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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GEOTAB INC. and GEOTAB USA, INC.,
Petitioner,

v.

FRACTUS, S.A.,
Patent Owner.

IPR2025-01026
Patent 11,031,677 B2

Before KEVIN C. TROCK, STEVEN M. AMUNDSON, and RUSSELL E. CASS, *Administrative Patent Judges*.

AMUNDSON, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Geotab Inc. and Geotab USA, Inc. (collectively "Petitioner") filed a Petition requesting an *inter partes* review of claims 1–20 in U.S. Patent No. 11,031,677 B2 ("the '677 patent") (Exhibit 1001) under 35 U.S.C. §§ 311–319. Paper 4 ("Pet.").[1] Fractus, S.A. ("Patent Owner") filed a Preliminary Response. Paper 12 ("Prelim. Resp."). Further, after receiving Board authorization to address certain issues, Petitioner filed a Preliminary Reply, and Patent Owner filed a Preliminary Sur-reply. Paper 15 ("Prelim. Reply"); Paper 17 ("Prelim. Sur-reply"); *see* Ex. 3001.

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute an *inter partes* review. We may institute an *inter partes* review only if "the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2024). The "reasonable likelihood" standard is "a higher standard than mere notice pleading" but "lower than the 'preponderance' standard to prevail in a final written decision." *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

Based on the current record and for the reasons explained below, Petitioner has shown that there is a reasonable likelihood that it would prevail with respect to at least one of the challenged claims. Thus, we

[1] Petitioner filed a confidential version of the Petition as Paper 3 and a public version of the Petition as Paper 4. We cite to the public version of the Petition.

institute an *inter partes* review of claims 1–20 in the '677 patent on all challenges included in the Petition.

II. BACKGROUND

A. Real Parties in Interest

Petitioner identifies the following real parties in interest: Geotab Inc. and Geotab USA, Inc. Pet. xv. Patent Owner identifies itself as the sole real party in interest. Paper 6, 1. The parties do not raise any issue about real parties in interest.

B. Related Matters

Petitioner and Patent Owner identify the following civil actions as related matters involving the '677 patent or a related patent (or both):

- *Fractus, S.A. v. ADT LLC*, No. 2:22-cv-00412 (E.D. Tex. filed October 21, 2022) (the "ADT litigation");
- *Fractus, S.A. v. Vivint, Inc.*, No. 2:22-cv-00413 (E.D. Tex. filed October 21, 2022)) (the "Vivint litigation");
- *Fractus, S.A. v. Geotab Inc.*, No. 2:24-cv-01008 (E.D. Tex. filed December 6, 2024) (the "Geotab litigation"); and
- *Fractus, S.A. v. Verizon Connect Inc. et al.*, No. 2:24-cv-01009 (E.D. Tex. filed December 6, 2024) (the "Verizon litigation").

Pet. xvii–xviii; Paper 6, 1.

According to Petitioner, the ADT litigation and the Vivint litigation have been dismissed with prejudice, and the Geotab litigation has been consolidated with the Verizon litigation. Pet. xvii.

Petitioner identifies the following Board proceedings involving a patent related to the '677 patent:

- *Vivint, Inc. v. Fractus, S.A.*, IPR2024-00087 (Patent 8,738,103 B2);
- *Vivint, Inc. v. Fractus, S.A.*, IPR2024-00088 (Patent 11,349,200 B2); and
- *Geotab Inc. et al. v. Fractus, S.A.*, IPR2025-01027 (Patent 11,349,200 B2).

Pet. xvi–xvii.

According to Petitioner, IPR2024-00087 and IPR2024-00088 were settled and terminated "before Fractus filed a preliminary patent owner response and before institution decision." Pet. xvi–xvii.

The following Board proceeding also involves a patent related to the '677 patent: *Geotab Inc. et al. v. Fractus, S.A.*, PGR2025-00056 (Patent 12,095,149 B2).

C. The '677 Patent (Exhibit 1001)

The '677 patent, titled "Multiple-Body-Configuration Multimedia and Smartphone Multifunction Wireless Devices," issued on June 8, 2021, from U.S. application no. 16/832,820 ("the '820 application") filed on March 27, 2020. Ex. 1001, codes (21), (22), (45), (54). The '677 patent identifies the '820 application as one of several applications in a series of continuation applications that started with U.S. application no. 11/614,429 ("the '429 application") filed on December 21, 2006, and later issued as U.S. Patent No. 8,738,103 B2. *Id.* at 1:8–17, code (63). The '677 patent claims priority to U.S. provisional application no. 60/831,544 filed on July 18, 2006, and U.S. provisional application no. 60/856,410 filed on November 3, 2006. *Id.* at 1:8–21, code (60).

> The '677 patent states that the invention relates to:
>
> a multifunction wireless device (MFWD), and, more particularly, but not by way of limitation, to a multifunction wireless device and antenna designs thereof combining into a single unit mobile data and voice services with at least one of multimedia capabilities (multimedia terminal (MMT) and personal computer capabilities, (i.e., smartphone) or with both MMT and smartphone (SMRT) capabilities (MMT+SMRT)[)].

Ex. 1001, 1:28–35.

The '677 patent explains that a MFWD "will include the RF capabilities, antenna system and signal processing hardware to connect to a mobile network at a speed of preferably at least 350 Kbits/s." Ex. 1001, 9:53–56. "For this purpose, a MFWD will preferably include at least 3G (such as for instance UMTS, UMTS-FDD, UMTS-TDD, W-CDMA, cdma2000, TD-SCDMA, Wideband CDMA) and/or 3.5G and/or 4G services (including for instance HSDPA, WiFi, WiMax, WiBro and other advanced services) in one or more of said frequency regions."[2] *Id.* at 9:58–64. Further, a MFWD "incorporating 3.5G or 4G features (i.e. comprising 3G and other advanced services such as for instance HSDPA, WiBro, WiFi, WiMAX, UWB or other high-speed wireless standards, hereinafter 4G services) might require operation in additional frequency bands corresponding to said 4G standards."[3] *Id.* at 25:1–6. Those additional

[2] The acronym "UMTS" stands for "Universal Mobile Telecommunications System." The acronym "FDD" stands for "Frequency Division Duplex." The acronym "TDD" stands for "Time Division Duplex." The acronym "CDMA" stands for "Code-Division Multiple Access." The acronym "SCDMA" stands for "Synchronous Code-Division Multiple Access." The acronym "HSDPA" stands for "High-Speed Downlink Packet Access."
[3] The acronym "UWB" stands for "Ultra wideband."

frequency bands include "bands within the frequency region 2-11 GHz and some of its sub-regions such as for instance 2-11 GHz, 3-10 GHz, 2.4-2.5 GHz and 5-6 GHz or some other bands." *Id.* at 25:6–9; *see id.* at 10:26–28 (identifying "the 2-11 GHz frequency region" and "in particular the 2.3-2.4 GHz frequency region").

In some embodiments, a MFWD includes "wireless connectivity to other wireless devices or networks through a wireless system such as for instance WiFi (IEEE802.11 standards), Bluetooth, ZigBee, UWB in some additional frequency regions," such as "an ISM band (for instance around 430 MHz or 868 MHz, or within 902-928 MHz or in the 2400-2480 MHz range, or in the 5.1-5.9 GHz frequency range or a combination of them) and/or within a ultra wide-band range (UWB) such as the 3-5 GHz or 3-11 GHz frequency range."[4] Ex. 1001, 10:14–23. But "the integration of an antenna system into" a MFWD "is further complicated by the presence in the MFWD" of "additional antennas, such as for example antennas for reception of broadcast radio and/or TV, antennas for geolocalization services, and/or antennas for wireless connectivity systems." *Id.* at 9:37–42.

The '677 patent discloses quantifying the complexity of an antenna contour with the complexity factor F_{21} and the complexity factor F_{32} to aid in designing a multiband antenna for a MFWD. *See, e.g.*, Ex. 1001, 16:54–18:15, 19:1–13, 19:61–20:4, 20:28–40, 42:30–39, code (57). According to the patent, these complexity factors "capture and characterize certain aspects of the geometrical details of the antenna contour (such as for instance its edge-richness, angle-richness and/or discontinuity-richness)

[4] The acronym "ISM" stands for "Industrial, Scientific, and Medical."

when viewed at different levels of scale." *Id.* at 16:56–61. Further, these complexity factors "guide the design of the antenna system by tailoring the degree of convolution of the antenna contour" and help "optimize both the miniaturization of the antenna as well as the multiband and RF performance characteristics." *Id.* at 20:31–33, 42:34–37.

The complexity factor F_{21} "is predominantly characterized by capturing the complexity and degree of convolution of features of the antenna contour that appear when the contour is viewed at coarser levels of scale." Ex. 1001, 19:15–18. The complexity factor F_{21} "is geared more towards assessing an overall complexity of an antenna contour," i.e., "whether the degree of convolution of an antenna contour distinguishes sufficiently from a simple rectangular shape when looked at from a zoomed-out view." *Id.* at 19:28–32, 30:51–55. In some embodiments, the complexity factor F_{21} "is related to the number of paths that a structure of the antenna system provides to electric currents and/or the equivalent magnetic currents to excite radiation modes" and "tends to increase with the number of antenna portions within the structure of the antenna system and/or the number of antenna elements that form the antenna system." *Id.* at 19:37–43.

The complexity factor F_{32} "is predominantly characterized by capturing the complexity and degree of convolution of features of the antenna contour that appear when the contour is viewed at finer levels of scale." Ex. 1001, 20:6–9. The complexity factor F_{32} "is geared more towards evaluating the full complexity of an antenna contour," i.e., "whether the degree of convolution of an antenna contour tends to approach that of a highly-convoluted curve such as the Hilbert curve." *Id.* at 20:16–20,

30:55–59. In some embodiments, the complexity factor F_{32} is "related to the degree of miniaturization achieved by the antenna system." *Id.* at 20:22–24.

When explaining an antenna contour, the '677 patent uses the terms "antenna box" and "antenna rectangle." *See* Ex. 1001, 15:6–16. The patent defines "antenna box" as "the minimum-sized parallelepiped of square or rectangular faces that completely encloses the antenna volume of space and wherein each one of the faces of the minimum-sized parallelepiped is tangent to at least one point of the volume" where "each possible pair of faces of the minimum-size parallelepiped shares an edge forming an inner angle of 90°." *Id.* at 11:24–31. The patent defines "antenna rectangle" as "the orthogonal projection of the antenna box along the normal to the face with largest area of the antenna box." *Id.* at 14:11–14.

The '677 patent explains that the "antenna contour of the antenna system is a set of joined and/or disjointed segments" comprising "the perimeter of one or more antenna elements placed in the antenna rectangle" and "the perimeter of closed slots and/or closed apertures defined within the antenna elements, and/or the orthogonal projection onto the antenna rectangle of perimeters of antenna elements, or perimeters of or parts of antenna elements that are placed in the antenna box but not in the antenna rectangle." Ex. 1001, 15:6–16. "The antenna contour needs to make efficient use of the area of the antenna rectangle in order to attain enough geometrical complexity to make the resulting structure of an antenna system suitable for" a MFWD. *Id.* at 16:13–16. Thus, "the antenna contour preferably comes into contact with each of the four (4) sides of the antenna rectangle in at least one point of each side of the antenna rectangle." *Id.* at 16:17–20.

The ’677 patent’s Figure 3 (reproduced below) depicts an example of an antenna contour of an antenna system for a MFWD:

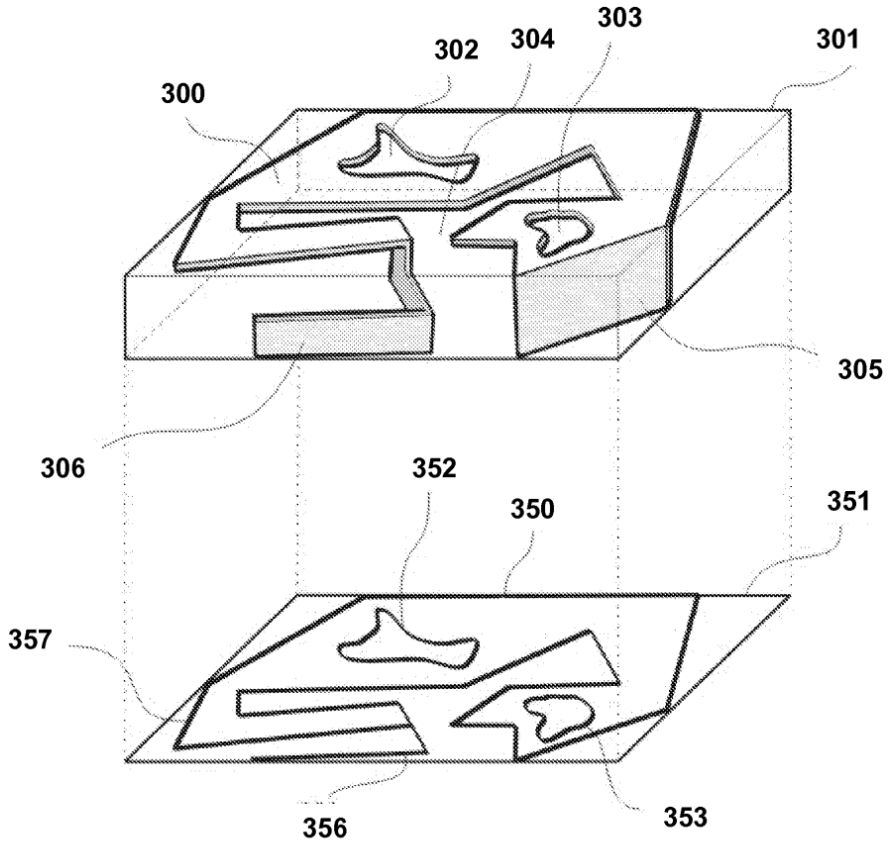


FIG. 3

Figure 3 illustrates in the upper portion an antenna comprising one antenna element 300 contained within antenna box 301 and in the lower portion antenna contour 350 associated with antenna element 300 and antenna rectangle 351 associated with antenna box 301. Ex. 1001, 27:44–47, 27:58–61, Fig. 3. Antenna rectangle 351 surrounds antenna contour 350 such that antenna contour 350 contacts each of the each of the four sides of antenna rectangle 351. *Id.* at 16:17–20, 27:59–61, Fig. 3.

