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. IPR2023-01209
Patent 7,561,104

PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 7,561,104

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I. INTRODUCTION

Google LLC ("Petitioner") respectfully requests *inter partes* review of Claims 1, 2, 3, and 11 ("the Challenged Claims") of U.S. Patent No. 7,561,104 ("the '104 Patent") (EX1001) under 35 U.S.C. §§311-319 and 37 C.F.R. §42.100 *et seq*.

The Challenged Claims encompass determining a location of a mobile station (*e.g.*, mobile phone) by modifying observed network measurement data used to locate the mobile station so as to address location accuracy when the mobile station is in an indoor facility. In Related Litigation, Patent Owner ("Owner") asserts that modification of observed network measurement data constitutes the purported "inventive feature" of the '104 Patent. EX1016, ¶54.

The USPTO erred in allowing the '104 Patent because its alleged novelty was disclosed in prior art that was not considered. The prior art cited in this Petition teaches that it was known to modify observed network measurement data of a Network Measurement Report (NMR) by using relative/normalized measurements as disclosed in the '104 Patent. Certain Challenged Claims encompass determining a signal characteristic (*e.g.*, signal strength measurement) having a greater magnitude and modifying the observed network measurement data using the signal characteristic having the greater magnitude, which was also from the prior art cited herein. The Challenged Claims are therefore unpatentable. *See* EX1006, EX1010 in their entireties.

II. MANDATORY NOTICES PURSUANT TO 37 C.F.R. §42.8(a)(1)

A. Real Party-In-Interest

Pursuant to 37 C.F.R. §42.8(b)(1), Petitioner certifies that Google LLC is the real party-in-interest. Google LLC is a subsidiary of XXVI Holdings Inc. which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties-in-interest to this proceeding.

B. Identification of Related Matters Under 37 C.F.R. §42.8(b)(2)

The following is a list of any judicial or administrative matters that would affect, or be affected by, a decision in this proceeding:

Related District Court and PTAB Matters

1. *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 (pending) (the "Related Litigation"); and

2. *Geoscope Technologies Pte. Ltd. v. Apple Inc.,* Civ. Action No. 1:22-cv-01373 (EDVA) filed on December 1, 2022 (pending).

Related Applications

The '104 Patent issued from U.S. Patent Application No. 12/026,333, filed February 5, 2008, claiming priority to U.S. Provisional Application No. 60/899,379, filed February 5, 2007.

Reexamination Control No. 90/012,694, filed September 24, 2012, is an *ex parte* reexamination of the '104 Patent. The Reexamination Certificate issued August 18, 2014.

U.S. Patent Application No. 13/771,542, filed February 20, 2013 (now U.S. Patent 8,786,494) is a continuation of U.S. Patent Application No. 12/424,320, filed April 15, 2009 (now U.S. Patent 8,400,358), which is a continuation of U.S. Patent Application No. 12/026,333.

Other Related Matters

1. *Google LLC v. Geoscope Technologies Pte. Ltd.,* Petition for *Inter Partes* Review of U.S. Patent 8,400,358, Case No. IPR2023-01210; and

2. *Google LLC v. Geoscope Technologies Pte. Ltd.,* Petition for *Inter Partes* Review of U.S. Patent 8,786,494, Case No. IPR2023-01211.

C. Lead and Backup Counsel

Pursuant to 37 C.F.R. §42.8(b)(3) and §42.10(a), Petitioner hereby identifies its lead and backup counsel as follows:

Lead Counsel: Patrick C. Keane, Esq. Registration No. 32,858 BUCHANAN INGERSOLL & ROONEY PC 1737 King Street, Suite 500 Alexandria, VA 22314 Direct Telephone (703) 838-6522 Main Facsimile (703) 836-2021 patrick.keane@bipc.com	**Backup Counsel:** Roger H. Lee, Esq. Registration No. 46,317 BUCHANAN INGERSOLL & ROONEY PC 1737 King Street, Suite 500 Alexandria, VA 22314 Direct Telephone (703) 838-6545 Main Facsimile (703) 836-2021 roger.lee@bipc.com
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A Power of Attorney is being filed concurrently herewith in accordance with 37 C.F.R. §42.10(b).

D. Service Information Under 37 C.F.R. §42.8(b)(4)

Petitioner consents to e-mail service at BIR-GoogleGeoscope@bipc.com.

III. PAYMENT OF FEES

The undersigned authorizes the Office to charge Deposit Account No. 02-4800 for fees required by 37 C.F.R. §42.15(a).

IV. REQUIREMENTS UNDER 37 C.F.R. §42.104

A. Grounds for Standing

Petitioner certifies that the '104 Patent is available for *inter partes* review pursuant to 37 C.F.R. §42.102(a)(2). Petitioner is not barred or estopped from requesting *inter partes* review challenging claims of the '104 Patent on the grounds identified herein.

This Petition is filed within one year from the date on which Petitioner was served a Complaint by Owner in the Related Litigation.

Neither Petitioner nor its privies have received a final written decision under 35 U.S.C. §318(a) regarding any claim of the '104 Patent on any ground that was raised or could have been raised by Petitioner or its privies in any *inter partes* review, post grant review, or covered business method patent review.

B. Identification of Challenges and Precise Relief Requested

Petitioner challenges Claims 1, 2, 3, and 11 of the '104 Patent and requests that these claims be found unpatentable for the reasons set forth in Petitioner's Grounds as follows:[1]

Ground	Reference(s)	Basis	Claims
1	U.S. Patent No. 7,706,811 ("Shkedi") (EX1006)	§102	1, 2, 3, 11
2	Shkedi; U.S. Patent Publication No. 2003/0064735 ("Spain") (EX1009)	§103	2
3	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") (EX1010)	§102	1, 2, 3, 11
4	Zhu; Heikki Laitinen, Jaakko Lähteenmäki, Tero Nordström, "Database Correlation Method for GSM Location", VTT Information Technology, IEEE, 2001. ("Laitinen")	§103	1, 2, 3, 11
5	Zhu; Spain	§103	2

Petitioner also relies upon the evidence listed in the Exhibit List, including the Declaration and *Curriculum Vitae* of David Hilliard Williams (EX1012, ¶¶1-12, and

[1] Owner asserts infringement of Claims 1 and 2 of the '104 Patent in the Related Litigation.

see generally, ¶¶13-249; EX1013) and the Declaration and *Curriculum Vitae* of Dr. Sylvia Hall-Ellis (EX1014-EX 1015).

C. Prior Art Qualification of Asserted References

For this Petition, Petitioner assumes the earliest effective filing date of the '104 Patent is February 5, 2007—the filing date of priority U.S. Provisional Application No. 60/899,379.[2]

Shkedi (EX1006), filed September 19, 2006, constitutes prior art at least under Section 102(e).

Spain (EX1009), published April 3, 2003, constitutes prior art at least under Section 102(b).

Zhu (EX1010), published no later than October 3, 2005, constitutes prior art at least under Section 102(b). EX1014.

Laitinen (EX1011), published no later than October 17, 2001, constitutes prior art at least under Section 102(b). EX1014.

[2] Petitioner does not concede that any challenged claim is entitled to an effective filing date of February 5, 2007.

V. BACKGROUND

A. The '104 Patent

The '104 Patent discloses a method to modify calibration data used to locate a mobile unit (*e.g.*, mobile phone) in an indoor facility by modifying observed network measurement data. EX1001, 3:38-42, 1:13-17. "Calibration data obtained outdoors may be modified and substituted for indoor calibration data" and "network measurement data may be modified for comparison with the outdoor calibration data." *Id.*, 3:46-49. Owner asserts that modification of observed network measurement data constitutes the purported "inventive feature" of the '104 Patent. EX1016, ¶54. This purported "inventive feature" was disclosed in prior art demonstrating it was well known to modify (*e.g.*, normalize) observed data and use the modified data to determine a mobile station's location. *See, e.g.,* EX1006, 5:59-63, 21:14-24; EX1010, pp.94-95. EX1012, ¶¶24-25.

B. Examination History

The Challenged Claims were allowed in the first action during prosecution. EX1002, pp.31-36 (Office Action dated Feb. 25, 2009). Reasons for allowance stated that "the examiner found no teaching in the prior art that would render obvious the claimed method for determining a location of a mobile station comprising 'determining which of said first and second signal characteristics has a greater magnitude; and modifying said observed network measurement data using the

greater magnitude signal characteristic'." *Id.*, p.11, pp.7-16 (Allowance dated May 29, 2009). EX1012, ¶27.

During prosecution of related Application No. 12/424,320, the Patent Office made a rejection based on Krumm, Stilp, or Schantz. EX1018, pp.175-180 (Office Action dated Jun. 17, 2011). Applicant argued that the applied art does not "teach or disclose collecting observed network measurement data (*e.g.*, from NMRs), 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." *Id.*, p.171; pp.167-172 (response filed Jul. 19, 2011 at pp.3-5). The Examiner withdrew the rejection in the next action without explanation. The application was allowed without reasons for allowance. EX1012, ¶28.

The '104 Patent was subject to reexamination ('694 Reexam) (EX1003). Claims 1-14 were confirmed without amendment and claims 15-21 were canceled as a result. EX1004. *See also* EX1003, pp.4-10 (NIRC dated Jul. 23, 2014). The Examiner's statement of reasons for patentability/confirmation indicated that "Benes fails teaching comparing the modified network measurement data with the calibration data". *Id.*, p.7 (NIRC dated Jul. 23, 2014 at 3). The Examiner determined that "Gordon does not explicitly teach that it is determined which signal has a greater magnitude and then using the greater magnitude signal to modify observed measurement data". *Id.* EX1012, ¶29.

