art would have of the claim terms, it is my opinion that Claim 18 of the ’358 Patent is patentable over the asserted references and that the Petition fails to demonstrate otherwise.

II. BACKGROUND AND QUALIFICATIONS

5. My opinions stated in this declaration are based on my own personal knowledge and professional judgment. In forming my opinions, I have relied on my knowledge and experience in designing, developing, and researching the technology referenced in this declaration.

6. I am over eighteen years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein. A detailed list of my qualifications and experiences is contained in my curriculum vitae, which I understand is being submitted as Ex. 2021. The following provides a brief overview of my qualifications relevant to the matters set forth herein. I am familiar with all aspects of position, location, and navigation technology.

7. I earned a Bachelor of Science (BS) degree in Applied Mathematics from the California Institute of Technology (Caltech) in 1977, a Master of Science in Electrical Engineering (MSEE) degree from the University of Southern California (USC) in 1979, and a Master of Business Administration

(MBA) degree from Pepperdine University in 1985.

8. I am a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), as well as a Senior Member of the American Institute of Aeronautics and Astronautics (AIAA). I hold memberships in the Institute of Navigation (ION), the Pacific Telecommunications Council (PTC), the Society of Satellite Professionals International (SSPI), and the International Association for the Advancement of Space Safety (IAASS). I also hold a General Radiotelephone Operator License from the Federal Communications Commission (FCC).

9. I am the President of 3C Systems Company, a company I founded in 1989 to provide consulting expertise in the design, development, analysis, and regulation of communications systems. My industry experience includes senior engineering management and technical positions at LinQuest, Litton, Magnavox, and Teledyne.

10. I have over 45 years of experience in the design, development, and application of position, location, and navigation systems, including with respect to iOS and Android location-based services. Examples of my experience are provided below.

11. I designed and implemented an improved graphics capability for the

St. Mary's Loran-C navigation system.

12. I developed the first Global Positioning System (GPS) navigation set for commercial aviation applications, the LTN-700, in the early 1980's. I also architected 2nd and 3rd generation aviation products, the LTN-710 and the μNAV.

13. I have participated in the design of numerous radio frequency (RF) devices. These included a TT&C (Telemetry, Tracking, and Control) transceiver operating from 70 MHz through S-Band, a 5.8-GHz Sensor Receiver for an RF Motion Capture system, a DVB-T/H receiver chipset, a Ka-band/5-GHz transverter (upconverter/downconverter unit used to change the frequency band over which a transceiver operates), an S-Band/L-Band transverter, miniaturized low-power J-Band transceiver for Trajectory Controlled Munitions, wideband (1-GHz bandwidth) modem, 60-GHz transceiver, several GPS receivers from cards to modules to chipsets to single chip solutions, an amplifier module for Globalstar's multi-channel active antenna subscriber units, and several miniaturized low-power S-Band, L-Band, and VHF frequency synthesizers.

14. I was Principal Investigator for four Department of Defense (DoD) Small Business Innovative Research (SBIR) contracts:

- QPSK and MPSK Transmission and Receiving Equipment
- RPV Range Surveillance and Radio Relay Via Satellite

- Miniature GPS Digital Translator Development
- ECM Resistant GPS Receiver

15. I developed one of the first GPS software receivers, in the early 1990's. A software receiver is a computer program that processes digitized GPS signal samples generating pseudo-range and delta-range measurements and computes a navigation solution. This was part of the work I performed for NAVSYS Corporation supporting an Air Force contract.

16. I developed a differential GPS (DGPS) navigation filter with autonomous fault detection and conducted studies of receiver autonomous integrity monitoring (RAIM). DGPS is a technique used to improve location accuracy, and RAIM is a technique used to verify the location estimate was obtained from valid measurement data.

17. I was a member of the tiger team formed to review contract performance of the vendor developing Sirius Satellite Radio's receiver chipset.

18. I developed the system architecture for the Leo One USA store-and-forward satellite system including radio frequency plan, multiple access techniques, link budgets, satellite constellation orbits, network protocols, and satellite and user terminals.

19. I was technical lead for the Eagle River due diligence leading to ICO Global Communication's (ICO) emergence from bankruptcy. I worked

closely with the ICO and Boeing Space Systems teams to identify and mitigate technical risks and continued to provide technical and regulatory support following the restructuring.

20. I was a member of the Teledesic (Gates–McCaw "internet in the sky") founding team. I developed the communications systems architecture for this low-Earth orbit (LEO) Ka-band satellite communications system, including developing the radio frequency plan, multiple access techniques, and link budgets.

21. I developed an RF Tag motion capture system for the entertainment industry allowing the capture of actor's performances in robust environments.

22. I was Chief Technology Officer (CTO) for SkyVault, a digital rights management and secure content distribution startup. I also developed a demo system showcasing SkyVault's UltraSecure™ digital content protection.

23. I was a member of the team that developed the SiRFstar I, SiRFstar II, and SiRFstar IV GPS chipsets, including between 2006 and 2009. I developed high performance signal acquisition algorithms and moding, investigated positioning and geolocation techniques for GSM and UMTS mobile devices, and analyzed hybrid positioning techniques for mobile devices.

24. I was a member of the FCC's LightSquared/GPS Industry technical

working group (TWG). The TWG was established to evaluate the potential for interference to GPS and conducted extensive testing of all types of GPS devices and use cases, including iOS and Android devices.

25. I was a member of an online dating startup's team where I worked on apps utilizing iOS location services.

26. I was a member of the Pascal's Pocket team developing remote control applications for smartphones. I developed an ultra-secure virtual private network (VPN) for gaming machine applications. I also worked on apps utilizing iOS and Android location services.

27. I was a member of the founding team of sfara, a mobile app telematics startup that uses data science and sensor fusion technology on smartphones to provide a "Sphere of Safety." My support included developing extensive expertise with the iOS and Android location services, and underlying technologies.

28. I developed a product line of web service tools for link budget analysis, capacity planning, and performance monitoring.

29. I led a team conducting an Independent Technical Evaluation of Panasonic's eXConnect service.

30. I was a senior advisor to OneWeb in position, location, and

navigation technology.

31. I have served as a senior advisor to Microsoft, Google, SpaceX, Facebook, and Viasat in matters of spectrum policy and radio technology.

32. I hold thirty U.S. patents in communications system design, eleven of which specifically cover position, location, and navigation technology. I have authored over thirty technical papers, twenty-one of which focused on position, location, and navigation technology. Two of these papers were published in Navigation: Journal of the Institute of Navigation.

33. I was an instructor at University of California Los Angeles (UCLA) Extension teaching short courses (one-week courses intended for industry professionals) on "Integrated Communications, Precision Positioning Determination and Navigation, and Identification Systems", and on "NAVSTAR Global Positioning System (GPS): Operation, Implementation, and Applications." I also presented a similar short course for the University Consortium for Continuing Education. Additionally, I was an instructor at California State University Northridge, teaching a class in Linear Systems.

III. MATERIALS CONSIDERED

34. In forming my opinions regarding the '358 Patent, I reviewed all materials referenced in this declaration. In forming my opinions, I have reviewed all of the exhibits filed to date in this proceeding as well as the Petition and

Institution Decision. In addition, my opinions are also based on my education, training, experience, and knowledge in the field.

IV. LEGAL STANDARDS

35. I am not an attorney and do not intend to offer my opinion on the law. In forming my opinions in this case, I used the following legal standards that were explained to me by counsel.

A. Claim Construction

36. I have been informed that claim terms are to be construed from the perspective of a person of ordinary skill in the art at the time the application was filed. I have been informed that a claim term is generally given the plain and ordinary meaning that a person of ordinary skill in the art would ascribe to it when viewed in the context of the patent's claims, specification, and prosecution history.

37. I have been informed that "intrinsic evidence," including the patent claims, specification, and prosecution history are the most important sources for interpreting claim language in a patent. I have been informed that related patents and their prosecution histories may also be relevant to interpreting claim terms in another patent.

38. I have been informed that "extrinsic evidence," such as dictionary definitions and technical publications, may also be used to help interpret the

claim language, but that such extrinsic evidence is secondary to the intrinsic evidence and cannot be used to contradict the meaning of the claim language that is evident from the intrinsic evidence.