As Figure 3 shows, antenna element 300 has been shaped "to support different radiation modes" corresponding to different frequency bands and includes:

- aperture 302 with a closed perimeter;
- aperture 303 with a closed perimeter;
- opening 304 that "increases the number of segments that form the perimeter of the antenna element 300";
- part 305 "bent 90° with respect to the rest of the antenna element 300" but "fully contained in the antenna box 301"; and
- part 306 also "bent 90° with respect to the rest of the antenna element 300" but "fully contained in the antenna box 301."

Ex. 1001, 27:47–57, Fig. 3.

As Figure 3 also shows, "antenna contour 350 comprises three disjointed subsets of segments" as follows:

- "a first subset is formed by the segments of the perimeter 357 (which includes both external segments of the antenna element 300 and those segments added to said antenna element by the opening 304) and the group of segments 356 corresponding to the orthogonal projection of part 306 of the antenna element 300";
- "a second subset is formed by the segments 352 associated to the perimeter of aperture 302"; and
- "a third subset is formed by the segments 353 associated to the perimeter of aperture 303."

Ex. 1001, 27:62–28:4, Fig. 3. In this example, "part 305 of the antenna element 300 has an orthogonal projection that completely matches a segment of the perimeter 357, and therefore does not increase the number of segments of the antenna contour 350." *Id.* at 28:5–8, Fig. 3.

The '677 patent discloses computing the complexity factor F_{21} and the complexity factor F_{32} for a particular antenna using three grids with "substantially square or rectangular cells" placed on the antenna rectangle: a first grid G_1, a second grid G_2, and a third grid G_3. Ex. 1001, 16:62–65. The "three grids are adaptive to the antenna rectangle" such that "the size and aspect ratio of the cells of each one of said three grids is determined by the size and aspect ratio of the antenna rectangle itself." *Id.* at 16:65–17:2. "The use of adaptive grids is advantageous because it provides a sufficient number of cells within the antenna rectangle to fully capture the geometrical features of the antenna contour at differing levels of detail." *Id.* at 17:2–5.

The grid G_1 and the grid G_3 are constructed from the grid G_2, "which needs to be defined in the first place." Ex. 1001, 17:16–17. The grid G_2 is "chosen so that the antenna rectangle is perfectly tessellated with an odd number of columns and an odd number of rows." *Id.* at 17:18–22. Additionally, the number of columns and the number of rows are "selected to produce a cell as square as possible" such that a cell has "an aspect ratio close to one." *Id.* at 17:47–51.

The '677 patent explains that "setting to nine (9) the number of columns that tessellate the antenna rectangle" for the grid G_2 provides "an advantageous compromise, for the preferred sizes of an MFWD, and the corresponding available volumes for the antenna system." Ex. 1001, 17:39–43. Therefore, the cell width in the grid G_2 "is selected to be equal to a ninth (1/9) of the length of the longer side of the antenna rectangle." *Id.* at 17:44–46.

The grid G_1 includes "an additional row and an additional column of cells" of the grid G_2 to "have enough cells of the grid G_1 as to completely

cover the antenna rectangle." Ex. 1001, 18:10–12. A cell of the grid G_1 "is obtained by combining four (4) cells of the grid G_2" such that each cell of the grid G_1 "consists of a 2-by-2 arrangement of cells of grid G_2." *Id.* at 18:1–3. Thus, a cell of the grid G_2 "is half the size of a cell of grid G_1 (i.e., a ½ scaling factor or an octave of scale)." *Id.* at 17:7–9. Also, a cell of the grid G_3 "is half the size of a cell of grid G_2, or one fourth the size of a cell of grid G_1 (i.e., a ¼ scaling factor or two octaves of scale)." *Id.* at 17:9–11.

The '677 patent provides the following equations for computing the complexity factor F_{21} and the complexity factor F_{32}:

$$F_{21} = -(\log(N_2) - \log(N_1)) / \log(1/2);$$

$$F_{32} = -(\log(N_3) - \log(N_2)) / \log(1/2);$$

where:

(1) N_1 is the number of cells of "the grid G_1 that are at least partially inside the antenna rectangle and include at least a point of the antenna contour";

(2) N_2 is the number of cells of "the grid G_2 that are completely inside the antenna rectangle and include at least a point of the antenna contour"; and

(3) N_3 is the number of cells of "the grid G_3 that are completely inside the antenna rectangle and include at least a point of the antenna contour."

Ex. 1001, 19:1–13, 19:61–20:4.

Using Figures 12 and 13, the '677 patent discloses a specific example of computing the complexity factor F_{21} and the complexity factor F_{32}. *See* Ex. 1001, 32:55–34:37, Figs. 12A–12B, 13A–13C.

The '677 patent's Figure 12A (reproduced below) depicts an illustrative antenna system for a MFWD:

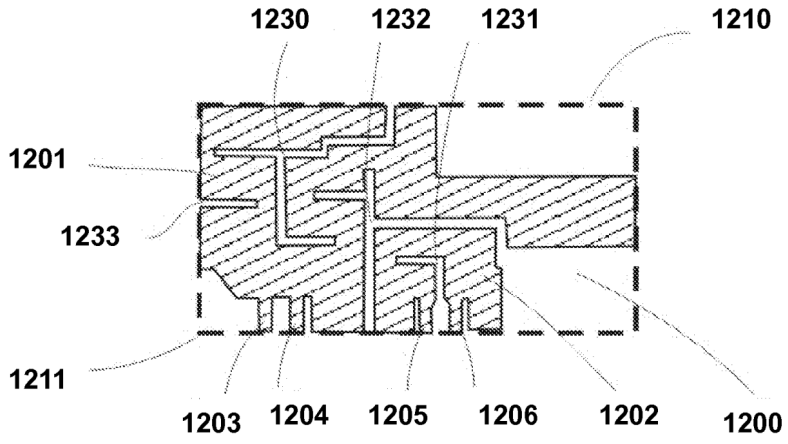


FIG. 12A

Figure 12A illustrates "the structure 1200 of an antenna system for a MFWD" surrounded by antenna rectangle 1210 shown as a dashed line. Ex. 1001, 32:55–58, Fig. 12A. "The structure 1200 has been shaped to attain the desired multiple frequency band operation as well as desired RF performance," e.g., to operate "in four (4) separate frequency bands within three (3) separate regions of the electromagnetic spectrum." *Id.* at 32:58–60, 33:13–15.

As Figure 12A shows, "peripheral parts of a substantially flat conducting plate have been removed, and slots 1230–1233 have been created within the structure 1200." Ex. 1001, 32:61–63, Fig. 12A. "Slot 1232 divides the structure 1200 into two antenna elements 1201 and 1202." *Id.* at 32:63–64, Fig. 12A. "Antenna element 1201 and antenna element 1202 are not in direct contact, although the two antenna elements 1201 and 1202 are in contact through the ground plane of the MFWD." *Id.* at 32:65–67, Fig. 12A. Antenna element 1201 includes "a feeding point 1204 and a grounding point 1203." *Id.* at 33:19–21, Fig. 12A. Antenna element 1202

includes "another feeding point 1205 and a grounding point 1206." *Id.* at 33:21–22, Fig. 12A. Further, the bottom left corner 1211 of antenna rectangle 1210 "is chosen to be the feeding corner." *Id.* at 33:26–27.

The '677 patent's Figure 13B (reproduced below) depicts the antenna contour in Figure 12A placed under a second grid:

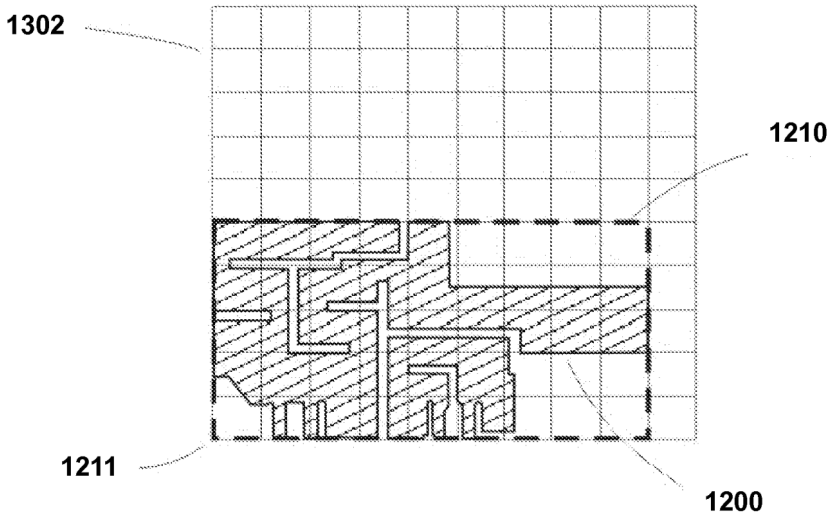


FIG. 13B

Figure 13B illustrates antenna structure 1200 surrounded by antenna rectangle 1210 placed under second grid 1302 having nine columns and five rows of cells. Ex. 1001, 33:64–34:3, Fig. 13B.

The ’677 patent’s Figure 13A (reproduced below) depicts the antenna contour in Figure 12A placed under a first grid:

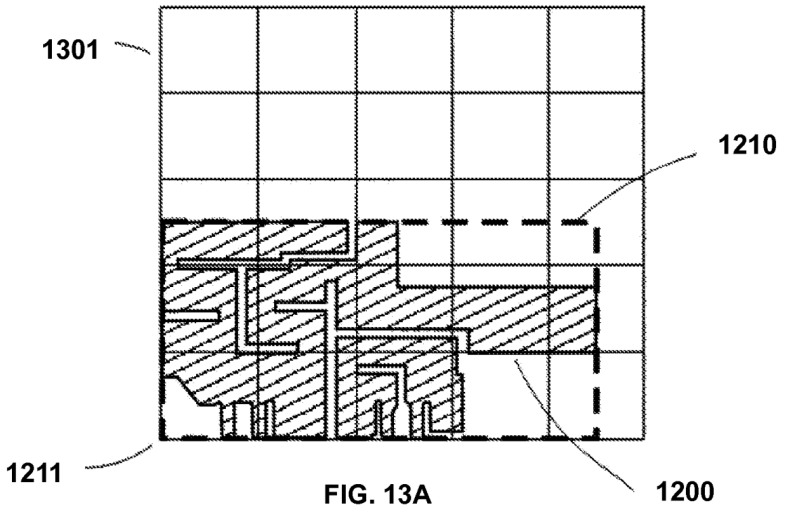


FIG. 13A

Figure 13A illustrates antenna structure 1200 surrounded by antenna rectangle 1210 placed under first grid 1301 having five columns and three rows of cells. Ex. 1001, 33:64–67, Fig. 13A.

The ’677 patent’s Figure 13C (reproduced below) depicts the antenna contour in Figure 12A placed under a third grid:

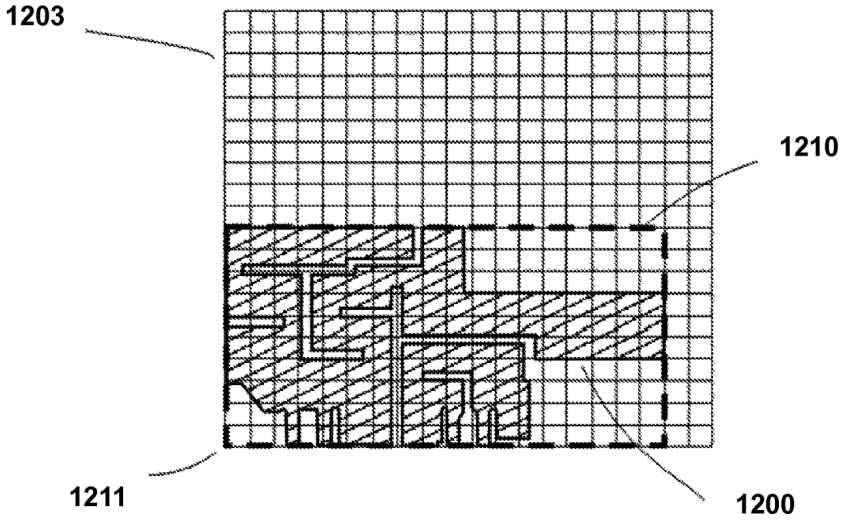


FIG. 13C

Figure 13C illustrates antenna structure 1200 surrounded by antenna rectangle 1210 placed under third grid 1303 (mislabeled as 1203) having eighteen columns and ten rows of cells. Ex. 1001, 33:64–67, Fig. 13C.