The prior art newly relied upon herein discloses the features alleged to be missing from art applied during prosecution of the ’333 and ’320 Applications and the ’694 Reexam. *See* Section VII. EX1012, ¶30.

C. The Prior Art

1. Shkedi (EX1006)

Shkedi discloses determining the location of a mobile telephone using a “Signal-Comparison Based Location-Determining Method” to address a need “for simple straightforward improvements in determining the precise location of mobile devices; especially in poor signal-reception locations such as in dense multi-story urban centers” and “locat[ing] a device in a multi-story structure.” EX1006, 1:23-27, 6:35-7:5. Shkedi discloses: (A) registering a selected location by first-causing a portable RF communications device at the selected location to receive an RF communications signal from a plurality of local fixed-location service-area antenna stations; (B) recording the selected location by electronically storing at least two of the respective reception signal strength measurements; (C) monitoring by second-causing a portable RF communications device to receive communications signals from a plurality of respectively local fixed-location service-area antenna stations, and to measure reception signal strength associated with the signals; and (D) determining if the portable RF communications device is at the selected location of the registering step by electronically comparing measurements in the monitoring

step with the stored at least two measurements of the recording step. EX1006, 5:36-63. EX1012, ¶¶47-48.

Shkedi specifically modifies observed network measurement data by using a strongest, greater magnitude signal to normalize measurements. EX1006, 6:12-34. Shkedi modifies observed network measurement data by performing mathematical operations on "less strong" signals using the strongest signal. *See id.,* 20:63-21:61. The modified data is used to determine the location of the mobile station. *Id.*, 5:59-63, 21:14-24. Shkedi's method is performed on a single mobile device, on separate devices, or in offsite facilities. *Id.*, 12:12-18. *See also id.,* 23:55-57. EX1012, ¶49.

2. Zhu (EX1010)

Zhu discloses determining indoor/outdoor locations of cellular handsets by using "received signal strength (RSS) methods" in a cellular environment", wherein signal modifying is performed using N strongest signals (i.e., signals of greater magnitude). EX1010, abstract, title, p.94. "The RSS technique estimates a cellular phone's location by matching signal strengths measured at the handset with signal strengths recorded in a database of radio frequency (RF) maps." *Id.*, p.92, left col. Zhu's methods are "for identifying and locating *indoor* handsets". *Id.*, abstract (emphasis in original). *See also id.*, p.92, left col. ("we conclusively show that RSS location techniques are also accurate for indoor users"), p.93, left col. ("we were concentrating on the more complicated question of indoor feasibility"). EX1012, ¶50.

A location algorithm receives a calibrated RF Map Database ("RFMD") and a sequence of network measurement reports ("NMRs"). EX1010, p.94, right col. NMR reports include signal strength data of the cellular phone to be located. Zhu discloses "normaliz[ing]" NMR data using signal strength data "to generate the relative received signal strength". EX1010, p.95, left col. *See also id.*, paragraph bridging pp.94-95. The "N strongest channels" or "six strongest channels" (e.g., 6 signals of greater magnitude) are selected from the observed network measurement data and used to calculate an average received signal strength. EX1010, p.94, right col. EX1012, ¶51.

3. Spain (EX1009)

Spain discloses interpolating grid points between existing grid points to improve the accuracy of an RF-based fingerprint database built using NMRs and observed network measurement data (i.e., RF "fingerprint" measurement data that can identify a mobile device location) . EX1009, [0101]:1-4 ("the database is built by taking fingerprint measurements at predetermined locations and using intelligent algorithms that interpolate the fingerprints at all locations in between the sampled locations"). *See also id.*, [0054]:1-3 ("To improve the accuracy of the fingerprint database, learning/training techniques and methodologies can be adopted for this problem."), [0055]:6-10. EX1012, ¶52.

4. Laitinen (EX1011)

Laitinen, entitled "Database Correlation Method for GSM Location", discloses fingerprint location methods applied to GSM, wherein "[t]he essential location-dependent parameters defined in GSM standard are Location Area Code (LAC), serving cell ID, timing advance (TA), and the measured signal strength of the serving cell and its neighbors." EX1011, p.2505, right col. , Fig. 1. Laitinen discloses "measurements performed by the network as well as by the [mobile station] MS"; "When the MS needs to be located, the necessary measurements are performed and transmitted to the location server", and "[t]he location server then calculates the MS location by comparing the transmitted fingerprint and the fingerprints of the database." *Id.*, p.2505, left col. Laitinen discloses that in GSM applications, the mobile station determines the cell ID having the strongest signal based on the multiple signal strength measurements continuously received by the mobile station. *Id.* (the mobile station "continuously makes signal strength measurements and also knows the cell ID of the strongest cell."). EX1012, ¶¶53-55.

D. Person of Ordinary Skill in the Art ("POSITA")

A POSITA would have been someone knowledgeable in wireless networks, cellular radio systems, mobile communication devices and radio navigation systems, 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. EX1012, ¶31.

VI. CLAIM CONSTRUCTION

The Board only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015-00633, Paper 11 at 16 (PTAB Aug. 14, 2015) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Other than the terms addressed below, Petitioner believes that no express constructions of the claims are necessary.

Claim terms are interpreted according to *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*), and its progeny. Some terms of the '104 Patent are in dispute and a Markman Order (EX1028) issued in Related Litigation addressing those disputes construing claim terms. Any claim terms not addressed below should be interpreted consistent with the *Phillips* standard. The Challenged Claims are unpatentable under the constructions below.

A. "calibration data"

The phrase "calibration data" should be construed as:

modified or unmodified network measurement data associated with a geographic location

Petitioner's construction is consistent with the Markman Order. *See* EX1028, p.8. EX1012, ¶¶37-38.

The '104 Patent discloses that signal strength is a type of calibration data. EX1001, 1:21-24 ("one or more types of calibration data associated with the mobile station (e.g., signal strength, …"). *See also id.*, 1:39-40 ("signal strength data stored in a calibration database"). Thus, the term "calibration data" should be construed to encompass signal strength measurements. EX1012, ¶39.

The '104 Patent discloses that "calibration data" encompasses data that has been modified. EX1001, 3:46-47 ("Calibration data obtained outdoors may be modified and substituted for indoor calibration data."), 3:7-11. *See also id.*, 12:35-37 ("wherein the modifying of said calibration data…"). The'104 Patent is titled "Method ***to modify calibration data*** used to locate a mobile unit". EX1012, ¶40.

B. "observed network measurement data"

The phrase "observed network measurement data" should be construed as:

measurement data from a network measurement report (*i.e.*, a report used in cellular networks which provides the results of a measurement from a mobile device on one or more cells)

Petitioner's construction is consistent with the Markman Order. *See* EX1028, p.10. EX1012, ¶¶41-42.

C. "grid point"

The phrase "grid point" should be construed as:

a point associated with representative calibration data for an area

Petitioner's construction is consistent with the Markman Order. *See* EX1028, p.20. EX1012, ¶¶43-44.

D. "as said mobile station"

In Related Litigation, Owner asserts that the phrase "as said mobile station" in claim 11 should be construed as "a[t] said mobile station." EX1016, ¶¶108-109. Petitioner adopts this construction for purposes of this Petition. EX1012, ¶45.

E. Order of "collecting…" "modifying…" and "comparing…" steps

In Related Litigation, Petitioner and Owner have stipulated that the order of "collecting….", "modifying….", and "comparing…." steps of claim 1 should be construed as "collecting has to occur before modifying, and modifying has to occur before comparing." EX1024, p.1. The Grounds address this construction. EX1012, ¶46.

VII. PETITIONER HAS A REASONABLE LIKELIHOOD OF PREVAILING

The Challenged Claims are unpatentable over the prior art. EX1012, ¶56.

A. Claims 1, 2, 3, and 11 Are Anticipated By Shkedi (Ground 1)

The following sections reference where elements of Claims 1, 2, 3, and 11 are anticipated by the prior art. EX1012, ¶57.

1. Claim 1 (Preamble): "A method for determining a location of a mobile station, comprising:"

Shkedi discloses the Preamble of Claim 1.[3] Shkedi discloses "methods for determining the location of a mobile telephone, or of a mobile communications device." EX1006, 1:6-15. *See also id.*, 1:19-21. Shkedi discloses a "Signal-Comparison Based Location-Determining Method". *Id.*, 6:35-7:5; 14:41-15:5,Fig. 6. Shkedi discloses mobile stations to be a "mobile telephone", "mobile communications device", "portable RF communications device", "cellular telephone device", and "portable device". *Id.*, 1:6-8, 5:36-43, 6:35-40, 6:2-3. The '104 Patent discloses that a mobile station encompasses a wireless communication device such as a telephone. EX1001, 1:13-17. EX1012, ¶¶58-60.

The Challenged Claims encompass observed network measurement data collected by a mobile station located indoors. Shkedi's techniques "locate a device in a multi-story structure." EX1006, 1:23-29; and "especially in poor signal-reception locations such as in dense multi-story urban centers." *Id.*, 1:23-29. *See also id.*, 5:27-30 (problem of poor signal-reception is "significantly addressed by embodiments of the present invention"). Shkedi discloses determining a mobile device location indoors. EX1012, ¶¶61-62.

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[3] Petitioner does not concede that any Preamble of the Challenged Claims is limiting.

a. Element [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;"

Shkedi discloses Element [1.1]. Shkedi discloses providing a database of previously-gathered calibration data "by electronically storing at least two of the respective signal strength measurements". EX1006, 5:44-50; 18:31-33 ("there is no limit on the number of desired locations that could be recorded and tracked by the cellphone."), 13:64-14:7 ("Database recorded on a tangible memory media…and having recorded thereon signal-strength location correlation data"). This database of previously-gathered signal strength measurements is used to locate the mobile device. *Id.*, 5:59-63. *See also id.*, 8:41-56, 6:35-7:5. EX1012, ¶¶63-65.