B. Level of Ordinary Skill in the Art

39. I have been informed that a patent and its claims are to be understood from the perspective of a hypothetical "person of ordinary skill in the art" ("POSITA"). I have been informed that a POSITA is considered to possess normal skills and knowledge in the relevant technical field.

C. Anticipation

40. I have been informed that for prior art to anticipate a patent claim, each and every element of a claim, as properly construed, must be disclosed either explicitly or inherently in a single prior art reference or embodied in a single prior art device. I have been informed that inherent anticipation may be found only if the prior art necessarily includes the claimed limitations.

41. I have been informed that, once a challenged claim has been properly construed, the step in determining whether the challenged claim is anticipated by the prior art requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

D. Obviousness

42. I have been informed that a claim may be invalid as obvious if the

differences between the claimed subject matter and one or more prior art references are such that the subject matter would have been obvious to a POSITA at the time of invention.

43. I have been informed that in assessing whether a claimed invention would have been obvious to a POSITA, the following factors are considered: (1) the scope and content of the prior art, (2) the differences between the claims and the prior art, (3) the level of ordinary skill in the art, and (4) objective indicia of non-obviousness.

44. I have been informed that a claim is not proved obvious merely by demonstrating that each of the claim elements was known in the prior art. Rather, there must be a showing that a POSITA would have reason to attempt to either combine two or more references or modify a reference to achieve the claimed invention, and that a POSITA would have had a reasonable expectation of success in doing so. I have been informed that obviousness should not be evaluated using the benefit of hindsight or what is known today.

45. I have been informed that the motivation to combine inquiry does not merely require showing that a POSITA could have combined references, but rather that a POSITA would have been motivated to combine references to arrive at the claimed invention. I have been informed that whether a POSITA would be

motivated to make a combination includes whether the POSITA would select particular references in order to combine their elements. I have been informed that fundamental differences between references may help show that a POSITA would not be motivated to combine them to achieve the claimed invention. I have been informed that when the prior art teaches away from a particular combination, the discovery of a successful means of combining said prior art is more likely to be non-obvious. I have been informed that a reference may be said to teach away when a person of ordinary skill in the art, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path taken by the patentee.

46. I have been informed that in evaluating whether patent claims are invalid as obvious, "objective indicia of non-obviousness" should be considered. I have been informed that objective indicia of non-obviousness include commercial success, long-felt but unsolved needs, copying, praise, unexpected results, industry acceptance, failure of others, and industry skepticism. I have been informed that there must be a nexus between the objective indicia and the claimed invention's novel features.

V. LEVEL OF ORDINARY SKILL IN THE ART

47. I understand that Petitioner and its expert have proposed that a POSITA would have been (1) someone knowledgeable in wireless networks,

cellular radio systems, mobile communication devices and radio navigation systems, (2) having at least a bachelor's degree in electrical engineering, with a background in radio frequency communications and/or navigation system technology as well as approximately two years of industry experience working on radio communication and/or navigation systems. Ex. 1012 ¶ 30.

48. I do not dispute Petitioner's definition of a POSITA for purposes of this declaration. Regardless, my opinions herein would not be changed by requiring somewhat more or somewhat less relevant knowledge and/or technical experience for a POSITA. Based on my background and experience, detailed further above, I am a person of at least ordinary skill in the relevant art for the '358 Patent.

VI. BACKGROUND OF THE TECHNOLOGY

49. As described in further detail below, the inventions claimed in the '358 Patent relate to the geolocation of mobile devices and provide solutions to specific problems in that field.

50. Location-based services 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, among other things, maps (*e.g.*, pinpointing a user's current location or the location of another individual for applications such as a driver for a rideshare application), navigation (*e.g.*,

driving directions), local search (*e.g.*, looking for nearby restaurants or providing relevant search results for requests with local intent), social networking, and targeted advertising. The '358 Patent's mention of "public safety groups" (Ex. 1001 at 1:23) indicates one possible application for emergency services.

51. Location-based services for mobile devices generally rely on the mobile devices being able to determine their location through a process called "geolocation." Ex. 1001 at 1:23-26. At the time of the invention, "there [was] a longstanding problem of providing high accuracy location data for mobile devices, such as mobile telephones." Ex. 1006 at 1:19-21. One way a mobile device can be geolocated is by using a GPS receiver. This GPS-based location could then be transmitted to a base station or used locally on the device. However, there are many situations where GPS information is not available or not reliable. In those situations, the mobile device can still use other information (such as an identification of nearby base stations and the strength of the signals received from each nearby base station) to assist in determining the mobile device's location.

52. At the time of the invention, geolocation using RF signals (*e.g.*, cellular data, as opposed to, for example, GPS information) was of interest in

the field. Many methods attempted to use RF signals to geolocate mobile devices, but generally had problems, including limited accuracy. *See* Ex. 1009 at [0003] ("A second solution is to compute the location of the mobile unit based on the cellular network signaling parameters …. This information is typically accurate to hundreds of meters."); *see also* Ex. 1006 at 1:39-57; Ex. 1011 at 2504 (angle of arrival techniques are "expensive to implement" and "impractical in microcell sites" while existing GSM methods "do not allow highly accurate signal timing measurements.").

53. Some systems, like the '358 Patent, relied on collecting "calibration data" from mobile devices moving through various geographic regions by saving this information into a "calibration database." Ex. 1001 at 1:27-31, 1:42-46. Once the calibration data is available, mobile devices seeking their location can retrieve and use the calibration data to determine their location. At a high level, a mobile device at an unknown location can "observe" and measure nearby network signals and compare that observed data to the previously-collected calibration data to determine its location. Various methods can be used for this comparison which involves both the calibration data and the observed data.

54. For example, testing is performed whereby mobile devices travel

through a region and record information such as the received signal strength from various nearby base stations associated with specific coordinates (*e.g.*, through simultaneous GPS measurements). This information is saved into the calibration database. Then, when a new mobile device passes through the region, it can "observe" data such as the received signal strength from nearby base stations and compare that observed data to the stored calibration data that is associated with coordinates. This allows the mobile device to determine its location even without GPS.

55. There are a number of reasons calibration data may not correspond to the data observed by a mobile device at the time it is seeking its location, even where the same base stations are involved. For example, variations in the environment (*e.g.*, weather) can affect the observed data. One potential reason for discrepancies is that the mobile device was indoors when it collected the observed data.

56. The inventors of the '358 Patent realized that "[c]alibration data is typically collected in an outdoor environment" because "it is more time-consuming to perform calibration procedures indoor due to the required access to buildings and the inability to utilize automated collection procedures designed for outdoor environments." Ex. 1001 at 1:30-38. However, many mobile devices

that require geolocation are located indoors, where 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." Ex. 1001 at 1:39-42. Thus, calibration data collected outdoors may not accurately approximate signals received indoors. Therefore, geolocation for mobile devices located indoors may not be accurate.

57. The inventors solved this problem by modifying the data observed by a mobile device to have a more accurate comparison to the stored calibration data. *See, e.g.,* Ex. 1001 at cl. 1. As discussed below, an important part of this solution is the generation and use of non-uniform grid points (NUGs) of varying shapes and sizes as part of a calibration database. Ex. 1001 at cl. 18, 3:63-3:67 ("The NUGs represent an area of collected calibration data, which may be stored in a database for easy retrieval during a calibration data comparison operation between the NUG and a received network measurement report (NMR).").

VII. OVERVIEW OF THE '358 PATENT

58. The '358 Patent was filed on April 15, 2009, and issued on March 19, 2009. Ex. 1001 at 1. The '358 Patent claims priority to U.S. Provisional Patent Application No. 60/899,379 ("the '379 Provisional"; Ex. 1005), filed on February 5, 2007. Ex. 1001 at 1. The '358 Patent incorporates by reference the entirety of the '379 Provisional. Ex. 1001 at 1:10-15. I understand that this

means that, for purposes of my analysis, the ’358 Patent specification includes the disclosures in the ’379 Provisional as though those disclosures were part of the ’358 Patent specification.