Using the grids in Figures 13A–13C to compute the complexity factor F_{21} and the complexity factor F_{32} for the antenna contour in Figure 12A, the '677 patent explains that:

(1) in Figure 13A "there are thirteen (13) cells of the first grid 1301 that, while being at least partially inside the antenna rectangle 1210 and including at least a point of the antenna contour of the structure 1200 (i.e., $N_1 = 13$)";

(2) in Figure 13B "there are thirty-eight (38) cells of the second grid 1302 completely inside the antenna rectangle 1210 and that include at least a point of the antenna contour of the structure 1200 (i.e., $N_2 = 38$)"; and

(3) in Figure 13C "there are one hundred and fourteen (114) cells of the third grid 1303 completely inside the antenna rectangle 1210 and that include at least a point of the antenna contour of the structure 1200 (i.e., $N_3 = 114$)."

Ex. 1001, 34:7–19.

With $N_1 = 13$, $N_2 = 38$, and $N_3 = 114$, the equations for computing the complexity factor F_{21} and the complexity factor F_{32} yield the following values:

$$F_{21} = -(\log(38) - \log(13)) / \log(1/2) = 1.55$$

$$F_{32} = -(\log(114) - \log(38)) / \log(1/2) = 1.58$$

Ex. 1001, 34:20–37.

D. The Challenged Claims

The '677 patent includes twenty claims as follows:

- independent claim 1 for a "wireless device";

- claims 2–5 that depend directly or indirectly from claim 1;
- independent claim 6 for a "wireless device";
- claims 7–11 that depend directly or indirectly from claim 6;
- independent claim 12 for a "wireless device"; and
- claims 13–20 that depend directly or indirectly from claim 12.

Ex. 1001, 42:47–44:61. Petitioner challenges all twenty claims in the '677 patent. Pet. 4, 32–100.

Claim 1 exemplifies the challenged claims and reads as follows (with formatting added for clarity and with bracketed numbers and letters added for reference purposes):[5]

1. [1.pre] A wireless device comprising:

[1.a] an antenna system comprising:

[1.b] a ground plane;

[1.c] a first antenna within the wireless device and configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum,

[1.d] the second frequency range being higher in frequency than the first frequency range and at least one of the three frequency bands being associated with a 4G communication standard,

[1.e] the first antenna being proximate to a first short side of a ground plane rectangle enclosing the ground plane and defining a first

[5] We use the same reference numbers and letters that Petitioner uses to identify the claim language. *See* Pet. 103 (Claim List).

antenna contour comprising an entire perimeter of the first antenna,

[1.f] wherein the first antenna contour has a level of complexity defined by complexity factor F_{21} having a value of at least 1.20 and complexity factor F_{32} having a value less than 1.75; and

[1.g] a second antenna within the wireless device and configured to support at least one frequency band different from the at least three frequency bands supported by the first antenna,

[1.h] the second antenna being arranged completely within the ground plane rectangle.

Ex. 1001, 42:47–43:3.

E. The Asserted References

For its challenges, Petitioner relies on the following references:

Name	Reference	Exhibit
Ciais-Quadband	Pascal Ciais et al., *Design of an Internal Quad-Band Antenna for Mobile Phones*, Vol. 14, No. 4 IEEE Microwave and Wireless Components Letters 148–50, (April 2004)[6]	1009
Nakano	Hisamatsu Nakano et al., *An Inverted FL Antenna for Dual-Frequency Operation*, Vol. 53, No. 8 IEEE Transactions on Antennas and Propagation 2417–21 (August 2005)	1012
Dou	US 2007/0200773 A1, published August 30, 2007 (based on an application filed February 24, 2006)	1013
Baliarda-543	US 2008/0018543 A1, published January 24, 2008 (based on an application filed December 21, 2006)	1040

Pet. 4, 32–100.

[6] The acronym "IEEE" stands for "Institute of Electrical and Electronics Engineers."

Petitioner asserts that the "AIA applies to all claims" in the '677 patent and that each reference qualifies as prior art under § 102(a)(1).[7] Pet. 4–5 (emphasis omitted). Alternatively, if the AIA does not apply to all claims, Petitioner asserts that:

(1) Nakano qualifies as prior art under pre-AIA § 102(a);

(2) Ciais-Quadband qualifies as prior art under pre-AIA § 102(a) and § 102(b); and

(3) Dou qualifies as prior art under pre-AIA § 102(e).

Id. at 5–6; *see* 35 U.S.C. § 102(a), (b), (e) (2006).

At this stage of the proceeding, Patent Owner does not dispute that Ciais-Quadband, Nakano, and Dou qualify as prior art. *See, e.g.*, Prelim. Resp. 1–2, 7–12, 18–24; Prelim. Sur-reply 1–5. As explained in more detail below, however, Patent Owner disputes that Baliarda-543 qualifies as prior art. *See* Prelim. Resp. 2–3, 25–31; Prelim. Sur-reply 5; *infra* § III.G.2(d).

F. The Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–9	103	Dou, Ciais-Quadband
1–20	103	Dou, Ciais-Quadband, Nakano
1–5, 12–20	102/103	Baliarda-543

Pet. 4, 32–100.

[7] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 102 and § 103 effective March 16, 2013.

G. Testimonial Evidence

To support its challenges, Petitioner relies on the declaration of Daniel van der Weide, Ph.D. (Exhibit 1007).[8] Dr. van der Weide states, "I have been retained by Wolf, Greenfield & Sacks, P.C., counsel for Geotab Inc. and Geotab USA, Inc.," to "assess claims 1–20" in the '677 patent. Ex. 1007 ¶ 1. Dr. van der Weide explains that he received (1) a "Bachelor of Science Degree in Electrical Engineering from the University of Iowa in 1987," (2) a "Master of Science Degree in Electrical Engineering from Stanford University in 1990," and (3) a "Ph.D. degree in Electrical Engineering from Stanford in 1993." *Id.* ¶ 3.

Further, Petitioner relies on the declarations of James L. Mullins, Ph.D. (Exhibit 1014) and Gordon MacPherson (Exhibit 1027) to establish the public accessibility of Ciais-Quadband, Nakano, and other publications before the '677 patent's effective filing date.

To support its positions, Patent Owner relies on the declaration of Hossein Hashemi, Ph.D. (Exhibit 2010). Dr. Hashemi states, "I have been retained by Edell, Shapiro and Finnan, LLC" as "a technical expert in the field of electrical engineering" to "provide various opinions regarding" the '677 patent. Ex. 2010 ¶¶ 2–3. Dr. Hashemi explains that he received (1) a "Bachelor of Science degree in Electronics Engineering from Sharif University of Technology in 1997," (2) a "Master's degree in Electronics Engineering from Sharif University of Technology in 1999," and (3) a

[8] Petitioner filed a confidential version of Dr. van der Weide's declaration and a public version of Dr. van der Weide's declaration. We cite to the public version of Dr. van der Weide's declaration.

"Master's degree and Ph.D. in Electrical Engineering from the California Institute of Technology in 2001 and 2003, respectively." *Id.* ¶ 7.

III. PATENTABILITY ANALYSIS

A. Legal Principles: Anticipation

To "demonstrate anticipation, the proponent must show 'that the four corners of a single, prior art document describe every element of the claimed invention.'" *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (quoting *Xerox Corp. v. 3Com Corp.*, 458 F.3d 1310, 1322 (Fed. Cir. 2006)). The prior-art document "must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements 'arranged as in the claim.'" *Id.* (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). Hence, a patent challenger cannot rely on portions from different, unrelated embodiments in a prior-art document to demonstrate anticipation. *See id.* at 1369, 1371.

The "disclosure of a limited number of combination possibilities" may anticipate a claim. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 851 F.3d 1270, 1274 (Fed. Cir. 2017). Hence, a reference may anticipate "if that reference teaches that the disclosed components or functionalities may be combined and one of skill in the art would be able to implement the combination." *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1344 (Fed. Cir. 2016). The "dispositive question regarding anticipation [is] whether one skilled in the art would reasonably understand or infer from the [reference's] teaching" that it discloses every claim element arranged as in the claim. *In re Baxter Travenol Lab'ys*, 952 F.2d 388, 390

(Fed. Cir. 1991); *see Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003).

We analyze the anticipation issues according to these principles.

B. Legal Principles: Obviousness

A patent may not be obtained "if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains." 35 U.S.C. § 103. An obviousness analysis involves underlying factual inquiries including (1) the scope and content of the prior art; (2) differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) where in evidence, objective indicia of nonobviousness, such as commercial success, long-felt but unsolved needs, and failure of others.[9] *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18, 35–36 (1966); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1047–48 (Fed. Cir. 2016) (en banc). When evaluating a combination of references, an obviousness analysis should address "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

We analyze the obviousness issues according to these principles.

C. Level of Ordinary Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems

[9] At this stage of the proceeding, the parties do not address objective indicia of nonobviousness. *See, e.g.*, Pet. 32–100; Prelim. Resp. 17–31.

encountered in the art; (3) prior-art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). Moreover, the prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner asserts that a person of ordinary skill as of the '677 patent's effective filing date would have had "at least a bachelor's degree in electrical engineering, computer science, or a similar degree and at least four years of experience in applied electromagnetics with an emphasis on antennas." Pet. 11 (quoting Ex. 1018 ¶ 32). Petitioner also asserts that "[a]lternatively, the person of ordinary skill in the art would have a master's degree in electrical engineering (or similar discipline) and at least two years of similar experience." *Id.* (quoting Ex. 1018 ¶ 32). Dr. van der Weide's testimony supports Petitioner's assertions. *See* Ex. 1007 ¶ 40.

For purposes of the Preliminary Response only, Patent Owner employs Petitioner's description of an ordinarily skilled artisan. Prelim. Resp. 17.

Based on the current record and for purposes of this decision, we accept Petitioner's description of an ordinarily skilled artisan because it comports with the technology and claims of the '677 patent as well as the

asserted references. *See, e.g.*, Ex. 1001, 1:26–6:47, 42:47–44:61, code (57); *infra* §§ III.E.1–III.E.2.

D. Claim Construction

1. GENERAL PRINCIPLES

We construe claim terms "using the same claim construction standard" that district courts use to construe claim terms in civil actions for patent infringement. *See* 37 C.F.R. § 42.100(b) (2025). Under that standard, claim terms "are given their ordinary and customary meaning, which is the meaning the term would have to a person of ordinary skill in the art at the time of the invention." *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 904 F.3d 965, 971 (Fed. Cir. 2018) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc)). The meaning of claim terms may be determined by "look[ing] principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

2. PETITIONER'S POSITION

Petitioner requests that the Board construe the following claim terms:

(a) "perimeter" in claims 1, 3, 5, 6, 11, 12, 16, and 19;

(b) "antenna box" in claims 6 and 12;

(c) "antenna rectangle" in claims 6, 12, and 20;

(d) "antenna contour" in claims 1–3, 5–9, 11–14, 16, 17, and 19;

(e) "complexity factor F_{21}" and "complexity factor F_{32}" in claims 1, 5, 6, 9, 11, 12, 16, and 19;

(f) "wireless device" in claims 1–20; and

(g) "4G communication standard" in claims 1, 4, and 12.

Pet. 13–31. Petitioner proposes an explicit construction for each claim term except "wireless device" and "4G communication standard." *Id.*

For "wireless device," Petitioner asserts that an ordinarily skilled artisan would have understood that "wireless device" refers to "the nature of the communication," e.g., "that the device can communicate wirelessly." Pet. 27 (quoting Ex. 1020, 11).

For "4G communication standard," Petitioner asserts that an ordinarily skilled artisan would have understood that "4G communication standard" encompasses "HSDPA, WiBro, WiFi, WiMax, UWB, or other high-speed wireless standards," including LTE frequency bands.[10] Pet. 28–31.

3. PATENT OWNER'S POSITION

Patent Owner does not propose an explicit construction for any claim term, phrase, or limitation. *See* Prelim. Resp. 13–17. Patent Owner submits that "the Board can resolve all issues without an explicit construction of any claim term." *Id.* at 13.

For "4G communication standard," however, Patent Owner asserts that an ordinarily skilled artisan would have understood that "4G communication standard" refers to "a technical specification related to the Fourth Generation (4G) of broadband cellular network technology." Prelim. Resp. 14. Patent Owner also asserts that "4G communication standard" encompasses "HSDPA, WiBro, WiFi, WiMax, UWB, or other high-speed wireless standards," including LTE communication standards. *Id.* at 15–17

[10] The acronym "LTE" stands for "Long-Term Evolution."

(quoting Ex. 1001, 25:3–4) (citing Ex. 1001, 25:1–12; Ex. 2012; Ex. 2013; Ex. 2014; Ex. 2016, 56); *see* Prelim. Sur-reply 5. As specific examples covered by "4G communication standard," Patent Owner identifies the following frequencies: "1900-2170 MHz, 810-960 MHz, 1710-1990 MHz, or 2-11 GHz (including some of its subregions such as 3-10 GHz, 2.4-2.5 GHz, and 5-6 GHz)." Prelim. Resp. 15 (citing Ex. 1001, 25:1–12).

4. DISCUSSION

"[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); *see Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Based on the current record, we determine that no claim term, phrase, or limitation requires an explicit construction to decide whether Petitioner satisfies the "reasonable likelihood" standard for instituting trial.