Shkedi registers signal strength measurements for a selected location "by first causing a portable RF communications device at the selected location (i) to receive an RF communications signal from a plurality of local fixed-location service-area antenna stations, and (ii) to measure reception signal strength respectively associated with the received signal from at least two of the plurality of antenna stations." EX1006, 5:44-50. A database is generated from a "data collection step where the portable device comes to measure the antenna signal space reception characteristics at the selected location." *Id.*, 11:26-28. EX1012, ¶¶66-67.

Shkedi electronically stores "at least two of the respective reception signal strength measurements. Storage may be on the device per se or transferred to a remote storage facility." EX1006, 11:39-42. EX1012, ¶68.

Shkedi's registered and recorded signal strength measurements for selected locations satisfy "calibration data". Such signal strength measurements constitute "modified or unmodified network measurement data associated with a geographic location" (*see* Section VI.A.) given that the signal strength measurements are associated with selected locations and are received from network antenna stations as a report (*e.g.*, at least two of the signal strength measurements).). *See also* EX1006, 5:4-5 (Shkedi addresses "a need for performing geographical location determinations"). EX1012, ¶69.

Shkedi discloses "(A) Registering" and "(B) Recording" prior to "(C) Monitoring" and prior to "(D) Determining ... by electronically comparing measurements", using "previously gathered" calibration data. EX1006, 5:44-63.

Shkedi's database of signal strength data is for a predetermined region encompassing the "selected location[s]" for which the signal strength data is registered and recorded. *Id.*, 5:44-53. Shkedi's database is associated with the "service-area" of "antenna stations" of a "cellular network", *e.g.*, "in a typical GSM implementation and a typical CDMA implementation." *Id.*, 5:36-50, 18:5-17,19:39-41. EX1012, ¶¶70-71.

Shkedi's wireless network includes a first transmitter and a second transmitter which provide calibration data and observed network measurement data. EX1006, 5:44-50 ("a plurality of local fixed-location service-area antenna stations"), Fig. 2. *See also id.*, 5:36-42 (the location-determining method is "operable by at least one portable RF communications device in conjunction with at least two fixed-location service-area antenna stations respectively capable of RF communication with the at least one device"), 25:61-67. EX1012, ¶¶72-73.

b. Element [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;"

Shkedi discloses Element [1.2]. Shkedi collects observed network measurement data from network measurement reports (NMRs). Shkedi discloses "(C) Monitoring … a portable RF communications device (i) to receive communications signals from a plurality of respectively local fixed-location service-area antenna stations, and (ii) to measure reception signal strength associated with the signals". EX1006, 5:54-58. Shkedi generates "unique fingerprints" (*i.e.*, network measurement reports (NMRs)). *Id.*, 16:19-22 ("the combination of measured signal strengths from surrounding cells … as measured by the cell phone at a certain location creates a unique fingerprint."). Shkedi "currently records" the unique fingerprint created from the measurements. *Id.*, 9:33-34.

Shkedi "collects" communications signal "data" from the unique fingerprints (*i.e.* NMRs) that are "monitored" (*i.e.*, "observed") by the mobile station. *Id. See also id.*, 11:60-63 ("the monitoring step collects sparse first order data, and then collects more comprehensive data for the next step"), 8:41-48 (a mobile telephone "observ[es] an identical list of service antennas with substantially identical respective signal strengths"). EX1012, ¶¶74-77.

Shkedi collects communications signal data as "measurement data from a network measurement report (*i.e.*, a report used in cellular networks which provides the results of a measurement from a mobile device on one or more cells)" (*see* Section VI.B.) given that Shkedi collects measurement data from the unique fingerprints (*i.e.*, reports used in cellular networks to provide results of a measurement). EX1006, 6:19-27, 6:35-36 ("cellular telephone device"), 17:24-28 ("measurements are from the perspective of the location of the reception device (the cellular telephone, ubiquitous computer, etc.) and substantially form an instance of an antenna space reception fingerprint".), 18:5-12. EX1012, ¶78.

Shkedi "measures 10 signals from 10 surrounding cells" to generate an original unique fingerprint (*i.e.*, original NMR). Shkedi collects observed network measurement data from the unique fingerprint by "choos[ing] the 4 cells with the strongest signals as neighboring cells" to form a modified fingerprint (*i.e.*, modified NMR). EX1006, 20:66-21:2, *see also* 20:63-21:24. EX1012, ¶79.

Shkedi uses software and circuitry for performing the collecting step. EX1006, 14:41-15:5 (registration, recording, monitoring, and determination modules 600, 610, 620, 630); 25:32-39 (mobile telephone device has "reasonable amount of spare computing power onboard"); 14:8-40.

The '104 Patent discloses that "network measurement data represents at least one network characteristic observed by the mobile station" (EX1001, 9:42-47). Shkedi's communications signal data represents signal strengths observed by the mobile station. The signal strength measurements collected as a result of Shkedi's monitoring step (C) from "a plurality of respectively local fixed-location service-area antenna stations" (*i.e.*, a first transmitter and a second transmitter) include a "first signal characteristic" and a "second signal characteristic". EX1006, 10:37-63, 10:50-52 ("measure reception signal strength respectively associated with the received signal from at least two of the plurality of antenna stations".). The term "signal characteristic" encompasses signal strength measurements according to the '104 Patent. EX1001, 12:31-32 ("said first signal characteristic is signal strength."), 12:33-34 ("said second signal characteristic is signal strength."). *See also id.*, 5:58-61. EX1012, ¶80.

Shkedi's signal strength measurements collected from unique fingerprints are subsequently compared with the database of previously-gathered signal strength

measurements collected in Steps (A) and (B) to locate the portable device. EX1006, 5:35-63. *See also id.*, 8:41-56, 6:35-7:5. EX1012, ¶¶81-82.

c. Element [1.3]: "determining which of said first and second signal characteristics has a greater magnitude;"

Shkedi discloses Element [1.3]. Shkedi discloses determining which of the first and second signal characteristics has a greater magnitude: normalizing signal strengths using the "strongest signal" (*see* EX1006, 6:12-34), "dividing the 3 less strong signals by the strongest signal" (*see id.,* 21:2-24), and determining whether a signal strength "is only slightly stronger" than another signal strength and dividing "by the sum of the signals of the 2 strongest cells" (*see id.,* 21:49-58). Shkedi discloses Elements [1.3] and [1.4]. EX1012, ¶¶83-84.

Shkedi discloses normalizing measurements using the "strongest signal" and using such normalized measurements in place of direct measurements. *See, e.g.,* EX1006, 6:12-34. Shkedi discloses that "in a cellular telephone CDMA environment it is the relative signal strengths that form an important metric for comparative purposes", as opposed to "direct measurements of signal strengths and direct comparisons of those measurements". *Id.*, 6:16-23. Shkedi discloses that "a strongest signal may be used as a unit to help normalize other simultaneous measurements". *Id.*, 6:27-29. A POSITA would have recognized that using the "strongest signal" to normalize other measurements involves determining which of the received signal strengths has a greater magnitude. EX1012, ¶¶85-88.

Shkedi discloses another embodiment of performing mathematical operations on "less strong" signals using "the strongest signal". EX1006, 21:2-5, 21:11-14. Shkedi modifies observed network measurement data "by dividing the 3 less strong signals by the strongest signal". *Id.* Shkedi determines "the strongest signal" having a greater magnitude than the "3 less strong signals". The 3 relations are recorded and compared with previously gathered data to determine phone location. *Id.*, 21:2-5. EX1012, ¶¶89-90. For example, "[t]he cell phone chooses the 4 cells with the strongest signals as neighboring cells (cells #1, 4, 6, 9)" and "calculates the ratio between the chosen 4 signals by dividing the 3 less strong signals by the strongest signal (assuming that cell #4 has the strongest signal)" and records the 3 relations, *i.e.*, "cell #1 signal/cell #4 signal, cell #6 signal/cell #4 signal and cell #9 signal/cell #4 signal". EX1006, 20:66-21:5.

Thus, Shkedi's database includes previously-gathered calibration data, *i.e.*, the 3 relations for each recorded (or "desired") location. *Id.* Thereafter, "[i]f the cellphone can measure signals from cells #1, 4, 6 and 9, the cellphone calculates the relations between cells #1, 6 and 9 to cell #4." *Id.*, 21:5-14. Shkedi discloses calculating the same "relations" between the 4 signals, *i.e.*, by dividing the 3 "less strong" signals by "the strongest signal" with respect to the signals that the cell phone is monitoring (*i.e.*, observed network measurement data). Shkedi discloses computing "relations" to obtain the database of previously-gathered calibration data

using mathematical techniques by determining a signal characteristic with a greater magnitude. Shkedi also discloses that the "relations" for the observed network measurement data are computed in the same manner. EX1012, ¶91.

The '104 Patent discloses performing mathematical operations on less strong signals using the strongest signal ("the highest cell power"):

> NM data may be modified by an amount relative to the signal strength of a NC-BS. In this example, the NC-BS having the highest signal power may be used as a basis to modify the values of the NM data. The differences between the NC having the highest cell power and the cell powers of the remaining NC-BSs may be calculated and the quantities thereof used to modify the original NM data.

EX1001, 5:58-64. *See also id.*, 5:10-15. The '104 Patent discloses that the modifying can involve "various known functions" other than "subtracting" and "adding". *Id.*, 6:64-67. This includes dividing as disclosed by Shkedi. EX1012, ¶92.