59. The ’358 Patent discloses an invention for determining the location of a mobile device (or “geolocating”) using signal information from wireless communications networks (*e.g.*, cellular signals). Ex. 1001 at 1:52-60. The claims of the ’358 Patent recite providing a database of “calibration data” and collecting “network measurement data” observed by the mobile device. *Id.* at cl. 1. This observed network measurement data is then modified to account for varying conditions and other variables that may be caused by, for example, environmental factors or signals propagating indoors. *Id*. at 3:50-56. After the observed network measurement data is modified, the observed network measurement data is compared with the database of calibration data to determine the location of the mobile device. *Id*. A high-level flowchart of this process is shown in Figure 7 of the ’358 Patent, reproduced below.

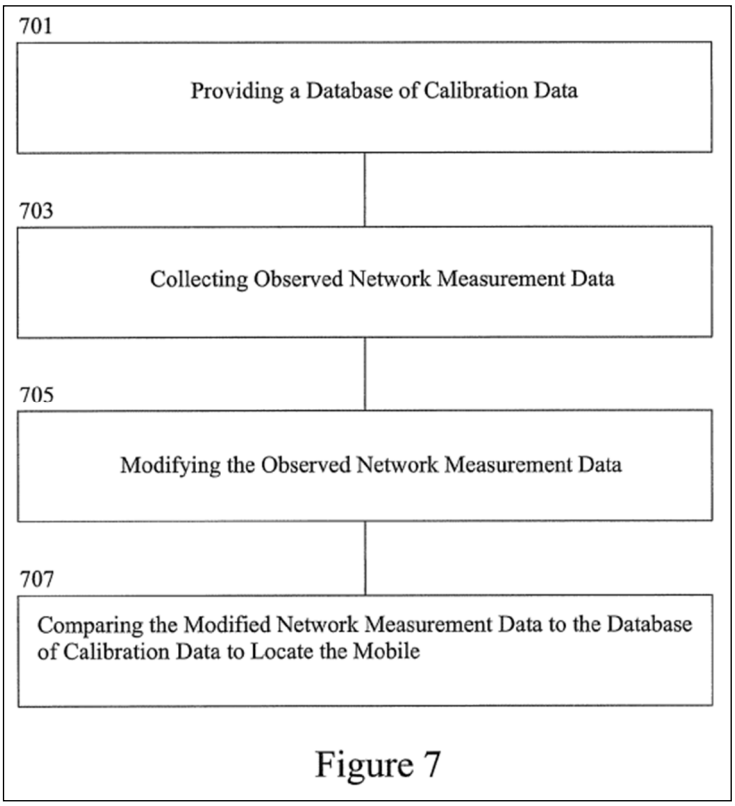


Figure 7

60. The invention of the '358 Patent addresses a particular problem in geolocation involving disparities between calibration data and observed data caused by "varying conditions and other operational variables" affecting how signals propagate in different environments, resulting in "poor estimated location accuracy." Ex. 1001 at 1:39-46, 9:46-50. One common reason for this disparity is that calibration data is "typically collected in an outdoor environment" because it is "time-consuming to perform calibration procedures indoors" but geolocation within a building, using observed data collected indoors, is often desirable. Ex. 1001 at 1:30-38. As a result, the differences in signal propagation outdoors versus indoors can make it difficult to perform an

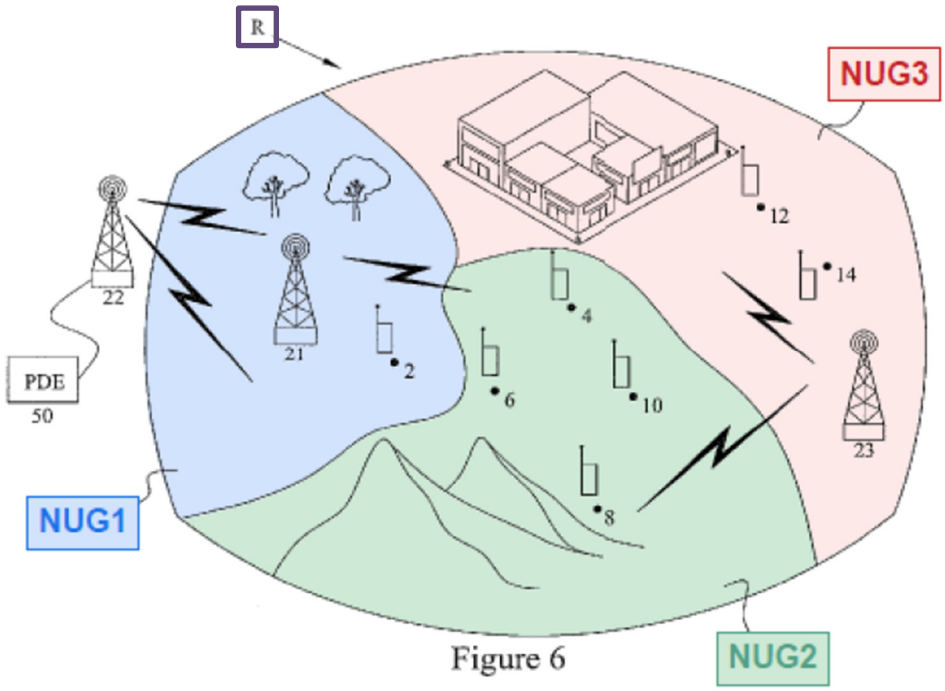
appropriate comparison of calibration data (collected outdoors) to observed data, especially where that observed data is collected indoors. Ex. 1001 at 1:30-38. To solve this problem, the ’358 Patent independent claims are directed to modifying the observed data measured by a mobile device to eliminate disparities with previously-gathered calibration data. Ex. 1001 at cl. 1. The specification extensively describes what these modifications may entail and how they are performed. Ex. 1001 at 5:14-55, 6:1-6:62, 6:63-7:31.

61. Dependent claim 18 of the ’358 Patent recites “[t]he method of claim 1 wherein said database comprises previously-gathered calibration data for one or more non-uniform grid points within said region.” Ex. 1001 at cl. 18. As I discuss further below, the ’358 Patent uses the term “non-uniform grid points” to refer to data structures that are generated based on evaluation of calibration data that has been collected in a region. Importantly, because these claimed grid points are generated based on the calibration data (rather than being predefined), their geographical boundaries, location, and associated signal information are not defined until determined from evaluation of the calibration data. Ex. 1005 at 3 (“The geometrical shape and the amount of data accumulated into such NUGs is seen to be variable since these are determined by the statistical similarity of the data allocated to a NUG.”).

62. The claimed grid points of the ’358 Patent “usually will not be uniformly distributed throughout the geographic region,” and thus the ’358 Patent uses the term “non-uniform grid points” or “NUGs” when describing grid points. Ex. 1008 at 2:43-50; Ex. 1001 at 3:57-67, 9:35-41.

63. Related patents such as U.S. Patent No. 8,406,753 (“’753 Patent”; Ex. 1008) similarly use “non-uniform grid points” or “NUGs” when describing grid points. Ex. 1008 at 2:43-50. I understand that the ’753 Patent as well as U.S. Patent No. 9,097,784 (“’784 Patent”; Ex. 1007) claim priority to the same provisional application (U.S. Provisional Application No. 60/899,379 (Ex. 1005, “’379 Provisional”) as the ’358 Patent, and also describe “grid points” as the term is used in these patents. The ’379 Provisional is incorporated by reference in the ’358 Patent (Ex. 1001 at 1:10-15) and includes disclosures regarding “grid points” that are also found in the ’753 and ’784 Patents. *See* Ex. 1005 at 5-7. I understand that, in a related litigation involving these parties and this patent, the court relied on disclosures in the ’753 Patent and ’784 Patent to construe the term “grid point.” Ex. 1028 at 19-20 (citing ’753 Patent (as “Ex. E”) and ’784 Patent (as “Ex. F”)). I also understand that Petitioner’s expert has recognized that the related ’753 Patent “describe[s] more fully” the “non-uniform grid points” of the ’358 Patent. Ex. 1012 ¶ 124.

64. As explained in the '358 Patent, the claimed grid points "represent an area of collected calibration data" and "represent the signal characteristics and/or calibration data over a given region." Ex. 1001 at 3:57-67. This is depicted in the related '784 Patent, which shows "a geographical region (R) having NUGs represented by NUG1, NUG2, and NUG3," and further explains "[a] NUG may be generated to represent the signal characteristics and calibration data over a given region." Ex. 1007 at 6:21-34.