As Petitioner recognizes, the '677 patent defines many of the claim terms Petitioner identifies for construction. *See* Pet. 14–27. As an example, the patent defines "antenna box" as "the minimum-sized parallelepiped of square or rectangular faces that completely encloses the antenna volume of space and wherein each one of the faces of the minimum-sized parallelepiped is tangent to at least one point of the volume" where "each possible pair of faces of the minimum-size parallelepiped shares an edge forming an inner angle of 90°." Ex. 1001, 11:24–31. As another example, the patent defines "antenna rectangle" as "the orthogonal projection of the antenna box along the normal to the face with largest area of the antenna box." *Id.* at 14:11–14.

As another example, the '677 patent provides the following equations for computing the complexity factor F_{21} and the complexity factor F_{32}:

$$F_{21} = – (\log(N_2) – \log(N_1)) / \log(1/2);$$

$$F_{32} = – (\log(N_3) – \log(N_2)) / \log(1/2);$$

where:

(1) N_1 is the number of cells of "the grid G_1 that are at least partially inside the antenna rectangle and include at least a point of the antenna contour";

(2) N_2 is the number of cells of "the grid G_2 that are completely inside the antenna rectangle and include at least a point of the antenna contour"; and

(3) N_3 is the number of cells of "the grid G_3 that are completely inside the antenna rectangle and include at least a point of the antenna contour."

Ex. 1001, 19:1–13, 19:61–20:4.

In the patentability analysis below, we address a claim-construction issue concerning "4G communication standard," i.e., whether that term encompasses LTE frequency bands including LTE band 12. *See infra* § III.G.2(e). We address this issue in the patentability analysis below to provide better context to explain the issue and our resolution of the issue.

E. Alleged Obviousness over Dou and Ciais-Quadband: Claims 1–9

Petitioner contends that claims 1–9 are unpatentable under § 103 because the claims would have been obvious over Dou and Ciais-Quadband. *See* Pet. 4, 32–69; Prelim. Reply 1–3. Patent Owner disputes Petitioner's contentions. *See* Prelim. Resp. 1–2, 18–22; Prelim. Sur-reply 1–5.

Below, we provide overviews of Dou and Ciais-Quadband. Then, we consider the obviousness issues. For the reasons explained below, Petitioner

does not establish sufficiently for purposes of institution that claims 1–9 are unpatentable under § 103 based on Dou and Ciais-Quadband.

1. OVERVIEW OF DOU (EXHIBIT 1013)

Dou is a U.S. patent application publication titled "Internal Diversity Antenna Architecture," filed on February 24, 2006, and published on August 30, 2007. Ex. 1013, codes (12), (22), (43), (54). Dou explains that:

(1) "diversity antennas are based on the concept of a smart array and tend to improve the receiving sensitivity of a wireless device by reducing multi-path interference"; and

(2) "[r]ecently, diversity antennas have been applied to wireless devices such as mobile telephones and handheld computers."

Id. ¶ 1.

Dou also explains that various embodiments directed to "an internal diversity antenna architecture" may "potentially improve the performance of a wireless device by improving one or more of characteristics, such as a size, shape, form factor, power consumption, battery life, transceiver operations, signal quality, weight, and other characteristics of the wireless device." Ex. 1013 ¶ 14; *see id.* ¶ 30.

Dou's Figures 2A and 2B (reproduced below) depict an embodiment of a wireless device having an internal diversity antenna architecture:

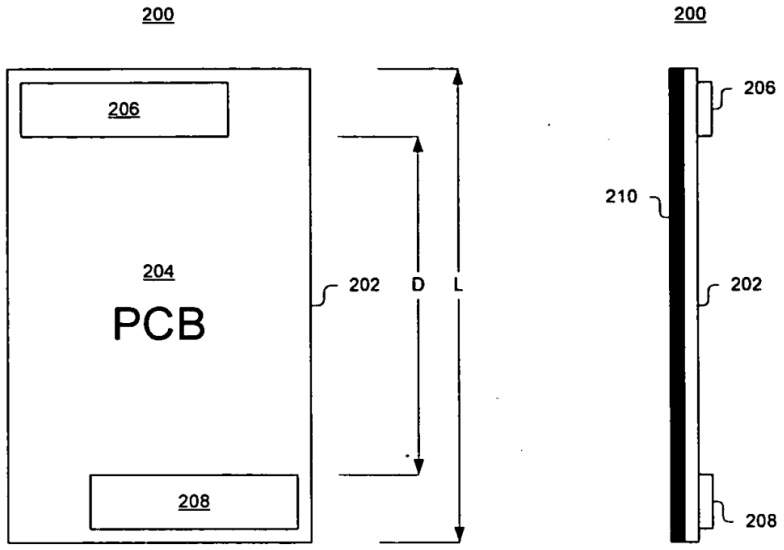


FIG. 2A FIG. 2B

Figures 2A and 2B are front and side views, respectively, of wireless device 200 including housing 202, printed circuit board (PCB) 204, first internal antenna 206 disposed on PCB 204, second internal antenna 208 also disposed on PCB 204, and ground plane 210. Ex. 1013 ¶¶ 5–6, 15–17, Figs. 2A–2B. Wireless device 200 "may comprise, or be implemented as a handheld computer, mobile telephone, personal digital assistant (PDA), combination cellular telephone/PDA, data transmission device, one-way pager, two-way pager, and so forth." *Id.* ¶ 15.

For wireless device 200, "the internal diversity antenna architecture may comprise" (1) first internal antenna 206 located "substantially near the top of the wireless device 200," e.g., "substantially near the top of the housing 202 and/or the top of the PCB 204," and (2) second internal antenna 208 located "substantially near the bottom of the wireless

device 200," e.g., "substantially near the bottom of the housing 202 and/or the bottom of the PCB 204." Ex. 1013 ¶ 17, Figs. 2A–2B.

First internal antenna 206 and second internal antenna 208 "may be used to implement various spatial diversity techniques to improve communication of wireless signals across one or more frequency bands of wireless shared media." Ex. 1013 ¶ 22. For example, "the length (L) of the wireless device 200 may be greater than 0.3 wavelength (>0.3λ) of the lowest frequency." *Id.* ¶ 24. Further, first internal antenna 206 and second internal antenna 208 "may be separated by a distance (D) that is no less than the quarter wavelength (>=λ/4) of the lowest frequency." *Id.*

First internal antenna 206 and second internal antenna 208 "may have varying polarities to implement one or more diversity techniques." Ex. 1013 ¶ 18. For instance, first internal antenna 206 "may be vertically polarized," and second internal antenna 208 "may be mainly horizontally polarized or vertically polarized with a cross-polarization component." *Id.* Using antennas with "different polarized radiation patterns" reduces "mutual coupling" and permits "cooperative operation." *Id.* ¶ 2.

First internal antenna 206 and second internal antenna 208 "may be designed for Evolution Data Optimized (EVDO) diversity at both the 800 MHz band (cellular) and the 1900 MHz (PCS)." Ex. 1013 ¶ 23.

First internal antenna 206 and second internal antenna 208 "may be tuned for operating at one or more frequency bands." Ex. 1013 ¶ 22. For example, first internal antenna 206 and second internal antenna 208 "may allow the wireless device 200 to operate" in various frequency regions as follows:

> the 824-894 Megahertz (MHz) frequency band for [Global System for Mobile communications] GSM operations, the 1850-1990 MHz frequency band for Personal Communications Services (PCS) operations, the 1575 MHz frequency band for Global Positioning System (GPS) operations, the 824-860 MHz frequency band for NAMPS operations, the 1710-2170 MHz frequency band for WCDMA/UMTS operations, ISM band in 2.4 GHz range for WiFi and Bluetooth, and other frequency bands.

Id.; *see id.* ¶ 45. Further, first internal antenna 206 and second internal antenna 208 "may be designed for Evolution Data Optimized (EVDO) diversity at both the 800 MHz band (cellular) and the 1900 MHz (PCS)." *Id.* ¶ 23.

First internal antenna 206 or second internal antenna 208 (or both) "may comprise a single antenna, or may be part of an array of antennas, such as a quad band antenna array." Ex. 1013 ¶ 25. First internal antenna 206 or second internal antenna 208 (or both) "may be implemented using any type of suitable internal antenna" including the following types: "a planar inverted-F antenna, a planar inverted-L antenna, an inverted-F antenna with a helical structure, an inverted-L antenna with a helical structure, a monopole antenna, a meandered monopole antenna, a dipole antenna, a balanced antenna, a printed helical antenna, a chip antenna, and a ceramic antenna." *Id.* ¶ 28; *see id.* ¶ 29 (discussing "a planar inverted-F antenna").

Dou explains that while wireless device 200 shown in Figures 2A and 2B "comprises an exemplary embodiment of an internal diversity antenna architecture, it can be appreciated that the placement or location of the first internal antenna 206 and the second internal antenna 208 within the wireless device 200 may be performed in accordance with various performance and design constraints." Ex. 1013 ¶ 30. For example, "the

efficiency of each antenna may depend upon a proper relationship between the size and shape of the antenna and the wavelength of the targeted frequency." *Id.* "The specific frequency range that the antenna is designed to cover may dictate the optimal size of an antenna." *Id.*

Dou's Figures 3A and 3B (reproduced below) depict another embodiment of a wireless device having an internal diversity antenna architecture:

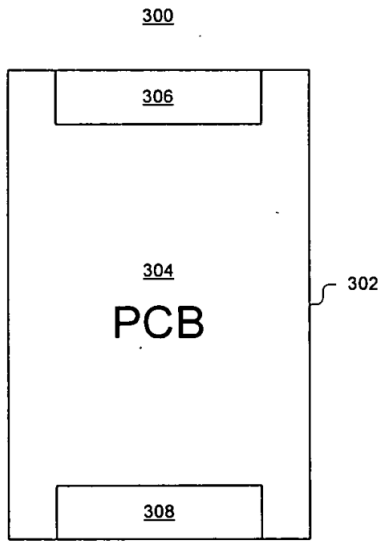


FIG. 3A

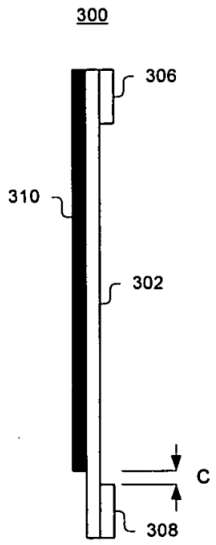


FIG. 3B

Figures 3A and 3B are front and side views, respectively, of wireless device 300 including housing 302, PCB 304, first internal antenna 306 disposed on PCB 304, second internal antenna 308 also disposed on PCB 304, and ground plane 310. Ex. 1013 ¶¶ 7–8, 31–34, Figs. 3A–3B. In "various embodiments," wireless device 300 "may be similar in some structural and operational aspects as wireless device 200." *Id.* ¶ 31.

As Figure 3B shows, however, "the ground plane 310 does not extend underneath the second internal antenna 308" in wireless device 300. Ex. 1013 ¶ 34, Fig. 3B. Also, second internal antenna 308 "may be

separated from the ground plane 310 by a clearance distance (C) that is no less than 5 mm (>5 mm)." *Id.* ¶ 34.

For wireless device 300, "the internal diversity antenna architecture may comprise" (1) first internal antenna 306 located "substantially at the top of the wireless device 300," e.g., "substantially at the top of the housing 302 and/or the top of the PCB 304, and (2) second internal antenna 308 located "substantially at the bottom of the wireless device 300," e.g., "substantially at the bottom of the housing 302 and/or the bottom of the PCB 304." Ex. 1013 ¶ 32. In "some implementations, the first internal antenna 306 and the second internal antenna 308 may achieve maximum separation within the wireless device 300." *Id.* ¶ 33.

First internal antenna 306 "may comprise, for example, a planar inverted F-antenna." Ex. 1013 ¶ 34. Second internal antenna 308 "may comprise, for example, a monopole-antenna, an inverted-L antenna, a meandered monopole, a printed helical antenna, a dipole antenna, a balanced antenna, or other suitable antenna." *Id.* "The embodiments are not limited in this context." *Id.*

Regarding the wireless devices shown in Figures 2A–2B and 3A–3B, Dou explains that "the antenna architecture may comprise three or more antennas." Ex. 1013 ¶ 40. For instance, "an additional antenna may comprise any suitable type of internal antenna disposed within the housing of a wireless device." *Id.* Further, "an additional antenna may comprise any suitable type of external antenna such as a whip antenna, extendable antenna, antenna stubby, and so forth." *Id.*

2. OVERVIEW OF CIAIS-QUADBAND (EXHIBIT 1009)

Ciais-Quadband is a paper titled "Design of an Internal Quad-Band Antenna for Mobile Phones" by Pascal Ciais et al., published in IEEE Microwave and Wireless Components Letters, volume 14, number 4 (April 2004). Ex. 1009, 148;[11] *see* Ex. 1014 ¶¶ 33–57; Ex. 1027 ¶¶ 8–9, 13 & Attach. A.

Ciais-Quadband "presents the design of a compact Planar Inverted-F Antenna (PIFA) suitable for cellular telephone applications." Ex. 1009, 148; *see id.* at 150. The PIFA "combines the use of a slot, shorted parasitic patches and capacitive loads to achieve multiband operation." *Id.* at 148.

Specifically, the PIFA "consists of a main patch with three additional parasitic elements placed on the corner of a ground plane whose size is representative of the Printed Circuit Board (PCB) of a typical mobile phone," i.e., "40.5 mm × 105 mm." Ex. 1009, 148. The "chosen length is not the best choice for an optimum GSM bandwidth (around 130 mm) or an optimum DCS bandwidth (around 70 mm) but it will equally helps [sic] in these both bands for an efficient antenna-chassis combination." *Id.*

Regarding the three additional parasitic elements, Ciais-Quadband explains that they were "added to the main patch to achieve our desired multiband goal." Ex. 1009, 149. Each of the three additional parasitic elements is connected to the ground plane by a metallic strip and "located near the main patch in order to be correctly electromagnetically excited." *Id.*

[11] For Exhibit 1009 (Ciais-Quadband), we follow Petitioner's practice and cite to the page numbers that appear in the publication.