In another embodiment, Shkedi compares signal strengths of "the two strongest cells" to determine whether "the two strongest cells are ***close enough in strength***". EX1006, 21:49-53 (emphasis added). Shkedi discloses that "[w]hen a cellphone is on the border of 2 cells, the signals as measured by the cell phone will be close to each other." *Id.*, 21:45-46. Shkedi discloses that "the cellphone can divide the signal strength of the chosen cells not by the signal of the strongest cell but by the sum of the signals of the 2 strongest cells if the two strongest cells are close

enough in strength". *Id.*, 21:49-58. If the signal strength of one cell ***"is only slightly stronger"*** than another cell, Shkedi determines which of the signals of the two strongest cells has the greater magnitude. *Id.*, 21:49-58 (emphasis added). EX1012, ¶¶93-95.

Shkedi compares signal strengths of the two strongest cells of the observed network measurement data to determine whether they are "close enough in strength" to warrant using their sum as the divisor. EX1006, 21:49-58. This determination is performed to: (1) determine whether the sum of the two strongest signals is to be used, and (2) ensure that relations calculated from the observed network measurement data are compared to the relations in the database of previously-gathered calibration data that were calculated under the same conditions, *i.e.*, using the sum of the two strongest signals. The two signal strengths of the two strongest cells (including "the greater magnitude signal characteristic") are then used to modify the weaker signal strengths (*i.e.*, "observed network measurement data") by dividing the weaker signals by the sum of the two strongest signal strengths. *Id.*, 21:54-61 ("cell #6 signal/(cell #4 signal+cell #1 signal)", "cell #9 signal/(cell #4 signal+cell #1 signal)"). EX1012, ¶¶96-98.

d. Element [1.4]: "modifying said observed network measurement data using the greater magnitude signal characteristic; and"

Shkedi discloses Element [1.4]. Shkedi discloses modifying observed network measurement data using the greater magnitude signal characteristic: normalizing signal strengths using the "strongest signal" (*see* EX1006, 6:12-34), "dividing the 3 less strong signals by the strongest signal" (*see id.,* 21:2-5, 21:11-14), and determining whether a signal strength "is only slightly stronger" than another signal strength and dividing "by the sum of the signals of the 2 strongest cells" (*see id.,* 21:49-58). Shkedi discloses the order of "collecting…" "modifying…" and "comparing…" steps (*see* Section VI.E.). Shkedi "collects" observed network measurement data prior to "modifying", and "modifies" prior to "comparing" modified network measurement data with the database calibration data. EX1012, ¶¶99-101.

Shkedi discloses using the "strongest signal…to help normalize" (*i.e.*, "modify") direct signal strength measurements. The '104 Patent discloses that modifying encompasses employing normalized/relative signal strengths. *See, e.g.,* EX1001, 5:58-61 ("NM data may be modified by an amount relative to the signal strength of a NC-BS. In this example, the NC-BS having the highest signal power may be used as a basis to modify the values of the NM data."). Like Shkedi, the '379 Provisional—which the '104 Patent incorporates by reference (EX1001, 1:6-9)—

discloses using "relative received signal strengths" instead of "absolute received signal strengths". EX1005, pp.25-26 ("absolute received signal strength comparisons between the wireless device and a calibration database may result in poor location estimation accuracy. In the following methods, instead of comparing absolute received signal strengths, a comparison of relative received signal strengths, obtained by various modifications, is proposed."). *See also* EX1003, p.89 (Owner conceded that normalization is a modification) (Response filed Dec. 24, 2013, at p.13). EX1012, ¶¶102-104.

Shkedi modifies signal strength data "by dividing the 3 less strong signals by the strongest signal". EX1006, 21:2-5, 21:11-14. The 3 relations are recorded and compared with previously gathered calibration data to determine the phone location. *Id.*, 21:2-5. Shkedi discloses calculating the same "relations" between the signals, *i.e.*, by dividing the 3 "less strong" signals by "the strongest signal". Shkedi modifies signals that the mobile station monitors (*i.e.*, the observed network measurement data) using the "strongest signal" among the signals the mobile station monitors. The '104 Patent discloses performing mathematical operations (*e.g.*, division) on the "less strong" signals using "the strongest signal". *See* EX1001, 6:64-67. EX1012, ¶¶105-106.

Shkedi compares the two strongest signal strengths cells of the observed network measurement data to determine whether they are "close enough in strength"

to warrant using the sum of the signals of the two strongest cells as the divisor. EX1006, 21:49-58. The two signal strengths of the two strongest cells (which includes "the greater magnitude signal characteristic") are then used to modify the weaker signal strengths as discussed *supra*.

e. Element [1.5]: "comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station."

Shkedi discloses Element [1.5]. Shkedi discloses comparing in a "***Signal-Comparison Based Location-Determining Method***". EX1006, 5:36-37 (emphasis added). Shkedi's comparing involves "[d]etermining if the portable RF communications device of the Monitoring step is at the selected location of the registering step by electronically ***comparing*** measurements in the monitoring step with the stored at least two measurements of the Recording step." *Id.*, 5:59-63. Shkedi's device simply performs such reception measurements and ***compares*** these measurements [or modified data obtained from such measurements] with the remembered signal strength combinations [*i.e.*, 'database of previously-gathered calibration data']" to determine the location of the device. *Id.*, 6:47-55. *See also id.*, 8:41-48 ("if a mobile telephone (at a user selected location) measures a plurality of service antenna signals and stores these with their respective service antenna identifications, then that mobile telephone (or an equivalent unit) upon observing an identical list of service antennas with substantially identical respective signal

strengths—can reasonably conclude that it is within a predetermined proximity of the original user selected location."). EX1012, ¶¶109-111.

Shkedi provides a database of previously-gathered calibration data, collects observed network measurement data, and modifies the observed network measurement data using the greater magnitude signal characteristic, resulting in modified network measurement data. The modified network measurement data is then compared with the database of previously-gathered calibration data for determining the mobile station location. *See* EX1006, 6:12-55, 11:2-17, 13:50-63, 15:33-16:23. EX1012, ¶112.

Shkedi expressly teaches that "it is the relative signal strengths that form an important metric ***for comparative purposes***" and the "strongest signal may be used as a unit to help normalize other simultaneous measurements". EX1006, 6:19-29 (emphasis added). Thus, Shkedi compares relative/normalized data (*i.e.*, the "modified network measurement data") with the database of previously-gathered calibration data for determining the mobile station location. *Id.*, 5:59-63 ("***electronically comparing*** measurements in the monitoring step with the stored at least two measurements of the Recording step") (emphasis added), 5:26-43 ("***Signal-Comparison*** Based Location-Determining Method", "for location determination") (emphasis added). EX1012, ¶¶113-114.

Shkedi's modified network measurement data (*e.g.*, the "relations") are compared with the "relations" of the database of previously-gathered calibration data to determine mobile station location. EX1006, 20:27-43 ("by calculating the relations between the measured signal strengths of neighboring cells, a cellphone can identify that it returned to a desired location ***by comparing*** the calculated relations between neighboring cells at current location with the calculated relations between neighboring cells at the desired location.") (emphasis added). *See also id.,* 21:14-25 ("The cellphone can determine [] location by subtracting each of the relations at the current location from each of the corresponding relations at the desired location and demanding that the each of the subtraction for each of the relations does not exceed a certain threshold or that the sum of the subtractions does not exceed a certain threshold or alternatively any other formula."). A POSITA would have recognized that the subtraction and checking against a threshold constitutes a "comparison". "Calibration data" encompasses data that has been modified. *See* Section VI.A. The "relations" obtained from previous direct measurements in Shkedi's techniques satisfy the database of previously-gathered calibration data. EX1012, ¶¶115-118.

2. Claim 2: "The method of claim 1 wherein said database comprises previously-gathered calibration data for one or more non-uniform grid points within said region."

Shkedi discloses Claim 2. "Non-uniform grid points" of the '104 Patent, as described more fully in the '753 Patent (EX1008) which claims priority to a common provisional application (EX1005), are grid points "non-uniformly spaced throughout a geographic region." EX1008, 9:41-42. The '104 Patent suggests "a non-uniform grid point (NUG) may represent the signal characteristics and/or calibration data over a given region." EX1001, 3:50-52; *See also* Section VI.C. EX1012, ¶¶119-122.

Shkedi discloses a database including such non-uniform grid points. EX1012, ¶123.

Shkedi discloses "Registering" and "Recording" non-uniform locations of a mobile telephone as signal strength measurements in a database (*see, e.g.,* EX1006, 5:44-50). Shkedi discloses updating that database with measurements made during "Monitoring" of the mobile telephone's location. *See id.*, 11:51-12:5,14:1-7. *See* Section VII.A.1.a, *supra*; ("there is no limit on the number of desired locations that could be recorded". EX1006, 18:31-33). *See also*, EX1006, 14:1-7. EX1012, ¶¶124-125.

Shkedi states that "a mobile telephone (at a user selected location) measures a plurality of service antenna signals" (*i.e.*, signal strengths) and stores them in a database. EX1006, 8:41-44. An "identical list of service antennas with substantially

identical respective signal strengths" can be used to locate a mobile telephone "within a predetermined proximity of the original user selected location." *Id.*, 8:44-48. Non-uniform user locations stored in Shkedi's database are "point[s] associated with representative calibration data for an area [*e.g.*, within a predetermined proximity]." These signals strengths are thus used as signal strengths for determining any user selected location that is "non-uniformly spaced throughout a geographic region." EX1012, ¶126.

Shkedi builds the database as a "transformational data bank" of non-uniform grid points "by collecting correspondences between GPS (latitude longitude) coordinates" and the signal strengths for the user selected locations. A "never registered location" is found by "extrapolating" to find locations failing "to report GPS." EX1006, 13:15-23. Such locations, when extrapolated, constitute non-uniform grid points that are used to "build" Shkedi's database for location determination. EX1006, 17:44, *see* 13:9-25. EX1012, ¶127.