Ex. 1007 at Fig. 6 (annotated to show each NUG in geographical region R in a different color).

65. The figure shows that each NUG corresponds to a particular area

within the entire "geographical region (R)." Ex. 1007 at Fig. 6, 6:21-34. The calibration data associated with a particular NUG is representative of that area. Ex. 1001 at 3:57-67. Using the figure above as an example, the subset of calibration data gathered in the region that is associated with NUG1 is representative of the area delineated by the boundaries of NUG1. Ex. 1007 at Fig. 6, 6:21-34.

66. The figure above also shows that the boundaries for each NUG differ, which results in each NUG having a different shape and size. Thus, the grid points are not uniform and look nothing like any conventional notion of a "grid." This is because the boundaries of each grid point are defined by evaluation of the calibration data itself. Ex. 1005 at 7[1]; Ex. 1008 at 12:7-14. Using the figure above as an example, the calibration data associated with NUG1 represents the area within the boundaries of NUG1. Ex. 1007 at Fig. 6. Until the calibration data is evaluated, the boundaries are undefined, and the claimed grid point does not exist.

67. Accordingly, the shape of each NUG is variable because it is based

[1] References to Ex. 1005 refer to the pdf page (*e.g.*, "Page 7 of 40") rather than the internal pagination of the document.

on evaluation of the calibration data (which can vary throughout a region) rather than being predefined. This is explained in both the '379 Provisional that is incorporated in the '358 Patent and in the related '753 Patent:

> The NUGs fully cover the region R and each NUG has statistically similar data accumulated into itself. ***The geometrical shape and the amount of data accumulated into such NUGs is seen to be variable since these are determined by the statistical similarity of the data allocated to a NUG.***

Ex. 1005 at 7 (emphasis added); *see also* Ex. 1001 at 1:10-15 (stating that the '379 Provisional is "incorporated by reference in its entirety" in the '358 Patent).

> The NUGs may fully cover the region R and each NUG may have statistically similar data accumulated into itself. ***The geometrical shape (i.e., the shape defined by the union of locations of calibration points assigned to the NUG) and the amount of data accumulated into such NUGs is seen to be variable since these are determined by the statistical similarity of the data allocated to a NUG***.

Ex. 1008 at 12:7-14 (emphasis added).

68. A fundamental characteristic of a claimed grid point is that the

geographical boundaries of the area it represents must be determined by evaluating the calibration data collected in a region. The related '753 Patent further confirms this central aspect of the claimed grid points, explaining they are generated based on evaluation of measured calibration data:

> The location of a wireless mobile device may be estimated using, at least in part, one or more pre-existing Network Measurement Reports ("NMRs") which include calibration data for a number of locations within a geographic region. ***The calibration data for these locations is gathered and analyzed so that particular grid points within the geographic region can be determined*** and associated with a particular set or sets of calibration data from, for example, one or more NMRs.

Ex. 1008 at Abstract, 9:34-39 (emphasis added).

69. This evaluation involves determining which data are "statistically very similar" using "increasingly stringent tests of statistical sufficiency" such that they can be associated with (or "allocated to") a particular grid point. Ex. 1005 at 6-7; Ex. 1008 at 10:44-59. For example, the "[s]tatistical similarity" of the gathered calibration data can be evaluated to determine where a grid point should be generated, if one should be generated at all. Ex. 1005 at 6-7; Ex. 1008 at 10:66-11:6. This "[s]tatistical similarity" in the calibration data can be

evaluated using different types of statistical analyses including clustering tests, a probability density function, the mean and variance of the data, or other functions of the calibration data. Ex. 1005 at 6; Ex. 1008 at 10:66-11:6, 12:4-14.

70. The manner in which the measured calibration data is evaluated and allocated to each grid point further demonstrates why the boundaries of the grid points are variable and dependent on the calibration data. For example, the calibration data is evaluated to determine whether it "exhibit[s] clustering" and, based on that evaluation, is allocated to different grid points. Ex. 1005 at 6; Ex. 1008 at 10:46-47. If clusters of data collected at different locations (referred to as "calibration points") are "statistically very similar, then the data for those calibration points is allocated to the same grid point. Ex. 1005 at 6; Ex. 1008 at 10:55-59. If these clusters of data are determined to be "sufficiently different," then they are allocated to different grid points. Ex. 1005 at 6; Ex. 1008 at 10:50-55. Because the "geometrical shape" of the area represented by a grid point is "defined by the union of locations of calibration points" allocated to it, this process of evaluating the calibration data in order to allocate it to different grid points defines the boundaries of that area. Ex. 1005 at 7; Ex. 1008 at 12:9-14.

VIII. CLAIM CONSTRUCTION

71. I understand that in its Institution Decision, the Board construed

"grid point" as "a point associated with representative calibration data for an area." Institution Decision at 9-11. I further understand that this is the same construction adopted by the district court for the term "grid point" in a related litigation involving the '358 Patent. Ex. 1028 at 18-20. Additionally, I understand for purposes of the Institution Decision, the Board construed "non-uniform grid points" as "grid points that are non-uniformly spaced throughout a geographic region." Institution Decision at 25.

72. Although the Board adopted the words of the district court's construction of "grid point," it found that this construction does not require that the claimed grid points be "generated based on the measured calibration data." Institution Decision at 27-28. For the reasons I explain below, the construction of "grid point" adopted by the district court in the related litigation ("a point associated with representative calibration data for an area") requires that the claimed grid points, including the boundaries of the area they represent, be generated based on evaluation of the calibration data.

73. The terms "non-uniform grid point," and "NUG" are not to my knowledge terms of art with commonly understood meanings in the field of radio frequency communications and/or navigation system technology. This terminology appears to be coined in the '379 Provisional and the patents and

applications claiming priority to the ’379 Provisional. Accordingly, it is my understanding that the intrinsic record (e.g., the claims, specification, and prosecution history) informs the meaning of these terms.

74. As I explain further below, the intrinsic evidence, including the specification of the ’358 Patent, would indicate to a POSITA that the term “non-uniform grid point” includes a requirement that the grid point, including the boundaries of the area it represents, be generated based on evaluation of calibration data. Ex. 1001 at 3:57-4:14; Ex. 1005 at 7; Ex. 1008 at 12:7-14; Ex. 1007 at Fig. 6, 6:21-34. That is, each NUG represents a non-uniform region with similar signal characteristics. Thus, in my opinion, if the district court’s construction of “grid point” is found to not include such a requirement, then “non-uniform grid point” should be construed as “a point associated with representative calibration data for an area whose boundaries are determined from evaluation of the calibration data.” As I discuss further below, this requirement is a fundamental aspect of the claimed grid points, as demonstrated by the claims and specification of the ’358 Patent.

A. The District Court’s Construction of “Grid Point” (“a point associated with representative calibration data for an area”)

75. The district court construed “grid point” as “a point associated with representative calibration data for an area.” Ex. 1028 at 18-20. In its claim

construction ruling, the district court explained what this construction means in the context of the ’358 Patent and other related patents that use the same term.

76. The district court explained that it used this phrase in its construction of “grid point” to “reflect that ***the defining characteristic of a NUG region***—as explained in the specifications of the ’753 Patent, ’104 Patent, and [’784] Patent—***is that the data points within an area are all ‘statistically very similar’*** such that each of the grid points within the NUG region can represent the overall NUG.” Ex. 1028 at 20 (emphasis added) (citing Ex. 1018 at 3:56-60; Ex. 1008 at 10:29-11:7; Ex. 1007 at 6:22-28).

77. Thus, the district court explained that the phrase “representative calibration data for an area” in its construction signifies that the calibration data associated with a grid point are “statistically very similar” such that the calibration data are representative of the area encompassed by the grid point. The ’379 Provisional (which is incorporated by reference in the ’358 Patent (Ex. 1001 at 1:10-15)) and the related ’753 Patent are consistent with this in how they describe the claimed grid points. Ex. 1005 at 6 (explaining how grid points are generated based on evaluation of whether clusters of calibration data are “statistically very similar” and identifying tests used to determine such “[s]tatistical similarity”); Ex. 1008 at 10:55-11:6 (same).