Ciais-Quadband's Figure 1a (reproduced below) depicts a PIFA positioned above a ground plane whose size is representative of a PCB:

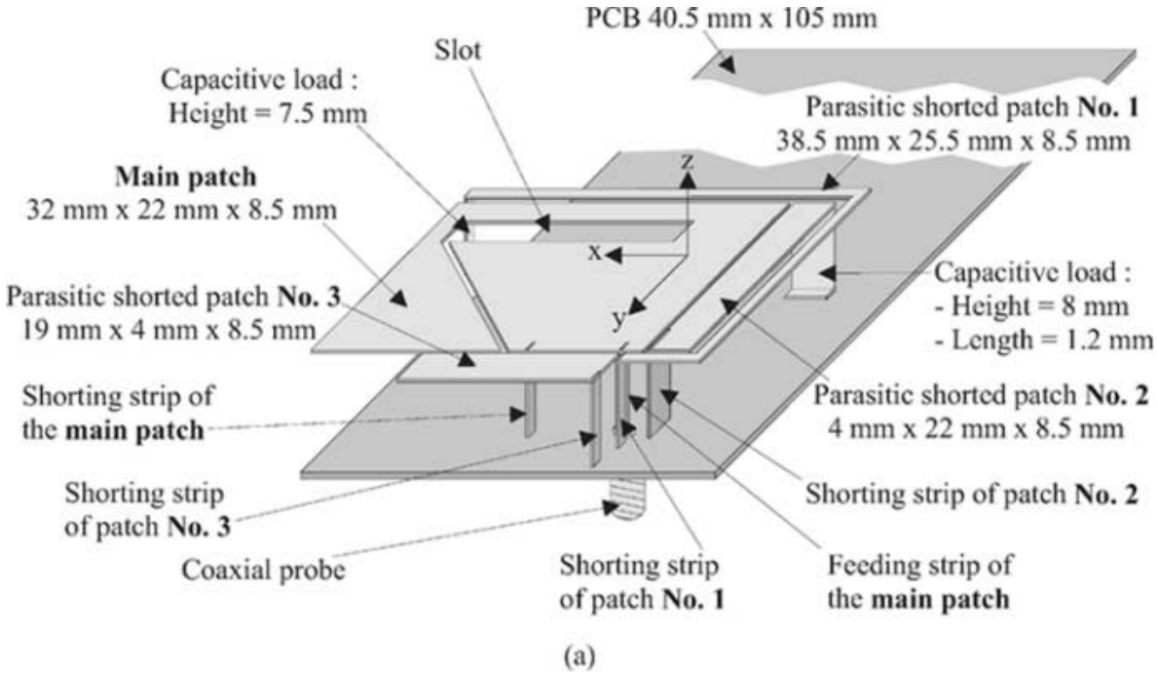


Figure 1a illustrates a PIFA including the following components:

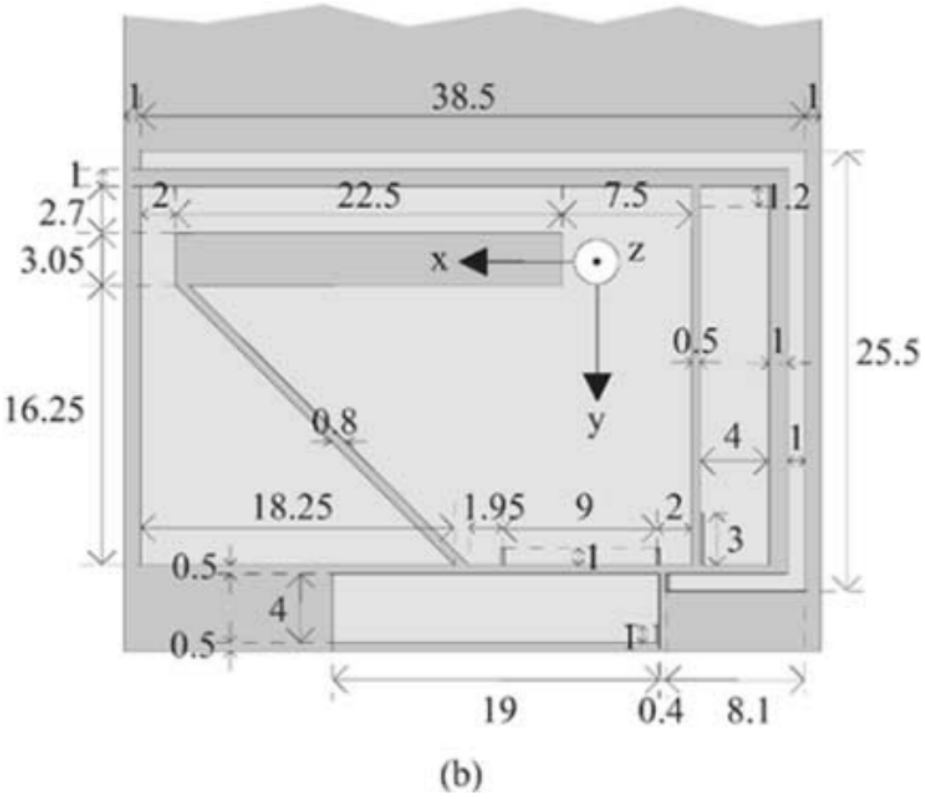
- a main patch (32 mm × 22 mm × 8.5 mm) with a slot;
- a feeding strip for the main patch;
- a shorting strip between the main patch and the ground plane (40.5 mm × 105 mm);
- parasitic shorted patch no. 1 (38.5 mm × 25.5 mm × 8.5 mm) coplanar with the main patch;
- a shorting strip between parasitic shorted patch no. 1 and the ground plane;
- a capacitive load (height = 7.5 mm) between parasitic shorted patch no. 1 and the ground plane;
- parasitic shorted patch no. 2 (4 mm × 22 mm × 8.5 mm) coplanar with the main patch;
- a shorting strip between parasitic shorted patch no. 2 and the ground plane;

- a capacitive load (height = 8 mm and length = 1.2 mm) between parasitic shorted patch no. 2 and the ground plane;
- parasitic shorted patch no. 3 (19 mm × 4 mm × 8.5 mm) coplanar with the main patch; and
- a shorting strip between parasitic shorted patch no. 3 and the ground plane.

Ex. 1009, 148–49, Fig. 1a. For the main patch, parasitic shorted patch no. 1, parasitic shorted patch no. 2, and parasitic shorted patch no. 3, the dimension 8.5 mm represents the height above the ground plane. *See id.* at 148, Fig. 1a.

"Capacitive loads were added to the parasitic patches no. 1 and no. 2 by vertically folding their strip ends." Ex. 1009, 149. Thus, "the electrical lengths of these resonators are artificially increased without enlarging the whole antenna size." *Id.*

Ciais-Quadband's Figure 1b (reproduced below) is a top view of the PIFA in Figure 1a:



(b)

Figure 1b illustrates the dimensions of the main patch, parasitic shorted patch no. 1, parasitic shorted patch no. 2, parasitic shorted patch no. 3, and their respective parts as well as the dimensions between these components of the PIFA. Ex. 1009, 148, Fig. 1b. Figure 1b also illustrates offsets or clearances for the PIFA with respect to the ground plane, specifically, 0.5 mm between the bottom of the ground plane and the bottom of the PIFA, 1.0 mm between the left side of the ground plane and the left side of the PIFA, and 1.0 mm between the right side of the ground plane and the right side of the PIFA. *Id.*

The PIFA "covers the GSM standard (Global System for Mobile communications, 880–960 MHz)" and "also the DCS (Digital Communication System, 1710–1880 MHz), PCS (Personal Communication

Services, 1850–1990 MHz) and UMTS (Universal Mobile Telecommunications System, 1920–2170 MHz) standards." Ex. 1009, 148; *see id.* at 150.

3. Whether an Ordinarily Skilled Artisan Would Have Been Motivated to Combine the Teachings of the References with a Reasonable Expectation of Success

(a) Petitioner's Contentions

Petitioner contends that Dou discloses a wireless handheld device with internally mounted antennas but "does not describe particular antennas" and "leaves the antenna selection" to an ordinarily skilled artisan. Pet. 33 (citing Ex. 1007 ¶ 118).

Petitioner contends that an ordinarily skilled artisan would have been motivated to use Ciais-Quadband's antenna for Dou's first internal antenna 206 and Dou's second internal antenna 208, i.e., to replace Dou's two antennas with duplicate copies of Ciais-Quadband's antenna. Pet. 33. Petitioner explains that:

(1) Ciais-Quadband's antenna "was designed for internal use in mobile phones," thus "making it suitable for use as Dou's 'internal antenna' 206 and 208";

(2) Ciais-Quadband's antenna "is a planar inverted-F antenna (PIFA)";

(3) Dou discloses using a PIFA for first internal antenna 206 and second internal antenna 208; and

(4) Ciais-Quadband's antenna operates in frequency regions used by "well-known communication standards (GSM, DCS, PCS, UMTS)" suitable for mobile phones like Dou's wireless device, i.e., "870-960 MHz and 1710-2170 MHz."

Id. at 33–34 (citing Ex. 1007 ¶¶ 119–120; Ex. 1009, 148, 150; Ex. 1013 ¶¶ 18, 22, 28).

According to Petitioner, the proposed combination would include four antennas, i.e., Ciais-Quadband's antenna as Dou's first internal antenna 206, Ciais-Quadband's antenna as Dou's second internal antenna 208, a GPS antenna, and "a 2.4 GHz antenna for WiFi/Bluetooth." Pet. 33–34. Regarding a GPS antenna and a WiFi/Bluetooth antenna, Petitioner explains that:

> (1) Dou describes its wireless device as having "three or more antennas" that may comprise "any suitable type of internal antenna";
>
> (2) Dou describes its wireless device as having "an antenna covering frequencies for GPS (1575 MHz) or WiFi or Bluetooth (ISM 2.4 GHz)";
>
> (3) including a GPS antenna and a WiFi/Bluetooth antenna in Dou's wireless device would provide "the services that Dou describes, in frequency ranges Ciais's quadband antenna did not cover"; and
>
> (4) including a GPS antenna and a WiFi/Bluetooth antenna in a mobile device was conventional.

Id. at 34–35 (citing Ex. 1007 ¶¶ 121–123; Ex. 1013 ¶¶ 22, 40; Ex. 1029 ¶ 44, Fig. 9).

Petitioner asserts that using Ciais-Quadband's antenna for Dou's first internal antenna 206 and Dou's second internal antenna 208 "would have been nothing more than combining familiar elements according to known methods with predictable results, and been no more than the 'predictable use of prior art elements according to their established functions.'" Pet. 35 (quoting *KSR*, 550 U.S. at 417) (citing Ex. 1007 ¶ 124). Petitioner also asserts that "[t]he same is true of adding an antenna for GPS and another for

WiFi and Bluetooth to Dou's device to provide the multiband coverage that Dou describes." *Id.* (citing Ex. 1007 ¶ 125).

Further, Petitioner asserts that an ordinarily skilled artisan would have had a reasonable expectation of success in using Ciais-Quadband's antenna for Dou's first internal antenna 206 and Dou's second internal antenna 208 because:

(1) Ciais-Quadband's antenna was designed for "internal use in cellular telephones";

(2) "Dou expressly contemplates using a multiband PIFA antenna" like Ciais-Quadband's antenna "as its first and second internal antennas";

(3) Dou describes antenna placement within a wireless device according to "various performance and design constraints" known to an ordinarily skilled artisan; and

(4) Ciais-Quadband "describes placing the quadband antenna at the end of a PCB 'on the corner of a ground plane' where Dou places its antennas 206 and 208."

Pet. 35–36 (citing Ex. 1007 ¶¶ 126–127; Ex. 1009, 148, 150; Ex. 1013 ¶¶ 28–30, Figs. 2A–2B). According to Petitioner, implementing Ciais-Quadband's antenna as Dou's first internal antenna 206 and Dou's second internal antenna 208 was "well within" the skills of an ordinarily skilled artisan, and "the resulting antenna operation was predictable." *Id.* at 36 (citing Ex. 1007 ¶ 127; Ex. 1013 ¶¶ 12, 63).

Regarding a GPS antenna and a WiFi/Bluetooth antenna, Petitioner asserts that an ordinarily skilled artisan would have had a reasonable expectation of success when including them in Dou's wireless device because:

(1) Dou explains that "the antenna architecture may comprise three or more antennas";

(2) "Dou specifically describes the wireless device having coverage including for GPS and WiFi and Bluetooth"; and

(3) including a GPS antenna and a WiFi/Bluetooth antenna in a mobile device was conventional.

Pet. 36 (citing Ex. 1007 ¶ 128; Ex. 1013 ¶¶ 22, 40; Ex. 1029 ¶ 44).

Regarding Dou's disclosure that first internal antenna 206 and second internal antenna 208 "may be separated by a distance (D) that is no less than the quarter wavelength (>=λ/4) of the lowest frequency," Petitioner asserts that Dou describes "spatial diversity" as "optional" and "just one of several alternative 'diversity techniques' for creating diversity between its antennas." Prelim. Reply 1–2 (emphasis omitted) (citing Ex. 1013 ¶¶ 18, 22). According to Petitioner, Dou's other diversity techniques include polarization diversity and pattern diversity. *Id.* at 2.