Shkedi expressly "builds" the database using non-uniform grid points. "[G]round truth" is measured to "locate shadow spots". An "accumulation of GPS coordinates in association with location fingerprints" provides "transformations between fingerprints and standard geographical map coordinates [*e.g.*, grid points]—via an intermediate fingerprint 'terrain' map database." EX1006, 9:19-25. This

database of non-uniform grid points reduces computation for location determination. *See id.*, 5:4-23. EX1012, ¶128.

Shkedi discloses obtaining non-uniform locations within buildings where "GPS signals" are unavailable. EX1006, 17:43-45. Such locations are recorded in Shkedi's database; these non-uniform grid points represent non-uniform locations of the buildings. *See id.*, 10:37-63, 14:1-7. EX1012, ¶129.

Shkedi's database of non-uniform grid points (EX1006, 14:1-7) is built from (1) extrapolation of collected "correspondence data" and/or (2) measuring of signal strengths to "fill in the map" (EX1016, ¶61) with non-uniform locations. Non-uniform grid points are expressly or implicitly obtained via Shkedi's "(A) Registering" or "(C) Monitoring", and "(B) Recording" of non-uniform locations, and are used to improve efficient location determination. *See* EX1006, 10:37-63. EX1012, ¶¶130-132.

3. Claim 3: "The method of claim 1 wherein said observed network measurement data includes data collected at the mobile station."

Shkedi discloses Claim 3. Shkedi's portable RF communications device (*i.e.*, the claimed "mobile station") receives the communication signals and measures reception signal strength associated with the signals. EX1006, 5:54-58 ("Monitoring by second-causing a portable RF communications device (i) to receive communications signals from a plurality of respectively local fixed-location service-

area antenna stations, and (ii) to measure reception signal strength associated with the signals;"). *See also id.*, abstract ("monitoring a portable device location by causing the device to measure reception signal strength"), 11:60-63. Shkedi's observed network measurement data includes data collected at the device whose location is to be determined, *i.e.*, the mobile station. EX1012, ¶¶133-137.

4. Claim 11: "The method of claim 1, wherein the observed network measurement data includes received signal strength of said transmitters as said mobile station."

Shkedi discloses Claim 11. The phrase "as said mobile station" in claim 11 should be construed as "a[t] said mobile station". *See* Section VI.D. Shkedi discloses measurement of reception signal strength occurs at the RF communications device, *i.e.*, at the mobile station whose location is to be determined. EX1006, 5:54-58 (RF communications device "receive[s] communications signals from a plurality of respectively local fixed-location service-area antenna stations" and "measure[s] reception signal strength associated with the signals"). *See also id.*, 27:12-19. Shkedi discloses that "receiv[ing] communications signals" and "measur[ing] reception signal strength" in the monitoring step can be performed "on a single mobile device", *i.e.*, at the mobile station. *Id.*, 11:51-12:5, 12:12-18 ("all of the four steps" of registering, recording, monitoring, and determining can be performed "on a single mobile device"). EX1012, ¶¶138-143.

B. Claim 2 Would Have Been Obvious Over Shkedi in View of Spain (Ground 2)

To the extent Shkedi's disclosure is deemed not to expressly reference "non-uniform grid points", it would have been obvious to include such points in Shkedi's database to achieve the accuracy and reduction in computation Shkedi contemplates. Owner has defined "non-uniform grid points to encompass "interpolated" grid points. *See* EX1008, 23:1-15, EX1016, ¶61 ("grid points help[] fill in the map"). EX1012, ¶¶144-148.

Spain discloses enhancing the accuracy of a fingerprint database (EX1009, ¶[0054]:1-3) by adding interpolated non-uniform grid points to a fingerprint matching database for location determination. Spain generates a "new grid" using a "complete grid of locations" as training data for a machine learning algorithm. EX1009, ¶¶[0054], [0055]. This "new grid" avoids any "need to obtain measurement for the complete grid" because grid points are generated. *Id.*, ¶[0055]. "[T]he system can learn which are the ambiguous areas" to continually improve the database. *Id.*, ¶[0055]:17-18. Spain expressly states:

> … the database is built by taking fingerprint measurements at predetermined locations and using intelligent algorithms that interpolate the fingerprints ***at all locations in between the sampled locations***.

EX1009, [0101]:1-4 (emphasis added).

> …learning/training techniques: (1) ***they offer a way to interpolate between grid points [generating non-uniform grid points] and reconstruct the grid***.

EX1009, [0055]:6-9 (emphasis added).

"In one instance the fingerprint corresponds not to one exact spot on the surface of the earth, ***but instead to a small area***. The Lat and Long fields in this embodiment indicate a ***position inside the area***, preferably the center point." EX1009, [0099]:9-13 (emphasis added). Spain's interpolated points are "point[s] associated with representative calibration data for an area" that are non-uniform by reconstruction of the grid. EX1012, ¶¶149-151.

Shkedi and Spain seek to improve accuracy in mobile unit location determination using "fingerprinting" techniques. *See* EX1006, 8:48-56. Both Shkedi and Spain are directed to improving location accuracy in areas with degraded GPS capability. *See* EX1009, ¶[0034]; EX1006, 5:12-13. EX1012, ¶152.

A POSITA would have understood Spain's learning/training fingerprint techniques for interpolating non-uniform grid points to be consistent with the disclosed objectives of enhanced location determination accuracy in Shkedi. Spain's addition of interpolated "grids of location data" would have been a routine addition to the grid point database of Shkedi. Enhancing Shkedi's database with interpolated non-uniform grid points would have been an obvious way to build the database in exactly the manner contemplated by Shkedi. Such a modification would have been

routine, and according to known methods, to obtain predictable results with a high probability of success. EX1012, ¶¶153-154.

C. Claims 1, 2, 3, and 11 Are Anticipated By Zhu (Ground 3)

The following sections reference where elements of Claims 1, 2, 3, and 11 are anticipated by the prior art. EX1012, ¶155.

1. Claim 1 (Preamble): "A method for determining a location of a mobile station, comprising:"

Zhu discloses the Preamble of Claim 1. Zhu's method "estimates a cellular phone's location by matching signal strengths measured at the handset with signal strengths recorded in a database of radio frequency (RF) maps." EX1010, p.92, left col. *See also id.*, p.93, left col. ("the best match determines the xy-coordinates of the most likely handset location"), abstract. Zhu's "cellular phone" and "wireless handset" are mobile stations because the '104 Patent indicates that "mobile stations" encompass wireless telephones. *Id.*, abstract; p.92, left col.; EX1001, 1:13-17. To the extent the Challenged Claims encompass locating a mobile station at an indoor location (*see* Section VII.A.1), Zhu discloses indoor location determination. *See, e.g.,* EX1010, abstract ("locating *indoor* handsets"), p.92, left col. ("RSS location techniques[] for indoor users"), p.93, left col. EX1012, ¶¶156-160.

a. Element [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;"

Zhu discloses Element [1.1]. Zhu discloses providing "[a] database of RF coverage maps for all nearby serving sectors [that] was created from a combination of propagation modeling and varying levels of indoor and outdoor measurement calibration". EX1010, p.92, right col. The RF map database includes a grid. "Each raster point in the grid corresponds to a location within the network and contains a vector of received signal strength indicator (RSSI) values in dBm for all audible base stations" and "[a] complete raster array of RSSI is called an RF Map Database (RFMD)." *Id.*, p.93, left col. *See also id.*, Fig. 3. EX1012, ¶¶161-163.

Zhu's RF map database (RFMD) includes previously-gathered signal strength measurements which constitute "calibration data". EX1010, p.93, left col. ("[o]nce an RFMD has been constructed for a network area, the RSSI-based location engine must compare received signal strength measurements made by the handset to the RFMD vectors."). EX1012, ¶¶156-158. Zhu's RFMD calibration data includes "modified or unmodified network measurement data associated with a geographic location" (*see* Section VI.A.) and received from network base stations. EX1010, p.95, left col. ("each discrete (x,y) location in the RFMD"). EX1012, ¶¶164-165.

Zhu's RFMD is for a "predetermined region in a wireless network". EX1010, p.92, right col. ("[t]ests were performed on an 850 MHz IS 136 cellular network in

mid-town Atlanta on the campus of the Georgia Institute of Technology" and "[t]he measurement area has length of 700m and width of 500m, as shown in Fig. 1.").

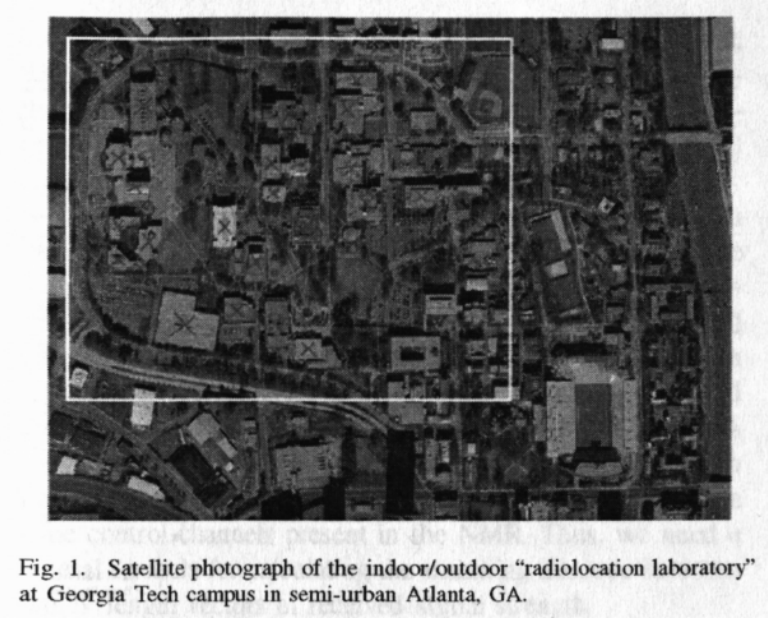


Fig. 1. Satellite photograph of the indoor/outdoor "radiolocation laboratory" at Georgia Tech campus in semi-urban Atlanta, GA.