78. The district court's construction makes clear that a "grid point" is not associated with generic calibration data, but rather is associated with calibration data that is representative for an area. This requires that the boundaries of the area represented by a particular grid point be determined by evaluating the calibration data so that the subset of data associated with that grid point is representative of that area. The representative calibration data for a particular area may constitute a subset of data collected in a broader region. Ex. 1007 at Fig. 6, 6:21-34 (depicting geographical region (R), where calibration data is collected, divided into different areas each associated with a different grid point (NUG1, NUG2, and NUG3)).

79. The '379 Provisional and the related '753 Patent describe the evaluation of statistical similarities across the set of calibration data gathered within a region, and teach examples of the statistical analyses used to generate the claimed grid points from this calibration data. Ex. 1005 at 6 ("If the aggregated cluster is . . . statistically very similar to either of the first or second clusters . . . then the data for the two calibration points may be allocated to the same NUG"), 7 ("The NUGs may fully cover the region R and each NUG has statistically similar data accumulated into itself"); Ex. 1008 at 10:39-65; 12:4-14. Similarly, the '379 Provisional and '753 Patent teach examples of the

statistical analyses used to generate the claimed grid points from this calibration data. Ex. 1005 at 6; Ex. 1008 at 10:66-11:6.

80. For these reasons, in my opinion, the district court's construction requires evaluating the calibration data to determine the boundaries of the area represented by a grid point so that "representative calibration data for [the] area" can be associated with it. If the calibration data is not evaluated, the "representative calibration data for an area" cannot be defined, and thus cannot be associated with a point.

81. In its claim construction ruling, the district court also stated that the related '753 Patent's explanation that "calibration data for a number of locations" is "gathered and analyzed so that particular grid points within the geographic region can be determined and associated with a particular set or sets of calibration data" demonstrates "what *must be done* to arrive at a grid point or set of grid points." Ex. 1028 at 19 (quoting '753 Patent at Abstract) (emphasis in original). In my opinion, this also shows that the district court recognized that generating a grid point involves evaluating calibration data, and that this requirement is reflected in its use of the phrase "representative calibration data for an area" in its adopted construction.

82. I understand the Institution Decision stated that this language in the

district court's claim construction ruling "was explaining why the cited language was not pertinent to the meaning of 'grid point'; it was not indicating that grid points must be generated based on the measured calibration data." Institution Decision at 27-28. In my opinion, this overlooks that how the claimed grid points are generated is fundamental to what they are. This is confirmed by the intrinsic evidence. For example, the '379 Provisional explains that the boundaries of the area represented by a given grid point, and thus the shape of that area, are not defined until the calibration data is evaluated. Ex. 1005 at 7 ("The ***geometrical shape*** and the amount of data accumulated into such NUGs ***is seen to be variable since these are determined by the statistical similarity of the [calibration] data allocated to a NUG***.") (emphasis added). The '379 Provisional also extensively describes the generation of grid points, explaining that "[t]he evaluation of data vectors is of great importance since it is fundamental to the method." Ex. 1005 at 6. As another example, the related '753 Patent describes in detail how grid points are generated so that they can serve their purpose of representing a given area. Ex. 1008 at 10:39-11:6, 12:4-14.

B. Construction of "Non-Uniform Grid Point" ("a point associated with representative calibration data for an area whose boundaries are determined from evaluation of the calibration data")

83. As I explained above, it is my opinion that the district court's construction of "grid point" requires that the calibration data be evaluated to

determine the boundaries of the area represented by a "grid point" so "representative calibration data for [the] area" can be associated with the "grid point." This same requirement would apply to "non-uniform grid points."

84. If the district court's construction is found to not have such a requirement, then I believe a more precise construction of "non-uniform grid point" that includes such a requirement would be proper in view of the intrinsic evidence. The intrinsic evidence, including the specification of the '358 Patent, indicates to a POSITA that the term "non-uniform grid point" includes a requirement that the grid point, including the boundaries of the area it represents, be generated based on evaluation of calibration data. Ex. 1001 at 3:57-4:13; Ex. 1005 at 7; Ex. 1008 at 12:7-14; Ex. 1007 at Fig. 6, 6:21-34. Thus, the intrinsic evidence supports a construction of "non-uniform grid point" as "a point associated with representative calibration data for an area whose boundaries are determined from evaluation of the calibration data." For the reasons I explain below, I believe this is how a POSITA would interpret the claim term "non-uniform grid point" in view of the intrinsic evidence. *Id*.

85. The claim language of the '358 Patent supports this construction. The use of the claim term "non-uniform" in claim 18 of the '358 Patent indicates that the area covered by each grid point is not uniform—*i.e.*, the boundaries of

the non-uniform grid points are different. Ex. 1001 at cl. 18. Additionally, claim 18 requires that the "[calibration] database" comprises "previously-gathered calibration data for one or more non-uniform grid points within said region." *Id.* Thus, the claim requires assigning the calibration data gathered over a "predetermined region" to "one or more non-uniform" grid points. *Id.* at cls. 15, 18.

86. The specification of the '358 Patent also supports this construction for "non-uniform grid point." The '358 Patent explains that a "non-uniform grid point (NUG) may represent the signal characteristics and/or calibration data over a given region" such that each NUG "represent[s] an area of collected calibration data." Ex. 1001 at 3:57-63. The boundaries of the area represented by a non-uniform grid point, which define the shape of that area, are variable because they are based on evaluation of statistical similarities across the gathered calibration data. The '379 Provisional that is incorporated into the '358 Patent explains this fundamental aspect of the claimed non-uniform grid points (or NUGs):

> The NUGs fully cover the region R and each NUG has statistically similar data accumulated into itself. ***The geometrical shape and the amount of data accumulated into such NUGs is seen to be variable***

> ***since these are determined by the statistical similarity of the data allocated to a NUG.***

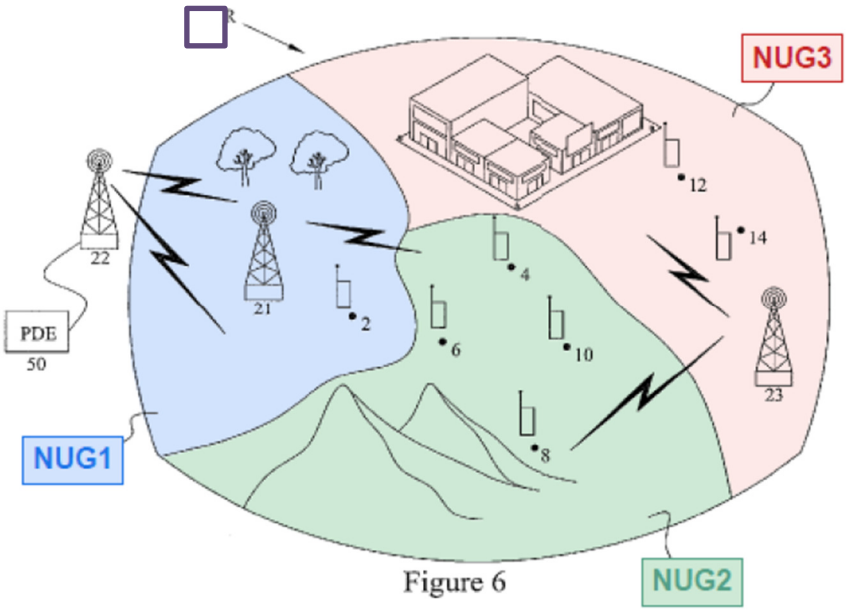
Ex. 1005 at 7 (emphasis added); *see also* Ex. 1001 at 1:10-15 (stating that the '379 Provisional is "incorporated by reference in its entirety" in the '358 Patent). The related '753 Patent explains this same aspect of the claimed non-uniform grid points (or NUGs):

> The NUGs may fully cover the region R and each NUG may have statistically similar data accumulated into itself. ***The geometrical shape (i.e., the shape defined by the union of locations of calibration points assigned to the NUG) and the amount of data accumulated into such NUGs is seen to be variable since these are determined by the statistical similarity of the data allocated to a NUG***.