Petitioner also asserts that "Dou does not require its 'diversity antenna architecture' to provide spatial diversity." Prelim. Reply 1 (emphasis omitted). Petitioner explains that (1) "Dou's dependent claim 8 recites at least a 'quarter wavelength' separation between a first and second 'diversity antenna'" and (2) "Dou's independent claims have no such requirement." *Id.* at 2.

(b) Patent Owner's Contentions

Patent Owner disputes that an ordinarily skilled artisan would have been motivated to use Ciais-Quadband's antenna for Dou's first internal antenna 206 and Dou's second internal antenna 208. *See* Prelim. Resp. 1–2, 18–22; Prelim. Sur-reply 1–5. In particular, Patent Owner contends that the proposed combination would not have been obvious to an ordinarily skilled

artisan because the proposed combination "directly contradicts the teachings of Dou." Prelim. Resp. 18.

Patent Owner explains that:

(1) an objective of "Dou's antenna design is to achieve spatial diversity between two antennas";

(2) "spatial diversity requires separating antennas by a sufficient distance to make their interference levels different";

(3) "Dou specifies a spacing between its two antennas of at least a quarter-wavelength at the lowest frequency of the antennas";

(4) "Dou's diversity antenna includes two antennas 206 and 208 located at opposite ends of a PCB 204 for the purpose of achieving spatial diversity";

(5) the lowest frequency of Ciais-Quadband's antenna is 870 MHz;

(6) the wavelength (λ) corresponding to a frequency of 870 MHz is 344.8 mm, and a quarter wavelength ($\lambda/4$) is 86.2 mm;

(7) the proposed combination employs Dou's ground plane 210 implemented "using the 40.5 mm × 105 mm dimensions" of Ciais-Quadband's ground plane;

(8) using Ciais-Quadband's antenna for Dou's two antennas 206 and 208 on Ciais-Quadband's ground plane results in a spacing between the two antennas of 47.0 mm, i.e., "barely more than half of the quarter-wavelength lower bound (86.2 mm) of the spacing specified by Dou to achieve spatial diversity at the antennas' lowest frequency (870 MHz)";

(9) a spacing between the two antennas of 47.0 mm "is contrary to the express teachings of Dou and would have eliminated effective spatial diversity, the core feature Dou's antenna architecture seeks to provide";

(10) the proposed combination violates the "explicit design constraints" specified by Dou and understood by an ordinarily skilled artisan as "necessary to achieve the spatial diversity Dou's antenna design seeks"; and

(11) an ordinarily skilled artisan would have recognized that the proposed combination "would destroy the very spatial diversity that Dou's antenna design sought to achieve."

Prelim. Resp. 1–2, 18–21 (emphasis omitted) (citing Ex. 1009, 148–49; Ex. 1013 ¶¶ 17, 22–24, codes (54), (57); Ex. 2010 ¶¶ 35–36, 46–50); *see* Prelim. Sur-reply 1–4.

As support, Patent Owner provides the following composite figure:

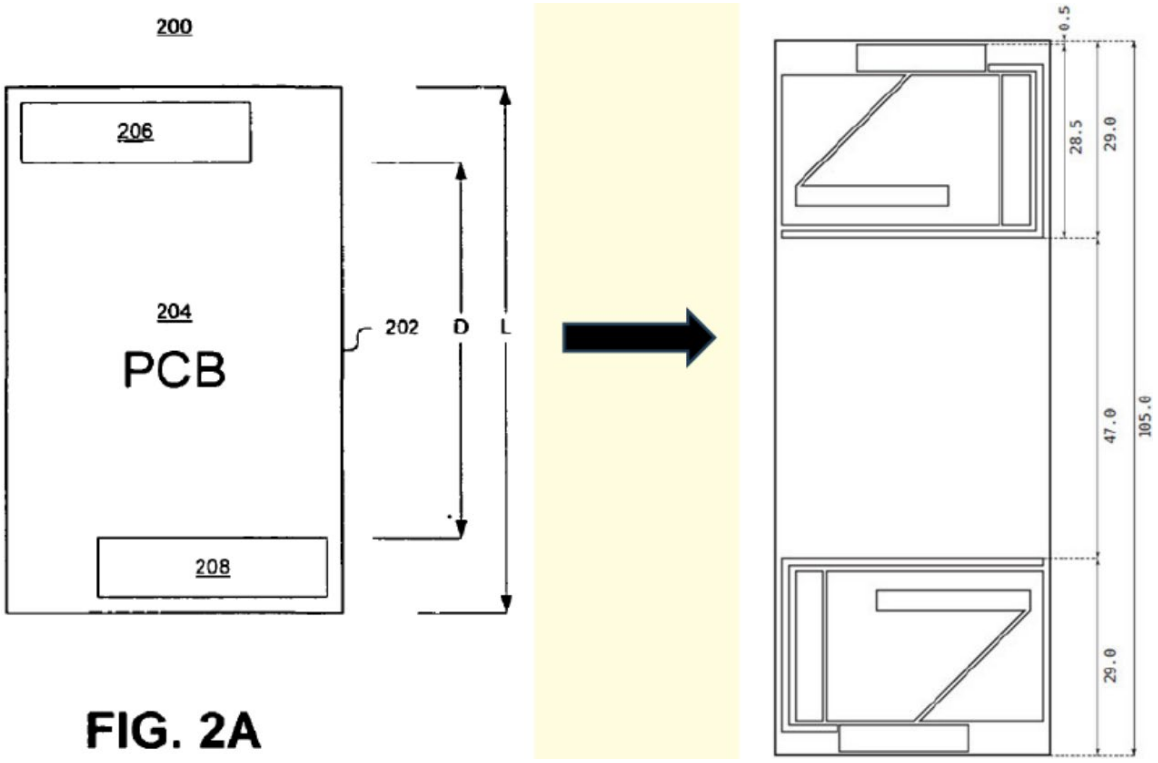


FIG. 2A

The above composite figure includes on the left Dou's Figure 2A and on the right a figure with (1) a first Ciais-Quadband antenna located near the top of a ground plane (or PCB) like Dou's first internal antenna 206 in Figure 2A and (2) a second Ciais-Quadband antenna located near the bottom of the

ground plane (or PCB) like Dou's second internal antenna 208 in Figure 2A. *See* Prelim. Resp. 21.

In the above composite figure, the figure on the right includes the following dimensions:

- 0.5 mm for the vertical clearance between the top of the ground plane and the top of the upper quadband antenna and the same vertical clearance between the bottom of the ground plane and the bottom of the lower quadband antenna;
- 28.5 mm for the vertical length of a quadband antenna (and no dimension for the horizontal width);
- 29.0 mm for the distance between the top of the ground plane and the bottom of the upper quadband antenna and 29.0 mm for the distance between the bottom of the ground plane and the top of the lower quadband antenna;
- 47.0 mm for the distance between the bottom of the upper quadband antenna and the top of the lower quadband antenna; and
- 105.0 mm for the vertical length of the ground plane (and no dimension for the horizontal width).

See Prelim. Resp. 20–21. Patent Owner explains that "[s]ubtracting the 29 mm required for the antennas at each end of the PCB from the 105 mm overall length of the PCB results in a spacing between the two antennas of 47.0 mm." *Id.* at 21.

Additionally, Patent Owner contends that the proposed combination provides no diversity whatsoever. *See* Prelim. Sur-reply 2–5. Regarding spatial diversity, Patent Owner asserts that with Ciais-Quadband's antenna used for Dou's two antennas 206 and 208, the two quadband antennas "are not sufficiently separated" on Ciais-Quadband's 40.5 mm × 105 mm ground plane for spatial diversity. *Id.* at 2–4.

Regarding pattern diversity, Patent Owner asserts that the two identical quadband antennas in the proposed combination would have "substantially identical omnidirectional radiation patterns, in a parallel arrangement on the ground plane," instead of "the different radiation patterns needed for pattern diversity." Prelim. Sur-reply 2, 4.

Regarding polarization diversity, Patent Owner asserts that the two identical quadband antennas in the proposed combination would have "the same polarization" because "they are not orthogonally polarized as needed for polarization diversity." Prelim. Sur-reply 2, 4–5.

Patent Owner also disputes that an ordinarily skilled artisan would have had a reasonable expectation of success in implementing the proposed combination. *See* Prelim. Resp. 2, 18, 22. Specifically, Patent Owner asserts that an ordinarily skilled artisan "understanding that at least a quarter-wavelength spacing between antennas is necessary to achieve spatial diversity" and "following Dou's express specification of this spacing" would not have expected the proposed combination "to successfully provide the spatial diversity Dou's antenna arrangement is intended to provide." *Id.* at 22 (citing Ex. 2010 ¶ 50).

(c) Analysis

Based on the current record, Petitioner does not establish sufficiently for purposes of institution that an ordinarily skilled artisan would have been motivated to combine Ciais-Quadband's teachings with Dou's teachings in the way Petitioner proposes. *See* Pet. 33–37, 45–46; Prelim. Reply 1–3; Ex. 1007 ¶¶ 118–128, 132, 155–157; Ex. 2010 ¶¶ 35, 37–39, 41, 45–50.

As Petitioner asserts, "Dou does not require its 'diversity antenna architecture' to provide spatial diversity." *See, e.g.*, Ex. 1013 ¶¶ 14, 17–18,

22–24, 30, 32–34; Prelim. Reply 1 (emphasis omitted). For example, Dou explains that first internal antenna 206 and second internal antenna 208:

> (1) "may be used to implement various spatial diversity techniques to improve communication of wireless signals across one or more frequency bands of wireless shared media";
>
> (2) "may have varying polarities to implement one or more diversity techniques"; and
>
> (3) "may be designed for Evolution Data Optimized (EVDO) diversity at both the 800 MHz band (cellular) and the 1900 MHz (PCS)."

Ex. 1013 ¶¶ 18, 22–23; *see* Ex. 1007 ¶¶ 112–113.

Although "Dou does not require its 'diversity antenna architecture' to provide spatial diversity," Dou nevertheless requires a wireless device with some type of diversity antenna architecture. *See, e.g.*, Ex. 1013 ¶¶ 14, 17–18, 22–24, 30, 32–34, codes (54), (57), claims 1 and 16. As an example, Dou's independent claim 1 covering a "wireless device" requires a "first diversity antenna" and a "second diversity antenna." *Id.* at claim 1. As another example, Dou's independent claim 16 covering a "wireless device" also requires a "first diversity antenna" and a "second diversity antenna." *Id.* at claim 16. As yet another example, Dou's Abstract describes a "wireless device" including a "first diversity antenna" and a "second diversity antenna." *Id.* at code (57).

Petitioner does not explain how the proposed combination provides anything other than spatial diversity. *See* Pet. 33–35; Prelim. Reply 1–3; Ex. 1007 ¶¶ 118–124. Based on the current record, we agree with Patent Owner that with Ciais-Quadband's antenna used for Dou's two antennas 206 and 208, the two identical quadband antennas would have:

(1) "substantially identical omnidirectional radiation patterns, in a parallel arrangement on the ground plane," instead of "the different radiation patterns needed for pattern diversity"; and

(2) "the same polarization" because "they are not orthogonally polarized as needed for polarization diversity."

See Prelim. Sur-reply 2, 4–5.

Regarding spatial diversity, Dou explains that first internal antenna 206 and second internal antenna 208 "may be separated by a distance (D) that is no less than the quarter wavelength (>=λ/4) of the lowest frequency." Ex. 1013 ¶ 24; *see* Ex. 2010 ¶¶ 37–38, 48. Consistent with Dou's preference for at least a quarter-wavelength spacing between antennas at the lowest frequency, "a commonly accepted rule of thumb is that at least a quarter-wavelength spacing between antennas is necessary to provide effective spatial diversity." Ex. 2010 ¶¶ 35, 37.

Effective spatial diversity requires sufficient spacing between antennas because that technique "uses multiple antennas to improve signal reliability and performance by mitigating the effects of multipath fading and other interference." Ex. 2010 ¶ 35. "Multipath fading occurs when a wireless signal propagates along multiple different paths of differing lengths because of interactions with obstacles, resulting in portions of the signal energy arriving at a receiver with different phases slightly offset in time." *Id.* Locations insufficiently separated in terms of wavelength "tend to experience similar fading and interference characteristics." *Id.* Thus, closely spaced antennas "cannot provide effective spatial diversity." *Id.* By providing sufficient spacing between antennas, however, "the likelihood increases that at least one of the antennas will be positioned at a location

where the multipath or other interference is relatively low, thereby improving overall signal quality and reliability." *Id.*

As Patent Owner contends, the proposed combination employs Dou's ground plane 210 implemented "using the 40.5 mm × 105 mm dimensions" of Ciais-Quadband's ground plane. *See* Pet. 33–35, 37, 45–46; Prelim. Resp. 20; Prelim. Sur-reply 2–4; Ex. 1007 ¶¶ 118–124, 132, 155–157; Ex. 2010 ¶ 49. The lowest frequency of Ciais-Quadband's antenna is 870 MHz. Ex. 1009, 149–50; *see* Ex. 1007 ¶¶ 115, 120, 135; Ex. 2010 ¶ 41. The wavelength (λ) corresponding to a frequency of 870 MHz is 344.8 mm, and a quarter wavelength (λ/4) is 86.2 mm. Ex. 2010 ¶¶ 39, 48.