Fig. 1 of Zhu

Zhu's network includes a first transmitter and a second transmitter. EX1010, p.92, right col. ("Three base stations were inside the measurement area", "Another five base stations in the neighborhood also provided coverage"). EX1012, ¶¶166-167.

b. Element [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;"

Zhu discloses Element [1.2]. Zhu discloses collecting observed network measurement data. Zhu's mobile station NMR includes first and second signal characteristics (e.g., signal strengths) from first and second transmitters, from which

observed network measurement data can be collected for modifying (via normalization) into modified network measurement data of a modified NMR. *See* EX1001, 9:42-47 ("observed data would typically be the same or similar to the data in a network measurement report (NMR)."). The original NMR contains up to 26 signal characteristics (e.g., N+1, or 7 signal strength characteristics) that are used to determine the strongest 6 signal characteristics in a modified NMR. *See*, EX1010, p.95, left col. ("[e]ach physical *xy* location . . . contains up to 26 received signal strength values"). The term "signal characteristic" encompasses signal strength measurements per the '104 Patent. EX1001, 12:31-32, 12:33-34, 5:58-61. EX1012, ¶¶168-171.

Zhu therefore collects "measurement data from a network measurement report (*i.e.*, a report used in cellular networks which provides the results of a measurement from a mobile device on one or more cells)" (*see* Section VI.B.) because signal strength data measured by Zhu's "cellular phone" is collected from the original NMR on Zhu's cellular phone (e.g., an NMR of at least 7 signal strength characteristics). EX1012, ¶172.

Per the '104 Patent's "modified NMR" of adjusted power levels (EX1001, 5:5), Zhu collects observed network measurement data from the original NMR to produce the "modified NMR" of adjusted signal strengths to locate the cellular phone. EX1010, p.92, left col. and p.96, right col. *See* EX1001, 6:64-67. Zhu's

modified NMR is transmitted from the mobile station to determine the phone's location. *See id.*, at 4:32-34. EX1012, ¶173.

Zhu discloses that up to 26 signal strength values are associated with eight base stations (*e.g.*, a first transmitter and a second transmitter). EX1010, p.92, right col. The mobile station provides a vector of received signal strengths "for all audible base stations" for accessing the RFMD. *Id.*, p.92, right col., p.93, left col. EX1012, ¶¶174-175.

c. Element [1.3]: "determining which of said first and second signal characteristics has a greater magnitude;"

Zhu discloses Element [1.3]. Zhu discloses determining from the collected set of observed network measurement data (*e.g.*, the collected N-plus signal strength characteristics of an NMR) a subset of the N strongest signal strength characteristics of greater magnitude. EX1010, p.94, right col., ("From [the N-plus values] a location algorithm selects a subset of *N* values", underlining added). *See also id.*, p.95, left col. ("handset NMR … contains *N* received signal strength measurements"), p.95, left col. ("NMR reports signal strengths from *N* control channels"). EX1012, ¶¶176-177.

Identifying the "*N* strongest channels" constitutes determining which of the signal(s) among the collected N-plus signal strength values (e.g., N+1 signal strengths) have a greater magnitude(s) than signal(s) having lesser magnitude(s). EX1012, ¶178.

Because Zhu's RFMD includes grid points which each contain "up to 26 received signal strength values (EX1010, p.95, left col.), Zhu's cellular phone can receive up to 26 signal strength values in an NMR as observed network measurement data. *See id.*, p.93, left col. The "*N* strongest channels" that are used to modify the NMR data (by normalization) are selected from the 26 signal strength values. EX1012, ¶179.

Zhu indicates that sufficient accuracy is achieved where "the strongest 6 received signals contribute the bulk of the accuracy to the overall system performance." EX1010, p.96, left col. Zhu contemplates that other values of N can be used (*e.g.*, N = 7) out of the "up to 26 received signal strength values". EX1010, p.95, left col. *See also id.*, p.96, left col., Table 1. Zhu determines the N (*e.g.*, 6) strongest signal strengths by determining which signal characteristic (*e.g.*, signal strength) is strongest; i.e., has greater magnitude. EX1012, ¶¶180-182.

A POSITA would have understood the rationale for determining the strongest signal to be technical, and related to the drop off in signal strength that occurs proportionally to the inverse square of distance as a receiver moves away from a transmitter. The signal strength of a transmitted signal diminishes very rapidly as the receiver moves away from the transmitter. Additional factors in terrestrial network radio propagation (e.g., reflection, diffraction, scattering) further diminish received

signal strength and quality as a receiver moves away from a transmitter. EX1007, p.9. EX1012, ¶183.

Wireless carrier networks therefore place strong emphasis on determining the strongest signal as a primary basis for signal/channel selection. Because wireless networks have overlap between adjacent base stations, a POSITA would have recognized that a receiver must be able to "see" (i.e., observe) multiple signals at any given time for handoff. A comparison process is used to determine the strongest signal from among "seen" (i.e., observed) signals to maximize connectivity. EX1012, ¶¶184-185.

d. Element [1.4]: "modifying said observed network measurement data using the greater magnitude signal characteristic; and"

Zhu discloses Element [1.4]. Zhu discloses using the N strongest signal strengths to modify the observed network measurement data of an NMR and produce a modified NMR. EX1012, ¶¶186-187.

Zhu discloses normalizing ("modifying") observed network measurement data of an NMR vector using a strongest signal strength received. EX1010, p.95, left col., formula (8). Zhu normalizes ("modifies") signal strengths of the NMR vector using the "*N* strongest channels", and in so doing, modifies observed network measurement data using the greater magnitude signal characteristic. EX1010, p.95,

left col. *See also id.,* p.94, right col. ("normalizing the RSS vector from NMR and RSS"). EX1012, ¶188.

Zhu uses an "averaged-NMR vector" as "[a] measured point [that] is actually the linear average of every instantaneous RF scanner measurement" to "remove any small-scale fading effects or other anomalies in the collection procedure." EX1010, p.94, left col. The averaged "NMR" data is the same as or similar to signal strength data reported in an NMR. *See, e.g.,* EX1001, 9:42-47 (the '104 Patent discloses observed data need not be identical to NMR data and includes "similar" data). EX1012, ¶189.

Zhu modifies the NMR by subtracting "average dBm-power of all received channels" from each control channel in the NMR using Formula (8)EX1010, p.95, left col. Zhu generates the relative received signal strength of the handset measurement Phr_j:

$$Phr_j = Nrss_j - \frac{1}{N}\sum_{i=1}^{N} Nrss_i \qquad (8)$$

Id. In Formula (8) of Zhu, the averaged-NMR vector ("$Nrss_j$" in Formula (8), which corresponds to "observed network measurement data") is modified using "the average dBm-power of all received channels" which is based on the greater magnitude signal characteristics (e.g., the N strongest signal strength values) among the "up to 26 received signal strength values." *Id.*, p.95, left col. *See also id.*, p.94,

right col. ("normalizing the RSS vector from NMR and RSS"). The use of relative/normalized measurements corresponds to an example disclosed in the '104 Patent. *See, e.g.,* EX1001, 5:58-61. *See also* EX1005, pp.25-26; EX1001, 1:6-9. EX1012, ¶190.

Zhu modifies the "observed network measurement data" using the "greater magnitude signal characteristic." EX1012, ¶¶191-192.

Zhu uses software and circuitry for performing the modifying, and an "RSSI-based location engine" performs a "location algorithm". EX1010, p.93, left col., pp.94-95 as discussed *supra*.

e. Element [1.5]: "comparing said modified network measurement data with said database of calibration data to thereby determine the location of the mobile station."

Zhu discloses Element [1.5]. Zhu discloses "estimat[ing] a cellular phone's location by matching signal strengths measured at the handset with signal strengths recorded in a database of radio frequency (RF) maps." EX1010, p.92, left col. Zhu "compare[s] received signal strength measurements made by the handset to the RFMD vectors" and "[t]he best match determines the xy-coordinates of the most likely handset location." *Id.*, p.93, left col. Zhu compares modified network measurement data (normalized "signal strengths measured at the handset") with said database of calibration data in the RFMD to determine a mobile station "handset location". EX1012, ¶¶193-195.

Zhu calculates "the Euclidean distance, M(x, y), between these normalized NMR vector and database signal strengths" (EX1010, p.93) to determine the lowest weighted Euclidean distance". *Id.*, pp.94-95. *See also id.*, p.95, right col.

Zhu's normalized network measurement data is "modified network measurement data" and Zhu's RF Map Database (RFMD) is a "database of calibration data". *See* Sections VII.C.1.a.-d. Zhu's comparing determines the mobile station location. EX1012, ¶¶196-200.

2. Claim 2: "The method of claim 1 wherein said database comprises previously-gathered calibration data for one or more non-uniform grid points within said region."

Zhu discloses Claim 2. *See, e.g.*, Section VII.C.1. EX1012, ¶¶145-200. *See also* Sections VI.C., VII.A.2., *supra*. EX1012, ¶¶201-202.