Ex. 1008 at 12:7-14 (emphasis added). Thus, the '358 Patent confirms that the boundaries of the area represented by a grid point (which define the shape of that area) are variable because they are based on evaluation of statistical similarities across the gathered calibration data. The boundaries are not predefined without consideration of the calibration data.

87. NUGs are depicted in Figure 6 of the related '784 Patent, which shows "a geographical region (R) having NUGs represented by NUG1, NUG2,

and NUG3."



Ex. 1007 at Fig. 6 (annotated to show each NUG in geographical region R in a different color), 6:21-34.

88. As the annotated figure shows, each NUG corresponds to an area that is part of a broader geographical region (R). Ex. 1007 at Fig. 6. The related '753 Patent explains that calibration data is gathered at different locations in this region and then "[t]he calibration data for these locations must be gathered and analyzed so that particular points (e.g., 'grid points') within the geographic region can be determined and associated with a particular set or sets of calibration data from, for example, one or more NMRs." Ex. 1008 at 2:31-35. These non-uniform grid points divide the geographical region into different

areas represented by each grid point, as is shown in the figure above. Ex. 1007 at Fig. 6, 6:21-34.

89. Additionally, the intrinsic evidence describes the evaluation of calibration data that occurs to generate a non-uniform grid point. For example, the '379 Provisional explains that "[t]he evaluation of the [calibration] data vectors is of great importance since it is fundamental to the method" of generating the claimed grid points. Ex. 1005 at 6; *see also* Ex. 1001 at 1:10-15. The '379 Provisional further explains that the data is evaluated "using increasingly stringent tests of statistical sufficiency." Ex. 1005 at 6; *see also* Ex. 1001 at 1:10-15. The "[s]tatistical similarity" of the gathered calibration data is evaluated to generate a grid point, which includes defining the area it represents and associating it with calibration data that is representative of that area. Ex. 1005 at 6-7; *see also* Ex. 1001 at 1:10-15. The '379 Provisional also explains that multiple methods of evaluating statistical similarities across the calibration data may be used to allocate calibration data to different grid points. Ex. 1005 at 6 (referring to "clustering tests" and "K-means algorithm"); *see also* Ex. 1001 at 1:10-15. For example, calibration data is evaluated to determine whether it "exhibit[s] clustering." Ex. 1005 at 6; *see also* Ex. 1001 at 1:10-15. Clusters of data collected at different "calibration points" that are determined, based on this

evaluation, to be "statistically very similar" are allocated to the same grid point while clusters of data that are "sufficiently different" are allocated to different grid points. Ex. 1005 at 6; *see also* Ex. 1001 at 1:10-15.

90. The result of this evaluation and allocation of data to each non-uniform grid point is that each has "statistically similar data accumulated into itself" such that each claimed grid point is associated with representative calibration data for an area. Ex. 1005 at 7; *see also* Ex. 1001 at 1:10-15. Additionally, the allocation of subsets of calibration data collected at various locations within a region to different non-uniform grid points defines the areas represented by each grid point. This means that the "geometrical shape" (*i.e.*, boundaries) of the area represented by a particular non-uniform grid point is "determined by the statistical similarity of the data" allocated to a grid point, which is based on evaluation of the calibration data. Ex. 1005 at 7; *see also* Ex. 1001 at 1:10-15. The related '753 Patent explains this same principle as well. Ex. 1008 at 10:66-11:6, 12:7-14.

91. For the reasons explained above, it is my opinion that a POSITA would interpret the term "non-uniform grid point," in view of the intrinsic evidence, to mean "a point associated with representative calibration data for an area whose boundaries are determined from evaluation of the calibration data."

IX. PATENTABILITY ANALYSIS OF CLAIM 18 OF THE '358 PATENT

92. I understand that the Board has instituted this proceeding on five separate grounds raising different prior art, or combinations thereof:

- Ground 1: Anticipation based on Shkedi
- Ground 2: Obviousness based on Shkedi and Spain
- Ground 3: Anticipation based on Zhu
- Ground 4: Obviousness based on Zhu and Spain
- Ground 5: Obviousness based on Zhu and Laitinen
- Ground 6: Obviousness based on Shkedi and Zhu

93. Grounds 5 and 6 are not directed to claim 18 of the '358 Patent, and thus I do not address them herein because I have only been asked to opine on the patentability or nonpatentability of claim 18. For the reasons I explain below, it is my opinion that claim 18 of the '358 Patent is not invalid under any of the grounds that challenge claim 18 (Grounds 1-4). In particular, each of the prior art references in these grounds fails to teach the "non-uniform grid points" required by claim 18 of the '358 Patent.

A. Ground 1: Anticipation based on Shkedi

94. I understand that Petitioner contends that Shkedi, which is U.S. Patent No. 7,706,811 (Ex. 1006), anticipates claim 18 of the '358 Patent. As

explained below, I disagree. In my opinion, Shkedi does not anticipate claim 18 of the ’358 Patent.

95. Petitioner contends that Shkedi discloses “‘Registering’ and ‘Recording’ non-uniform locations of a mobile telephone as signal strength measurements in a database” and “updating that database with measurements made during ‘Monitoring’ of the mobile telephone’s location.” Pet. at 32 (citing Ex. 1006 at 5:36-63, 11:51-12:5, 14:1-7). However, the locations referred to in these steps of Shkedi are predetermined locations where signal measurements (*i.e.*, calibration data) are collected. The “Registration” (or “Registering”) step that Petitioner points to is “a data collection step where the portable device comes to measure the antenna signal space reception characteristics at the selected location” and the “Monitoring” step is another data collection step “alike in technical detail to the Registering step” from which the location of the mobile communications device can be determined by comparison to the measurements collected at the “Registration” step and recorded in the “Recording” step. Ex. 1006 at 11:18-28, 11:51-65, 12:6-11. Petitioner contends that these locations where calibration data is collected are “non-uniform grid points.” Pet. at 32-33.

96. As I explained above in Section VIII regarding claim construction,

the term "grid point" (or "non-uniform grid point") used in claim 18 of the '358 Patent requires that the boundaries of the area represented by the grid point be determined from evaluation of the calibration data. It is my opinion that, under this proper construction, Shkedi has no teaching or suggestion of a "database compris[ing] previously-gathered calibration data for one or more non-uniform grid points," as required by claim 18. Ex. 1001 at cl. 18. Petitioner states that Shkedi discloses "[n]on-uniform user locations" that supposedly constitute points "associated with representative calibration data for an area [*e.g.*, within a predetermined proximity]." Pet. at 33 (citing Ex. 1006 at 8:44-48). I disagree with this because Shkedi's reference to a "predetermined proximity" does not demonstrate that Shkedi's "user selected location[s]" stored in a database represent an area, let alone one whose boundaries are determined from evaluation of the calibration data.

97. Instead, Shkedi's discussion of "predetermined proximity" is an assumption about where a mobile device is estimated to be based on comparing data from the "Monitoring" step to data from the "Registering" step. Ex. 1006 at 5:44-58, 8:41-56. Shkedi assumes that a signal collected while "Monitoring" is within a certain distance from a signal with similar characteristics collected during "Registering." Ex. 1006 at 8:41-56, 11:18-37 (describing "Registering"),

11:51-12:5 (describing "Monitoring"). This location is not a non-uniform grid point because it is does not represent an area and it is not generated based on evaluation of the measured calibration data

98. More specifically, the disclosure regarding "predetermined proximity" in Shkedi explains that when signals are observed during the "Monitoring" step, a user can "conclude that it is within a predetermined proximity" of a prior stored location based on the similarity of the signal strength measurements. Ex. 1006 at 8:41-48. However, a stored "user selected location" of Shkedi is not associated with a given area based on a "predetermined proximity." The estimation of whether a user is within a "predetermined proximity" of a stored location depends on whether a mobile device is able to "observ[e] an identical list of service antennas with substantially identical respective signal strengths," and thus will differ based on environmental conditions, mobile device conditions, and other factors that impact the data observed by a device at the time it is determining its location (as opposed to the previously-stored calibration data). Ex. 1006 at 8:41-48. Thus, there is no area represented by a particular "user stored location" that can be defined. Even if such an area could be defined, its boundaries would not be determined from evaluation of the calibration data.

99. In contrast, the "grid points" of claim 18 of the '358 Patent have a defined area that they represent when they are generated, as is depicted in Figure 6 of the related '784 Patent (reproduced below).