In the proposed combination, a distance of 47.0 mm separates the two quadband antennas. Ex. 2010 ¶¶ 49–50. A distance of 47.0 mm corresponds to about 55% of a quarter wavelength (λ/4) at a frequency of 870 MHz, i.e., about 55% of 86.2 mm. *See id.* ¶ 50. Dr. Hashemi testifies that a distance of 47.0 mm separating the two quadband antennas in the proposed combination "would have eliminated effective spatial diversity, a feature Dou's antenna architecture seeks to provide." *Id.*

Petitioner does not explain why an ordinarily skilled artisan who used Ciais-Quadband's antenna for Dou's two antennas 206 and 208 would have departed from the commonly accepted rule of thumb and Dou's preference for at least a quarter-wavelength spacing between antennas at the lowest frequency to the extent needed to implement the proposed combination, i.e., with only about 55% of the preferred spacing between antennas. *See* Pet. 33–35; Prelim. Reply 1–3; Ex. 1007 ¶¶ 118–124. Hence, based on the current record, Petitioner does not establish sufficiently for purposes of institution that an ordinarily skilled artisan would have been motivated to

combine Ciais-Quadband's teachings with Dou's teachings in the way Petitioner proposes.

In the Preliminary Reply, Petitioner contends that the proposed combination "implements Dou's wireless device" with Ciais-Quadband's antenna, not with Ciais-Quadband's ground plane. Prelim. Reply 3 (citing Pet. 36). In the Preliminary Sur-reply, Patent Owner responds by asserting that Petitioner "mischaracterizes the Petition." Prelim. Sur-reply 1. According to Patent Owner, the Petition "states that it is utilizing the ground plane teachings" of Ciais-Quadband, including the 40.5 mm × 105 mm ground plane, "within the Dou architecture." *Id.* at 3. As support, Patent Owner quotes the Petition's statements about limitations 1.b and 1.e. *Id.* (quoting Pet. 37, 45–46).

Based on the current record, we agree with Patent Owner that the proposed combination employs Dou's ground plane 210 implemented "using the 40.5 mm × 105 mm dimensions" of Ciais-Quadband's ground plane. *See* Pet. 33–35, 37, 45–46; Prelim. Resp. 20; Prelim. Sur-reply 2–4; Ex. 1007 ¶¶ 118–124, 132, 155–157; Ex. 2010 ¶ 49.

In particular, for limitation 1.b reciting "a ground plane," the Petition states that the proposed combination "uses Dou's ground plane 210 to implement Ciais's ground plane teaching." Pet. 37; *see* Ex. 1001, 42:49; Ex. 1007 ¶ 132. Ciais-Quadband teaches that the antenna "consists of a main patch with three additional parasitic elements placed on the corner of a ground plane whose size is representative of the Printed Circuit Board (PCB) of a typical mobile phone," i.e., "40.5 mm × 105 mm." Ex. 1009, 148. Hence, Ciais-Quadband's "ground plane teaching" concerns both antenna

placement with respect to a ground plane, i.e., "on the corner of a ground plane," and the ground plane size, i.e., "40.5 mm × 105 mm." *Id.*

Further, for limitation 1.e reciting "the first antenna being proximate to a first short side of a ground plane rectangle enclosing the ground plane and defining a first antenna contour comprising an entire perimeter of the first antenna," the Petition relies on the combined disclosures in Dou and Ciais-Quadband. Pet. 45–49; *see* Ex. 1001, 42:57–60; Ex. 1007 ¶¶ 155–187. Specifically, the Petition states that the proposed combination "implements Dou's teaching to dispose antenna 206 (first antenna) at the top of PCB 204" that defines a ground plane rectangle enclosing "the ground plane 210 disposed on the side of the PCB opposite from antenna 206." Pet. 45 (citing Ex. 1007 ¶¶ 155–156; Ex. 1013 ¶¶ 16–17, 29, Figs. 2A–2B); *see* Ex. 1007 ¶ 155–156. Regarding the ground plane size, the Petition states that "Ciais teaches a rectangular (40.5 mm × 105 mm) PCB, also backed by a ground plane, that Ciais explains is representative of PCBs for typical mobile phones." Pet. 45–46 (citing Ex. 1007 ¶¶ 156–157; Ex. 1009, 148, Fig. 1); *see* Ex. 1007 ¶¶ 156–157.

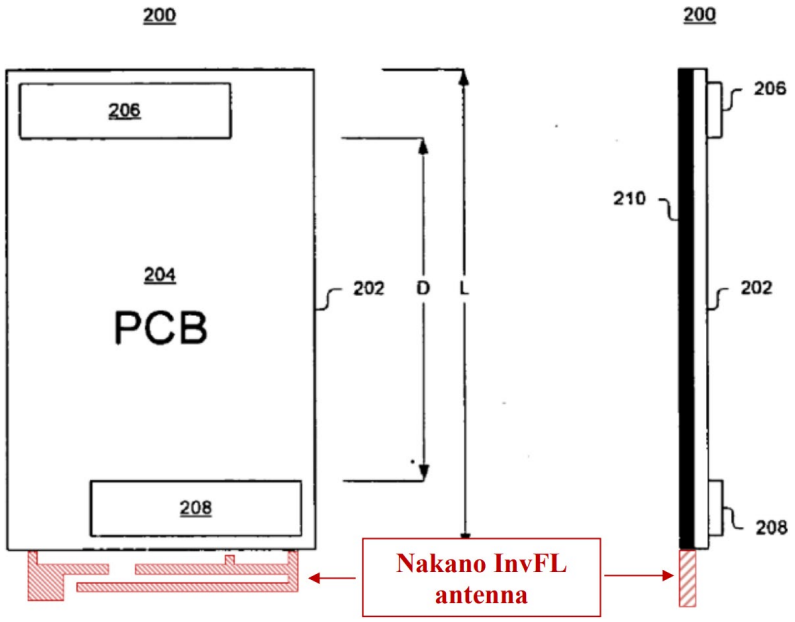
Because Petitioner does not establish sufficiently for purposes of institution that an ordinarily skilled artisan would have been motivated to combine Ciais-Quadband's teachings with Dou's teachings in the way Petitioner proposes, Petitioner does not demonstrate a reasonable likelihood of proving that claims 1–9 are unpatentable under § 103 based on Dou and Ciais-Quadband.

F. Alleged Obviousness over Dou, Ciais-Quadband, and Nakano: Claims 1–20

Petitioner contends that claims 1–20 are unpatentable under § 103 because the claims would have been obvious over Dou, Ciais-Quadband, and Nakano. *See* Pet. 4, 69–89. Patent Owner disputes Petitioner's contentions. *See* Prelim. Resp. 2, 23–25.

For the challenge based on Dou, Ciais-Quadband, and Nakano, Petitioner contends that an ordinarily skilled artisan would have been motivated to use Ciais-Quadband's antenna for Dou's first internal antenna 206 and Dou's second internal antenna 208 for the reasons discussed for the challenge based on Dou and Ciais-Quadband. Pet. 69; *see id.* at 33–34; *supra* § III.E.3(a). Petitioner also contends that an ordinarily skilled artisan would have been motivated to use Nakano's inverted FL (InvFL) antenna as an additional antenna arranged at the bottom of Dou's ground plane 210. *Id.* at 69–70.

Petitioner provides the following figure showing Nakano's InvFL antenna arranged at the bottom of Dou's ground plane 210:



The above figure includes front and side views from Dou's Figures 2A and 2B, respectively, of Dou's wireless device 200 with Nakano's InvFL antenna arranged below Dou's ground plane 210 and shown in red. *See* Pet. 71. The above figure also includes the red annotation "Nakano InvFL antenna" with red arrows pointing to the antenna arranged below Dou's ground plane 210. *See id.*

Patent Owner asserts that the challenge based on Dou, Ciais-Quadband, and Nakano still proposes replacing "Dou's two antennas 206 and 208 with duplicate copies of the Ciais-Quadband antenna." Prelim. Resp. 24; *see id.* at 2. Patent Owner also asserts that "the proposed addition of Nakano's antenna does nothing to address the non-obviousness of replacing Dou's antennas with two copies of Ciais-Quadband's antenna." *Id.* at 24. Therefore, according to Patent Owner, the challenge based on Dou, Ciais-Quadband, and Nakano "fails for the same reasons" as the challenge based on Dou and Ciais-Quadband. *Id.* at 2.

Because the challenge based on Dou, Ciais-Quadband, and Nakano relies on the same deficient rationale for combining Ciais-Quadband's teachings with Dou's teachings in the way Petitioner proposes, we agree with Patent Owner that the challenge based on Dou, Ciais-Quadband, and Nakano "fails for the same reasons" as the challenge based on Dou and Ciais-Quadband. *See* Pet. 33–34, 69–71; Prelim. Resp. 2, 23–25; *supra* § III.E.3(c). Hence, Petitioner does not demonstrate a reasonable likelihood of proving that claims 1–20 are unpatentable under § 103 based on Dou, Ciais-Quadband, and Nakano.

G. Alleged Anticipation by or Obviousness over Baliarda-543: Claims 1–5 and 12–20

Petitioner contends that claims 1–5 and 12–20 are unpatentable under § 102 as anticipated by Baliarda-543 or § 103 as obvious over Baliarda-543. *See* Pet. 4, 89–100; Prelim. Reply 3–5. Patent Owner disputes Petitioner's contentions. *See* Prelim. Resp. 2–3, 25–31; Prelim. Sur-reply 5.

Below, we provide an overview of Baliarda-543. Then, we consider the obviousness issues. For the reasons explained below, Petitioner establishes sufficiently for purposes of institution that claims 1–5 and 12–20 are unpatentable under § 102 as anticipated by Baliarda-543 or § 103 as obvious over Baliarda-543.

1. OVERVIEW OF BALIARDA-543 (EXHIBIT 1040)

Baliarda-543 is a U.S. patent application publication titled "Multiple-Body-Configuration Multimedia and Smartphone Multifunction Wireless Devices," filed on December 21, 2006, as the '429 application, and published on January 24, 2008. Ex. 1040, codes (12), (21), (22), (43), (54). As discussed above, the '677 patent issued from an application in a series of continuation applications that started with the '429 application. Ex. 1001, 1:8–17, code (63); *supra* § II.C.

As the parties agree, Baliarda-543's specification is "materially identical" to the '677 patent's specification. *Compare* Ex. 1001, 1:28–42:44, *with* Ex. 1040 ¶¶ 2–338; *see* Pet. 97; Prelim. Resp. 2, 13, 25, 31.

2. WHETHER BALIARDA-543 QUALIFIES AS PRIOR ART FOR CLAIMS 1–5 AND 12–20

(a) Legal Principles

(i) The Benefit of Priority Based on an Earlier Application

Claims in a later application may obtain "the benefit of the filing date of an earlier application" if, among other things, the earlier application discloses the invention "in the manner provided by" § 112's first paragraph "other than the requirement to disclose the best mode." 35 U.S.C. § 120; *Arthrex, Inc. v. Smith & Nephew, Inc.*, 35 F.4th 1328, 1343 (Fed. Cir. 2022). That paragraph provides as follows:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

35 U.S.C. § 112(a).

In an *inter partes* review, a patent owner bears the burden of establishing the benefit of priority based on an earlier application. *See, e.g.*, *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1376 (Fed. Cir. 2016); *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1379–80 (Fed. Cir. 2015). If a patent owner relies on an earlier application to antedate a reference, the patent owner must "show not only the existence of the earlier application, but why the written description in the earlier application supports the claim," i.e., "all the limitations" in the claim. *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327 (Fed. Cir. 2008).

The analysis for the benefit of priority proceeds on a claim-by-claim basis. *See Lucent Techs., Inc. v. Gateway, Inc.*, 543 F.3d 710, 718 (Fed. Cir. 2008); *Waldemar Link, GmbH v. Osteonics Corp.*, 32 F.3d 556, 558 (Fed. Cir. 1994).

(ii) The Written-Description Requirement

As noted above, § 112's first paragraph requires that the specification "contain a written description of the invention." 35 U.S.C. § 112(a). For purposes of the written-description requirement, the "invention" is "whatever is now claimed." *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1564 (Fed. Cir. 1991) (emphasis omitted).

The written-description requirement serves to (1) "clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed" and (2) "ensure that the scope of the right to exclude, as set forth in the claims, does not overreach the scope of the inventor's contribution to the field of art as described in the patent specification." *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) (alteration by the court) (quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563 (Fed. Cir. 1991)); *Reiffin v. Microsoft Corp.*, 214 F.3d 1342, 1345 (Fed. Cir. 2000); *see Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1344 (Fed. Cir. 2016).

The "test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad*, 598 F.3d at 1351; *Mentor Graphics Corp. v. EVE-USA, Inc.*, 851 F.3d 1275, 1296 (Fed. Cir. 2017). The "test requires an objective inquiry into the four

corners of the specification from the perspective of a person of ordinary skill in the art." *Ariad*, 598 F.3d at 1351.

While the written-description requirement "does not demand any particular form of disclosure" or "that the specification recite the claimed invention *in haec verba*, a description that merely renders the invention obvious does not satisfy the requirement." *Ariad*, 598 F.3d at 1352; *see Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1566 (Fed. Cir. 1997). The analysis for disclosure sufficiency may consider "such descriptive means as words, structures, figures, diagrams, formulas, etc." *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997).