Zhu discloses that the RF map database includes measured points at non-uniform locations in a region:

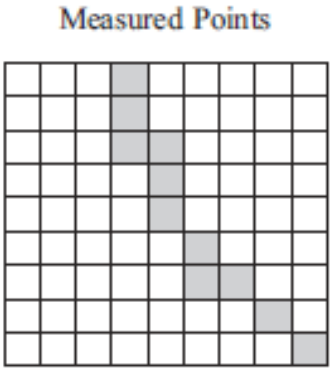


Fig. 2 of Zhu (Excerpt)

EX1010, Fig. 2, pp.93-94. Shown in Fig. 2, Zhu's measured points (in gray) "tend to cluster along paths due to the walking or driving methods of collection" and are non-uniformly spaced throughout a region. *Id.*, p.94, left col. Zhu's "clusters or paths" of measured points are stored in the RF map database and constitute the claimed "one or more non-uniform grid points". *See* Section VII.A.3; *see also id.,* 2:43-50. EX1012, ¶203.

Owner has defined "non-uniform grid points" to encompass "interpolated" grid points. *See* EX1008, 23:1-15, EX1016, ¶61 ("grid points help[] fill in the map"). Zhu discloses "interpolation" based on the measured non-uniform points (*see id.*, pp.93-94) through "a 2D cubic interpolation scheme over a diamond-shaped area that surrounds every measured raster point" thereby generating additional non-uniform grid points. *Id.*, p.93, right col. Zhu's interpolated non-uniform grid points are added to the RF map database for each measured point. EX1012, ¶204.

Zhu also discloses modeled points are determined for a location, including unmeasured locations, to expand the RF map database with non-uniform grid points. "[E]ach RF map contains scanner measurements which gracefully blend into modeled, unmeasured regions." *Id.*, p.93, right col. Zhu determines non-uniform grid points to build out the RF map database using both interpolated and modeled points. EX1012, ¶205.

Zhu's database of non-uniform grid points constitutes "point[s] associated with representative calibration data for an area." Each "grid spacing" of Zhu's RF map database is a 10-meter square area. EX1010, p.93, left col. A non-uniform grid point within each 10-meter area is associated with representative calibration data (*e.g.*, measured points). EX1010, p.94, left col. Zhu's stored non-uniform grid points are used for determining an unknown location of a mobile device. EX1012, ¶¶206-208.

3. Claim 3: "The method of claim 1 wherein said observed network measurement data includes data collected at the mobile station."

Zhu discloses Claim 3. Zhu discloses that the observed network measurement data is collected at the cellular phone, *i.e.*, at the mobile station the location of which is to be determined. Zhu discloses collecting "signal strengths measured at the handset" and matching same "with signal strengths recorded in a database of radio frequency (RF) maps." EX1010, p.92, left col. *See also id.*, p.94, left col. ("Handset RSS Properties"), p.94, right col. ("handset measurements"), p.95, left col. ("handset NMR"). EX1012, ¶¶209-212.

4. Claim 11: "The method of claim 1, wherein the observed network measurement data includes received signal strength of said transmitters as said mobile station."

Zhu discloses Claim 11. The phrase "as said mobile station" in claim 11 should be construed as "a[t] said mobile station". *See* Section VI.D. EX1012, ¶¶213-215.

In Zhu, the NMR report ("observed network measurement data") includes received signal strength of said transmitters at the cellular phone/handset ("mobile station") the location of which is to be determined. EX1010, p.92, §I, ¶2 ("The RSS technique estimates a cellular phone's location by matching signal strengths measured at the handset…"), p.93, §III.A., ¶1 ("…compare received signal strength measurements made by the handset to the RFMD vectors."). The received signal strengths are of transmitters of Zhu's system. EX1010, p.92, §II, ¶1 ("Three base stations were inside the measurement area, where eight medium-tier sectors are in use. Another five base stations in the neighborhood also provided coverage at the edge of the test area."), p.95, §II.D, ¶2 ("Each physical xy location modeled in the Georgia Tech campus RFMDs contains up to 26 received signal strength values, each corresponding to different IS-136 800 MHz control channels. From these values, a location algorithm selects a subset of *N* values that corresponds to the same control channels present in the NMR."). EX1012, ¶¶216-217.

D. Claims 1, 2, 3, and 11 Would Have Been Obvious Over Zhu in View of Laitinen (Ground 4)

Zhu discloses each element of claims 1-3 and 11. *See* Section VII.C. EX1012, ¶¶218-219.

Zhu discloses applying its techniques to GSM networks. EX1010, p.96, right col. ("the performance is likely similar to other cellular telephony air interface (such as GSM, CDMA, WCDMA, etc.)"). Laitinen discloses that in GSM, the mobile station determines the cell ID having the strongest signal based on the multiple signal strength measurements continuously received by the mobile station. EX1011, p.2505, right col. (the mobile station "continuously makes signal strength measurements and also knows the cell ID of the strongest cell."). Laitinen discloses determining which of first and second signal characteristics (*i.e.*, the multiple "signal strength measurements") has a greater magnitude in order to identify the cell ID having the strongest signal (*i.e.*, "the cell ID of the strongest cell"). *Id.* EX1012, ¶¶220-222.

A POSITA would have been motivated to employ Zhu's techniques in GSM applications and in doing so would have determined the cell ID having the strongest signal (*i.e.*, signal having "a greater magnitude") as taught by Laitinen. Zhu teaches that its techniques are applicable to GSM networks. EX1010, p.96, right col. Zhu expressly cites Laitinen as a similar RSS technique in need of improvement to account for "indoor users", and Zhu provides such an improved technique. EX1010,

p.92, left col. ("The RSS technique estimates a cellular phone's location by matching signal strengths measured at the handset with signal strengths recorded in a database of radio frequency (RF) maps…. Laitinen, et. al. in [5] report location performance statistics for *outdoor* users in a GSM network, but there has been no previous research that includes *indoor* users"). *See also id.,* title, abstract ("method for identifying and locating indoor handsets"), p.96, left col. ("techniques remain accurate even when the majority of test data is from indoor handsets"). A POSITA would have naturally looked to Zhu's technique as a means to improve upon the accuracy of GSM location methods as taught by Laitinen, and the signal of the cell ID having the strongest signal (*i.e.*, signal having "a greater magnitude") identified in accordance with GSM would have been one of the "N strongest channels" used to modify (i.e., normalize) the observed network measurement data as taught by Zhu (*see* Section VII.C.1.d.). A POSITA would have had a reasonable expectation of success given the similarities between Zhu and Laitinen discussed *supra*. EX1010, p.92, left col.; EX1011, p.2505*,* Fig. 1 (both relate to location methods for estimating a cellular phone's location by matching signal strengths measured at the handset with signal strengths record in a database of radio frequency (RF) maps). EX1012, ¶¶223-226.

E. Claim 2 Would Have Been Obvious Over Zhu and Zhu-Laitinen in View of Spain (Ground 5)

Claim 2 would have been obvious. *See* Sections VII.C.1., VII.D. EX1012, ¶¶227-229.

Zhu discloses measured points that are non-uniform and grid points derived therefrom that are similarly non-uniform (*i.e.*, interpolated/modeled). Owner has acknowledged that interpolated points constitute non-uniform grid points in a radio frequency map. *See* EX1008, 23:1-15, EX1016, ¶61. In light of Owner's admission, Zhu's interpolated points clearly constitute non-uniform grid points. EX1012, ¶¶230-231.

Zhu's interpolation is referenced as "a 2D cubic interpolation scheme over a diamond-shaped area that surrounds every measured raster point." EX1010, p.93, right col. Spain teaches that interpolation techniques such as Zhu's are well known in the art. Spain teaches interpolation to determine non-uniform grid points (*e.g.*, locations where GPS is unavailable, EX1009, ¶[0034]). Zhu contemplates using interpolation techniques such as that of Spain to produce non-uniform grid points. EX1012, ¶¶232-234.

Zhu discloses that the RF map database includes "clusters or paths of measured points," "interpolated points" and "modeled points." EX1010, pp.93-94.

Spain provides a known method to generate interpolated points. Spain teaches a learning/training technique for generating interpolated points for improving

location accuracy when using RF fingerprint databases like the one disclosed by Zhu. Spain teaches that "[t]o improve the accuracy of the fingerprint database, learning/training techniques and methodologies can be adopted for this problem." EX1009, ¶[0054]:1-3. *See also id.,* ¶[0054]:4-7, ¶[0055]:5, ¶[0055]:5-18, [0101]:1-4, [0054]:1-3, [0055]:1-6, [0055]:6-9. EX1012, ¶¶235-236.

Spain expressly states:

> … the database is built by taking fingerprint measurements at predetermined locations and using intelligent algorithms that interpolate the fingerprints ***at all locations in between the sampled locations***.

EX1009, [0101]:1-4 (emphasis added).

> …learning/training techniques: (1) ***they offer a way to interpolate between grid points [generating non-uniform grid points] and reconstruct the grid***.

EX1009, [0055]:6-9 (emphasis added).

Spain discloses generating interpolated points for "all locations in between the sampled locations" to "reconstruct the grid" while Zhu's interpolation references a "diamond-shaped area." EX1012, ¶¶237-238.

A POSITA would have understood Spain's learning/training fingerprint techniques for interpolating non-uniform grid points to be consistent with the disclosed objectives of enhanced location determination accuracy in Zhu. Such a

modification would have been routine, and according to known methods, to obtain predictable results with a high probability of success. A POSITA would have been motivated to modify Zhu's system or the Zhu/Laitinen system to include Spain's learning/interpolating technique to improve location accuracy of Zhu's fingerprint techniques by generating non-uniform grid points "between grid points" (EX1009, [0055]:6-9), e.g., for "all locations in between the sampled locations" (EX1009, [0101]:1-4). A POSITA would have had a reasonable expectation of success given that both Zhu and Spain seek to improve location accuracy in mobile unit "fingerprinting" techniques using signal strengths measured by the mobile unit. *See* EX1010, pp.92-93; *see* EX1009, ¶[0035]:1-7, ¶[0003]:2-3, ¶[0009], title and abstract. Thus, a POSITA would have recognized that Spain's learning/training techniques for interpolating and regenerating a grid to generate "new grids" would have improved the accuracy of Zhu's location determination. EX1012, ¶¶239-242.