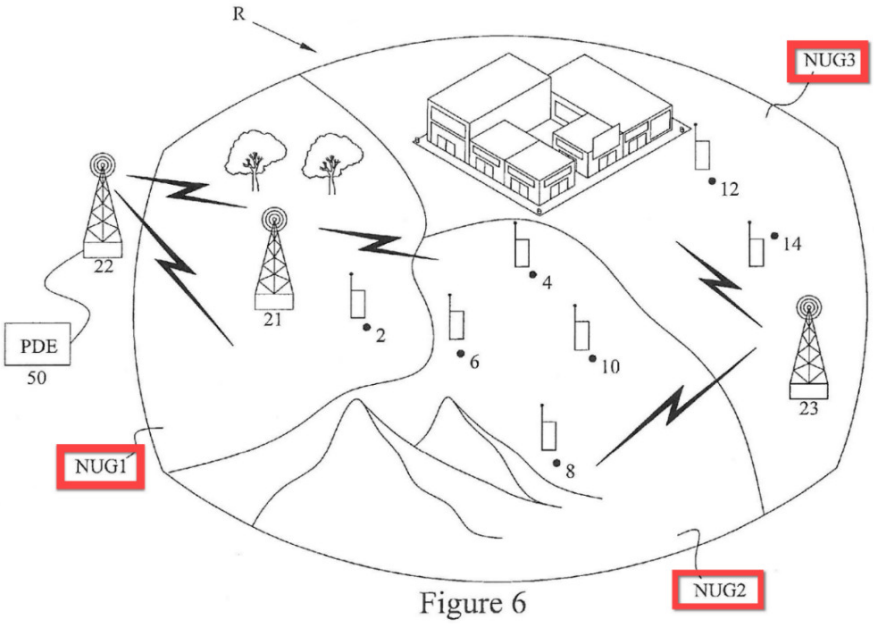


Figure 6

Ex. 1007 at Fig. 6.

100. Environmental and other factors may affect the observed data measurements of the '358 Patent but the claimed grid points of the '358 Patent have already been defined based on evaluation of previously-gathered calibration data. Ex. 1005 at 6-7; Ex. 1008 at Abstract; Ex. 1007 at Fig. 6, 6:21-34. Thus, unlike Shkedi, the area represented by a claimed grid point in the '358 Patent exists and is specifically defined regardless of what data is observed at the time a user is seeking its location. This is necessary as the "non-uniform grid

point" must represent the calibration data in that particular area, as I explained above in Sections VII and VIII. If the boundaries of the area are not defined, the "non-uniform grid point" cannot represent the area.

101. Thus, in my opinion, Shkedi does not disclose or teach the use of any "point[s] associated with representative calibration data for an area" [*i.e.*, the district court's construction of "grid point"], let alone any "point[s] associated with representative calibration data for an area whose boundaries are determined from evaluation of the calibration data" [*i.e.*, the construction of "non-uniform grid point" that I discussed above in Section VIII]. This means that Shkedi does not disclose "non-uniform grid points," as required by claim 18 of the '358 Patent. Because Shkedi fails to teach this limitation, it is my opinion that it does not anticipate claim 18 of the '358 Patent.

102. Additionally, I disagree with Petitioner's assertion that Shkedi teaches the "non-uniform grid points" required by claim 18 of the '358 Patent because Petitioner conflates "calibration points" and "grid points" in the '358 Patent claims. The '358 Patent claims differentiate locations where calibration data is collected, which it refers to as "calibration points," from the "non-uniform grid points." Ex. 1001 at cl. 27 ("The method of claim 15 wherein said previously-gathered calibration data includes ***calibration data gathered at a***

predetermined calibration point within said region wherein said predetermined calibration point is not located within a structure.") (emphasis added), cl. 18 (reciting "non-uniform grid points").

103. The '379 Provisional incorporated in the '358 Patent makes this same distinction between "calibration points" and "non-uniform grid points." For example, the '379 Provisional explains that calibration data is "obtained at each discrete point (***calibration point***)" within a region and that "[t]he calibration data could consist of many such sets (vectors) ***obtained at each calibration point***." Ex. 1005 at 5-6 (emphasis added); *see also* Ex. 1001 at 1:10-15. In contrast, the '379 Provisional explains that "non-uniform grid points" are "generat[ed]" based on "evaluation of the [calibration] data vectors" and that this evaluation "is of great importance since it is fundamental to the method." Ex. 1005 at 6 (describing the operation of a "NUG generator"); *see also* Ex. 1001 at 1:10-15. Thus, "calibration points" and "grid points" are two different terms used in the claims and the distinction between the two is meaningful, particularly in view of the '379 Provisional's disclosures confirming that distinction. Thus, Petitioner's contention that Shkedi's disclosure of locations where calibration data is collected is a disclosure of "non-uniform grid points" does not account for the distinction between "calibration points" and "grid

points" in the '358 Patent claims.

104. Petitioner also points to language in Shkedi regarding "collecting correspondences between GPS (latitude longitude) coordinates and antenna space reception 'coordinates' for the same location" to create a "transformational data bank," which can in turn, be used to find "a never registered location" by "grabbing antenna space reception 'coordinates' and extrapolating them within the correspondence set" as disclosing "non-uniform grid points." Ex. 1006 at 13:9-25; Pet. at 33. Specifically, Petitioner contends that the extrapolated locations "constitute non-uniform grid points that are used to 'build' Shkedi's database for location determination." Pet. at 33.

105. This disclosure in Shkedi merely involves using "extrapolation" of measured data to estimate a user's location, not a location that is stored in Shkedi's database. Ex. 1006 at 13:9-25. The "extrapolated" location that Shkedi refers to is explicitly a "never registered location," meaning a location that has ***not*** been stored in the database. Ex. 1006 at 13:18-21; *see also id*. at 5:44-49 (describing Shkedi's "Registering" process). Claim 18 of the '358 Patent requires the "database" of claim 15 to "comprise[] previously-gathered calibration data for one or more non-uniform grid points within said region." Ex. 1001 at cl. 18. Thus, Shkedi's discussion of "extrapolation" is not a

disclosure of "non-uniform grid points" in a database because Shkedi expressly teaches that these are locations that are "never registered" (*i.e.*, not stored in Shkedi's database) as opposed to other locations stored in the database during the "Registering" and "Recording" steps. Ex. 1006 at 5:44-53, 11:18-50.

106. For the reasons I have explained above, I believe that Shkedi does not anticipate claim 18 of the '358 Patent.

B. Ground 2: Obviousness based on Shkedi and Spain

107. I understand that Petitioner contends that the combination of Shkedi and Spain, which is U.S. Patent Application No. 2003/0064735 (Ex. 1009), renders obvious claim 18 of the '358 Patent. As explained below, I disagree. In my opinion, the combination of Shkedi and Spain does not render obvious claim 18 of the '358 Patent.

108. As I explained above in Section IX.A, Shkedi does not teach the "non-uniform grid points" required by claim 18 of the '358 Patent. In my opinion, Spain also does not teach the "non-uniform grid points" required by claim 18 of the '358 Patent. Petitioner relies on Spain's description of how a fingerprint database "is built by taking fingerprint measurements at predetermined locations and using intelligent algorithms that interpolate the fingerprints at all locations between the sampled locations" as disclosing "non-uniform grid points." Pet. at 35-36 (citing Ex. 1009 at [0101] and [0054]-

[0055]). The interpolated fingerprints of Spain, however, are different from the claimed "non-uniform grid points" of the '358 Patent.

109. As I explained above in Section VIII regarding claim construction, the claimed grid points of the '358 Patent are associated with representative calibration data for an area whose boundaries are determined from evaluation of the calibration data. In Spain, however, the interpolated fingerprints are used to fill in missing fingerprint measurements at predetermined locations that are defined in advance independently of any calibration data. For example, Spain describes "interpolat[ing] the fingerprints at ***all locations*** in between the sampled locations" to reduce the number of physical measurements to be made to populate the fingerprint database. Ex. 1009 at [0101] (emphasis added). That this interpolation occurs at "all locations" confirms that it is for the purpose of filling in fingerprint measurements for predetermined locations. Interpolating fingerprints for "all locations" is meaningless unless those locations have already been determined and defined; "all" refers to the entire set of locations, requiring the set of locations to be defined in advance.