VIII. OTHER CONSIDERATIONS

A. Secondary Considerations

Petitioner is not aware of any secondary considerations evidence bearing any nexus to the purported claimed invention. Any purported evidence of secondary considerations that Owner may present in this proceeding would be insufficient to overcome the strong evidence of obviousness of the Challenged Claims. EX1012, ¶¶243-246.

B. Discretion to Institute

1. The Board should not deny this Petition under §314(a)

The '104 Patent has not been challenged in any prior AIA trial proceeding, and this Petition is not a "follow-on" petition. Events in Related Litigation do not warrant denial, and application of the *Fintiv* factors weighs against discretionary denial as explained below.

f. Factor 1: Whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted

The Related Litigation is ongoing and Petitioner will seek a pre-institution stay. At worst, this factor is neutral because the Board has declined to predict whether the district court will stay the related litigation. *Sand Revolution II v. Continental Intermodal Group-Trucking LLC*, IPR2019-01393, Paper 24 at 7 (PTAB June. 16, 2020); *Apple Inc. v. Parus Holdings*, IPR2020-00686, Paper 9 at 10 (Sept. 23, 2020).

g. Factor 2: Proximity of the court's trial date to the Panel's projected statutory deadline for a final written decision

"The PTAB will weigh this factor against exercising discretion to deny institution under Fintiv if the median time-to-trial is around the same time or after the projected statutory deadline for the PTAB's final written decision." Katherine K. Vidal, *Interim Procedure for Discretionary Denials in AIA-Post Grant Proceedings with Parallel District Court Litigation*, USPTO, at 8-9 (June 21, 2022). Such is the

case here and trial has not yet been scheduled. Thus, this factor favors institution or at worst is neutral. *See Microsoft Corporation v. D3D Technologies, Inc*., IPR2021-00703, Paper 10 at 12 (PTAB Oct. 12, 2021) (concluding that although the final written decision is projected to issue about a month after the trial date, *Fintiv* Factor 2 is neutral); *Laboratory Corporation of America Holdings v. Ravgen, Inc*., IPR2021-01054, Paper 11 at 17 (Nov. 5, 2021) ("Given the present uncertainty on this record about when trial in the district court might occur for the Labcorp lawsuit, we determine that this factor does not weigh in favor of discretionary denial.").

h. Factor 3: Investment in the parallel proceeding by the court and the parties

Discovery in the Related Litigation is ongoing. The parties have exchanged preliminary infringement disclosures, invalidity contentions, and opening expert reports. Contention discovery has been completed; however expert discovery is incomplete. A Markman order issued on July 19, 2023 (EX1028), which only marginally, if at all, weighs in favor of denial. *See Fintiv*, Paper 15 at 14-15 (finding that a *Markman* order, completed contention discovery, incomplete expert discovery and lack of substantive motion practice weighted somewhat in favor of denying institution); *Sand Revolution II*, Paper 24 at 11 (holding that *Fintiv* Factor 3 weighs only marginally, if at all, in favor of exercising discretion to deny institution.).

Petitioner's diligence in filing its Petition outweighs any investment. *See Fintiv* at 11 ("If the evidence shows that the petitioner filed the petition expeditiously

… this fact has weighed against [denial]"). The preliminary identification of asserted claims occurred on March 27, 2023, which was subsequently amended on May 10, 2023 and June 12, 2023. Petitioner filed its Petition less than three months after being made aware of the full set of asserted claims. *Dish Network LLC v. Broadband iTV, Inc*., IPR2020-01332, Paper 14 at 29 (Jan. 27, 2021) (finding that Petitioner diligently filed its Petition less than three months after receiving Owner's full set of asserted claims). This factor is neutral.

i. Factor 4: Overlap between issues raised in the petition and in the parallel proceeding

Petitioner has not filed a stipulation in Related Litigation. However, Petitioner reserves the right to file such a stipulation based on the contents of Owner's Preliminary Response.

j. Factor 5: Whether the petitioner and the defendant in the parallel proceeding are the same party

Petitioner is the defendant in the district court proceeding. The PTAB has noted "it is far from an unusual circumstance that a petitioner in *inter partes* review and a defendant in a parallel district court proceeding are the same" *Sand Revolution II*, IPR2019-01393, Paper 24 at 12-13. This factor is neutral.

k. Factor 6: Other circumstances that impact the Panel's exercise of discretion, including the merits

"[W]here the PTAB determines that the information presented at the institution stage presents a compelling unpatentability challenge, that determination

alone demonstrates that the PTAB should not discretionarily deny institution under Fintiv". Interim Procedure at 4-5. Such is the case here. It is highly likely that Petitioner would prevail with respect to at least one challenged claim for the reasons explained in the above Grounds, and this favors institution under *OpenSky*. Thus, trial should be instituted given the compelling merits.

2. The Board should not deny this Petition under §325(d)

Shkedi, Zhu, Laitinen, and Spain were neither considered nor substantively discussed by the Patent Office during prosecution or reexamination of the '104 Patent. Shkedi, Zhu, Laitinen, and Spain are also non-cumulative to the art cited during prosecution or reexamination of the '104 Patent. Accordingly, the Board should not exercise its discretion to deny this petition under §325(d).

The factors recited in *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17 (PTAB Dec. 15, 2017) (precedential) weigh in favor of institution. *Id.* at 4. In the present Petition, aspects of the prior art and arguments not considered by the USPTO due to material error during prosecution warrant institution. *See Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8-9 (PTAB Feb. 13, 2020) (precedential). Spain corresponds to U.S. Patent No. 6,944,465 which the Examiner initialed in an IDS filed in the related '358 Patent. The Board has found such consideration without further analysis to be insufficient to exercise its discretion to not institute. *See e.g.*,

Amgen Inc. v. Alexion Pharm., Inc., IPR2019-00740, Paper 15 (PTAB Aug. 30, 2019); *Scientific Design Co. v. Shell Oil Co.*, IPR2021-01537, Paper 7 (PTAB Mar. 18, 2022) and IPR2022-00158, Paper 7 (PTAB Apr. 4, 2022). Moreover, the Patent Office did not previously rely on the disclosures of Spain which Petitioner now relies on to address the claimed subject matter discussed above.

Furthermore, the Patent Office's lack of consideration of Shkedi, Zhu, Laitinen, and Spain is "material error" because the Patent Office overlooked the disclosures of such references that impact patentability of the Challenged Claims. *Advanced Bionics* at 8 n.9 ("material error may include misapprehending or overlooking specific teachings of the relevant prior art where those teachings impact patentability of the challenged claims"). The Board has consistently declined to discretionarily deny institution under similar facts. *See, e.g., DISH Network LLC v. Sound View Innovations, LLC*, IPR2020-01041, Paper 13, 22 (PTAB Jan 19, 2021); *Roku, Inc. v. Universal Electronics, Inc.*, IPR2019-01615 (PTAB April 17, 2020); *Trans Ova Genetics, LC v. XY, LLC*, IPR2018-00250, Paper 9, 18-19 (PTAB June 27, 2018).

With respect to factor (f), the Petition is supported by an expert declaration by Dr. Williams explaining how a POSITA would have understood Shkedi, Zhu, Laitinen, and Spain. *See, e.g.*, EX1012, ¶¶44-52; *see also* EX1013. This new evidence also weighs against discretionary denial. *See, e.g., Puma N. Am., Inc. v.*

Nike, Inc., IPR2019-01058, Paper 10, 19 (PTAB Oct. 31, 2019) (instituting where petition presented "new non-cumulative evidence…. probative to issues of patentability and helpful to our consideration of a prior art combination that was not before the Examiner").

IX. CONCLUSION

Petitioner has shown a reasonable likelihood of success. Therefore, this Petition should be granted and the Board should institute trial.

Respectfully submitted,

Date: August 10, 2023

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APPENDIX A - LIST OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 7,561,104, issued on July 14, 2009 ("the '104 Patent")
1002	File History of U.S. Patent Application No. 12/026,333, filed on February 5, 2008 ("the '333 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	IEEE P802.15 Wireless Personal Area Networks, Ranging Subcommittee Final Report, 8 Nov. 2004, R. Roberts, Harris Corporation
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

Exhibit No.	Description
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	File History of U.S. Patent Application No. 12/424,320, filed on April 15, 2009 ("the '320 Application")
1019-1023	*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
1025-1027	*Not Assigned*
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

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. §42.24

The undersigned hereby certifies that the foregoing Petition totals 11,572 words, excluding the parts which are exempted by 37 C.F.R. §42.24(a)(1).

Date: August 10, 2023

/Patrick C. Keane/

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on this 10th day of August, 2023, a true and correct copy of the foregoing **PETITION FOR *INTER PARTES* REVIEW FOR U.S. PATENT NO. 7,561,104 and EXHIBITS 1001-1016, 1018, 1024, and 1028,** are being served via overnight UPS on the correspondence address of record* for **U.S. Patent No. 7,561,104** as follows:

Duane Morris LLP
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**Duane Morris LLP is no longer located at 505 9th Street, N.W., Suite 1000, Washington, DC 20004. Counsel for Petitioner is serving these papers to the current address noted above and confirmed upon contacting Duane Morris*.

and a courtesy copy is being served to Patent Owner's litigation counsel as follows:

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