110. Although these fingerprints may correspond to a "small area" surrounding a predetermined location, Spain does not teach how this area is defined or how its boundaries are determined. *See* Ex. 1009 at [0099]-[0101].

Spain does not teach that the boundaries of this "small area" are based on evaluation of calibration data. *See* Ex. 1009 at [0099]-[0101].

111. Spain only describes corresponding a fingerprint to a "small area" as an alternative to corresponding it to a single point. Ex. 1009 at [0099]. Spain does not, however, describe any other differences between these two alternatives. Ex. 1009 at [0099]. In the embodiment in which fingerprints may correspond to a single point, that point is predetermined based on where the fingerprint data is collected. Ex. 1009 at [0099]. This suggests that in the embodiment in which fingerprints may correspond to "small areas," those areas, and the boundaries of such areas, are also predetermined, and thus independent of any evaluation of calibration data. Nothing in Spain indicates the "small areas" are non-uniform or have different shapes and sizes. Indeed, Figure 10 (which paragraph [099] is describing) does not have a field that identifies or indicates the shape or size of the "small area." Ex. 1009 at Fig. 10, [0099]. Thus, given Spain's lack of disclosure to the contrary, a POSITA would understand Spain's embodiment that corresponds fingerprints to a "small area" (instead of "one exact spot" identified by a particular latitude and longitude) to also use predetermined areas. Ex. 1009 at [0099]-[0101]. As Spain explains, in the "small area" embodiment, the area is still identified by a particular

predetermined location represented in the "Lat and Long fields." Ex. 1009 at [0099], Fig. 10. In my opinion, this further confirms that the boundaries of the "small area[s]" described by Spain are not determined from evaluation of calibration data, but rather are predetermined without any consideration of the calibration data. Ex. 1009 at [0099].

112. For the reasons I have explained above, I believe that the combination of Shkedi and Spain does not render obvious claim 18 of the '358 Patent.

C. Ground 3: Anticipation based on Zhu

113. I understand that Petitioner contends that Zhu, which is a publication entitled "Indoor/Outdoor Location of Cellular Handsets Based on Received Signal Strength" (Ex. 1010), anticipates claim 18 of the '358 Patent. As explained below, I disagree. In my opinion, Zhu does not anticipate claim 18 of the '358 Patent.

114. Petitioner contends that Zhu's "measured points" constitute "non-uniform grid points" because they "tend to cluster along paths due to the walking or driving methods of collection," and thus, may not be non-uniformly distributed relative to each other. Pet. at 46-47. These "measured points," however, are locations where calibration is collected, which is why they "cluster" due to the "method[] of collection." Ex. 1010 at 94. As I explained

above in Section IX.A in connection with discussing Petitioner's arguments regarding Shkedi, the '358 Patent claims (and the incorporated '379 Provisional) refer to locations where calibration data is collected are as "calibration points," and the claims expressly distinguish "calibration points" from "non-uniform grid points." Ex. 1001 at cls. 18, 27; Ex. 1005 at 5-6. Thus, Petitioner's argument about Zhu's "measured points" conflates "calibration points" and "non-uniform grid points," the latter of which are required by claim 18 of the '358 Patent.

115. Petitioner also relies on Zhu's disclosure of "local interpolation" and "modeling" as teaching "non-uniform grid points." However, neither Zhu's measured locations nor its modeled points are a teaching or disclosure of "non-uniform grid points." As I explained above in Section VIII regarding claim construction, the claimed grid points of the '358 Patent represent areas whose boundaries are determined from evaluation of calibration data. Zhu expressly teaches that its measured locations or modeled points correspond to predetermined areas in a raster array that are defined independently of any calibration data (*e.g.*, uniform 10m by 10m squares). Ex. 1010 at 93-94. Thus, the boundaries of the "areas" of Zhu that Petitioner relies on are not determined from evaluation of calibration data. This can be seen in the figures in Zhu, shown below, which show that data is merely filled into a predefined and uniform grid.

The location and boundaries of squares in this grid are not determined from evaluation of any calibration data. Ex. 1010 at 93-94.

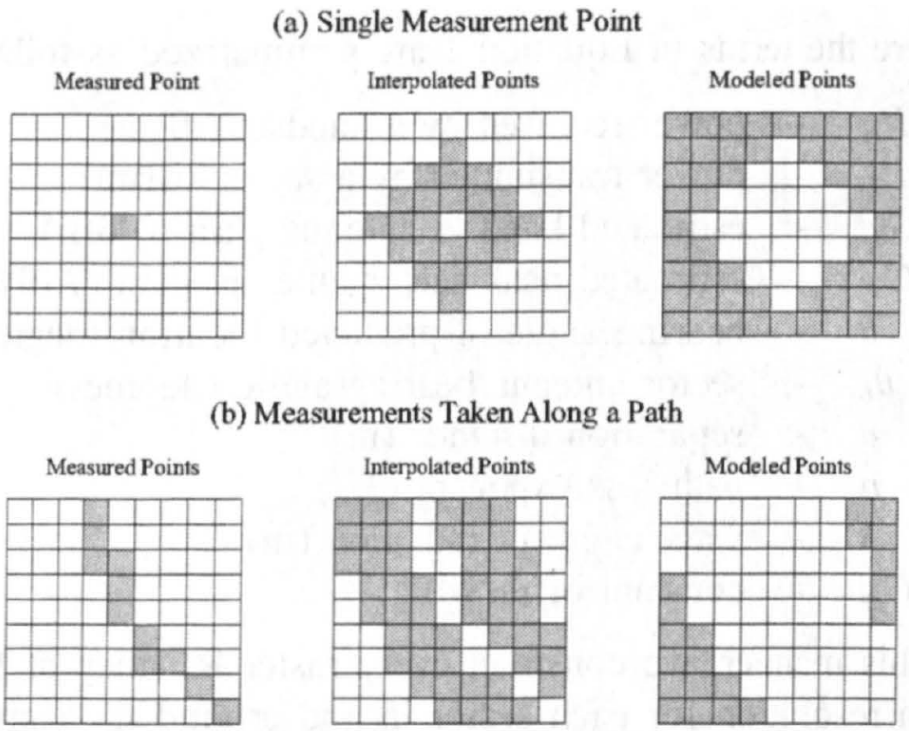


Fig. 2. Marked raster regions (in gray) for (a) a single measurement and (b) a path of measurements.

116. This is a significant difference between the measured locations and modeled points of Zhu, which are part of a uniform, predetermined grid, and the claimed grid points of the '358 Patent, which are non-uniform and represent areas whose boundaries are determined from evaluation of calibration data. Thus, the measured locations and modeled points of Zhu are not "non-uniform grid points" as required by claim 18 of the '358 Patent.

117. For the reasons I have explained above, I believe that Zhu does not

anticipate claim 18 of the ’358 Patent.

D. Ground 4: Obviousness based on Zhu and Spain

118. I understand that Petitioner contends that the combination of Zhu and Spain renders obvious claim 18 of the ’358 Patent. As explained below, I disagree. In my opinion, the combination of Zhu and Spain does not render obvious claim 18 of the ’358 Patent.

119. As I explained above in Section IX.C, Zhu does not teach the “non-uniform grid points” required by claim 18 of the ’358 Patent. Similarly, as I explained above in Section IX.B, Spain does not teach the “non-uniform grid points required by claim 18 of the ’358 Patent. Thus, the combination of Zhu and Spain does not teach the required “non-uniform grid points,” and thus this combination does not render obvious claim 18 of the ’358 Patent.

120. As I explained in Paragraph 93, I have not addressed Grounds 5 and 6 because they are not directed to claim 18 of the ’358 Patent, and I have only been asked to opine on the patentability or nonpatentability of claim 18.

X. CONCLUSION

121. As discussed above, it is my opinion that claim 18 of the '358 Patent is patentable over the prior art of record and that the Petitioner failed to demonstrate otherwise. I reserve the right to supplement my opinions in the future, including to account for new information made available to me.

122. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested proceeding before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the proceeding and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

123. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: 5/27/2024

Mark Sturza