To satisfy the written-description requirement, the inventor must have "possession of the invention as broadly claimed." *Rivera v. Int'l Trade Comm'n*, 857 F.3d 1315, 1322 (Fed. Cir. 2017); *see LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1345–47 (Fed. Cir. 2005); *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1478–79 (Fed. Cir. 1998). For instance, the inventor must have possession of the claimed invention as interpreted to encompass an allegedly infringing product. *See Rivera*, 857 F.3d at 1319–22; *ICU Med., Inc. v. Alaris Med. Sys., Inc.*, 558 F.3d 1368, 1372–73, 1377–79 (Fed. Cir. 2009).

(iii) Evidentiary Standard

At the institution stage of an *inter partes* review, the statutory "reasonable likelihood" standard for institution applies to the issue of whether a reference qualifies as prior art. *Cf. Hulu*, IPR2018-01039, Paper 29 at 12 (precedential) (citing 35 U.S.C. § 314(a)).

(b) Background

Independent claims 1 and 12 recite a "4G communication standard." *See* Ex. 1001, 42:47–43:3, 44:3–33. In particular, claim 1 requires a "first antenna" configured to "support at least three frequency bands" including "at least one" frequency band "associated with a 4G communication standard." *Id.* at 42:50–57. Further, claim 12 requires a "first antenna" configured to "transmit and receive signals from a 4G communication standard" and a "second antenna" configured to "receive signals from a 4G communication standard." *Id.* at 44:20–25.

Independent claim 6 does not reference a "4G communication standard." *See* Ex. 1001, 43:19–48.

(c) Petitioner's Contentions

Petitioner contends that Baliarda-543 (filed as the '429 application) qualifies as prior art for independent claims 1 and 12 and their respective dependent claims 2–5 and 13–20 because:

(1) claims 1–5 and 12–20 are not entitled to the benefit of priority to the '429 application's December 21, 2006, filing date due to the '429 application's failure to satisfy the written-description requirement for claims 1–5 and 12–20; and

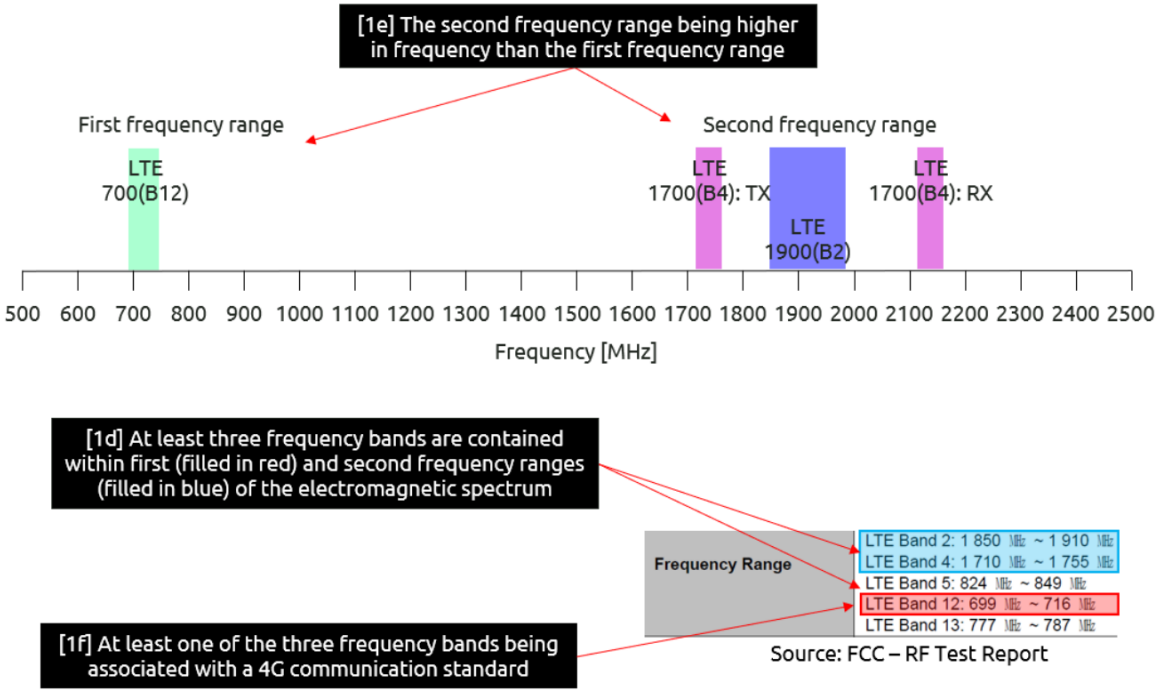
(2) the "earliest possible effective filing date" for claims 1–5 and 12–20 is April 7, 2014, i.e., the filing date of U.S. application no. 14/246,491 filed as a continuation of the '429 application.

See Pet. 3, 91–97.

More specifically, Petitioner asserts that an ordinarily skilled artisan would have understood that "4G communication standard" recited in claims 1 and 12 encompasses LTE frequency bands. Pet. 28–31. Petitioner

asserts that in the Geotab litigation Patent Owner "argued that the claimed '4G communication standard' is met by LTE." *Id.* at 91; *see id.* at 28, 30–31, 44; Prelim. Reply 4–5.

As support, Petitioner reproduces the following figure from Patent Owner's complaint against Petitioner in the Geotab litigation (Ex. 1024 ¶ 43(b)):



The above figure includes the text "[1e] The second frequency range being higher in frequency than the first frequency range" with an arrow pointing to a "First frequency range" including "LTE 700(B12)" and another arrow pointing to a "Second frequency range" including "LTE 1700(B4): TX," "LTE 1900(B2)," and "LTE 1700(B4): RX." *See* Pet. 31; Ex. 1024 ¶ 43(b). The above figure also includes the text "[1d] At least three frequency bands are contained within first (filled in red) and second frequency ranges (filled in blue) of the electromagnetic spectrum" with an arrow pointing to "LTE Band 12: 699 MHz ~ 716 MHz" highlighted in red and another arrow

pointing to "LTE Band 2: 1850 MHz ~ 1910 MHz" highlighted in blue and "LTE Band 4: 1710 MHz ~ 1755 MHz" also highlighted in blue. *See* Pet. 31; Ex. 1024 ¶ 43(b). The above figure further includes the text "[1f] At least one of the three frequency band being associated with a 4G communication standard" and an arrow pointing to "LTE Band 12: 699 MHz ~ 716 MHz" highlighted in red. *See* Pet. 31; Ex. 1024 ¶ 43(b).

Petitioner asserts that as of the '429 application's December 21, 2006, filing date, "the LTE frequency bands had not even been defined and what frequency ranges they might eventually use was an 'open issue.'" Pet. 92 (emphasis omitted) (citing Ex. 1007 ¶¶ 302–307; Ex. 1025; Ex. 1026, 7; Ex. 1036, 84; Ex. 1037, 108; Ex. 1038, 112; Ex. 1039, 497–502); *see* Prelim. Reply 4.

Regarding LTE band 12 (699-716 MHz uplink and 728-746 MHz downlink) referenced in Patent Owner's complaint against Petitioner in the Geotab litigation, Petitioner asserts that this band was not available for "use with mobile communications" or "use in any cellular communication, let alone LTE or 4G communication," as of the '429 application's December 21, 2006, filing date. Pet. 92–94 (emphases omitted); *see* Prelim. Reply 4–5. Petitioner explains that "the spectrum at 698-806 MHz (spanning the frequencies where LTE bands 12, 13, and 14 were later defined)" was:

(1) "occupied by television broadcasters in TV Channels 52-69" and "could not be used for cellular communication" as of the '429 application's December 21, 2006, filing date; and

(2) unavailable for cellular communication until October/November 2007.

Pet. 93–94, 97 (emphasis omitted) (citing Ex. 1007 ¶¶ 308–310; Ex. 1039, 498, 501; Ex. 1041, 1; Ex. 1045, 3); *see* Prelim. Reply 4–5.

Petitioner asserts that the '429 application's "suggestion that 4G would include bands within a 2-11 GHz frequency range provides no description of the 698-806 MHz frequency range that would later include" LTE bands 12, 13, and 14. Pet. 96 (citation omitted) (citing Ex. 1040 ¶ 212). Petitioner also asserts that the '429 application expressly distinguishes frequency bands allocated to television because "the '429 application states that 'the integration of an antenna system into the MFWD 100 is further complicated by the presence in the MFWD 100 of additional antennas . . . for reception of . . . TV.'" *Id.* at 96–97 (alterations by Petitioner) (quoting Ex. 1040 ¶ 96); *see* Prelim. Reply 5.

Further, Petitioner asserts that an ordinarily skilled artisan "reading the '429 application on December 21, 2006 would have concluded that the applicants did not possess a wireless device with an antenna configured to support an LTE frequency band" or "configured to transmit and receive" LTE signals because "the LTE frequency band definition was an 'open issue' and the frequency ranges for LTE bands had not been selected." Pet. 94 (emphases omitted) (citing Ex. 1007 ¶ 311). According to Petitioner, on December 21, 2006, "when the '429 application was filed, no one could have determined whether any antenna disclosed in the application" was configured to support a frequency band "associated with" LTE or to send/receive LTE signals because "the LTE frequency bands had not yet even been defined." *Id.* (emphasis omitted) (citing Ex. 1007 ¶ 311).

Additionally, Petitioner asserts that an ordinarily skilled artisan "would have concluded that the applicants did not possess an antenna

configured to send or receive signals in the 698-806 MHz spectrum," including LTE band 12 that Patent Owner relies on in the Geotab litigation, for "communication with any '4G communication standard' because those frequencies were not usable for any mobile device communications at the time of filing." Pet. 94 (emphasis omitted) (citing Ex. 1007 ¶ 313).

Therefore, according to Petitioner, the '429 application "fails to provide written description for the full scope" of (1) a frequency band "associated with a 4G communication standard" according to claim 1 and (2) an antenna configured to "transmit and receive signals from a 4G communication standard" according to claim 12 that includes LTE bands 12, 13, and 14. Pet. 95 (emphases omitted).

(d) Patent Owner's Contentions

Patent Owner contends that (1) the '677 patent and Baliarda-543 "share an identical disclosure," (2) all claims in the '677 patent are entitled to the benefit of priority to the '429 application's December 21, 2006, filing date, and (3) "Baliarda-543 is not prior art." Prelim. Resp. 2–3.

Patent Owner also contends that the "only disagreement" between the parties is how "4G communication standard" would have been understood by an ordinarily skilled artisan as of the '429 application's December 21, 2006, filing date, not whether the '429 application provides written-description support for "4G communication standard." Prelim. Resp. 28; *see id.* at 30; Prelim. Sur-reply 5. According to Patent Owner, Petitioner attempts to "twist a run-of-the-mill claim construction disagreement" into written-description issue in "an unsupported effort" to deny the '677 patent its priority date. Prelim. Resp. 3, 28; *see* Prelim. Sur-reply 5.

Patent Owner asserts that the LTE project "shifted from study to reality" by June 2006 and that the "LTE standard" was "essentially established" before the '429 application's December 21, 2006, filing date. Prelim. Resp. 16–17 (citing Ex. 2012; Ex. 2013; Ex. 2014; Ex. 2016, 56).

Further, Patent Owner asserts that it is "clear from the specification" of the '429 application/'677 patent that "the inventors were in possession of" antennas configured to support a frequency band "associated with a 4G communication standard." Prelim. Resp. 30. Patent Owner asserts that the specification provides "ample examples of 4G services and their associated frequencies." *Id.* at 31.

As support, Patent Owner cites the following disclosure in the specification about suitable frequency bands:

> A MFWD incorporating 3.5G or 4G features (i.e. comprising 3G and other advanced services such as for instance HSDPA, WiBro, WiFi, WiMAX, UWB or other high-speed wireless standards, hereinafter 4G services) might require operation in additional frequency bands corresponding to said 4G standards (for instance, bands within the frequency region 2-11 GHz and some of its sub-regions such as for instance 2-11 GHz, 3-10 GHz, 2.4-2.5 GHz and 5-6 GHz or some other bands). In some cases, to achieve a maximum volume compactness it would be advantageous that the same antenna system is capable of supporting the radiation modes corresponding to the additional frequency bands.

Prelim. Resp. 30–31 (citing Ex. 1001, 25:1–12); *see* Ex. 1001, 25:1–12. Patent Owner specifically identifies the disclosure of "other high-speed wireless standards" and "additional frequency bands corresponding to said 4G standards." Prelim. Resp. 30 (quoting Ex. 1001, 25:3–6).

Regarding LTE band 12, Patent Owner asserts that "a study started in 2004 had the objective of developing the LTE framework for 'flexible use of

existing and new frequency bands.'" Prelim. Sur-reply 5 (emphasis omitted) (quoting Ex. 1026, 7). Therefore, according to Patent Owner, an ordinarily skilled artisan "would have understood that LTE, a '4G communication standard,' would have operated at new and different bandwidth (i.e., frequency) allocations." *Id.*

Additionally, Patent Owner asserts that Petitioner improperly relies on Patent Owner's litigation statements "for at least two reasons." Prelim. Resp. 27 n.2. First, the district court in the Geotab litigation has not "issued a claim construction." *Id.* Second, the test for written-description support "requires an objective inquiry into the four corners of the specification from the perspective of" a person of ordinary skill in the art. *Id.* (emphasis omitted) (quoting *Ariad*, 598 F.3d at 1351). Thus, according to Patent Owner, "it is improper to rely on" litigation statements. *Id.*

(e) Analysis

Based on the current record, and for the reasons explained below, we agree with Petitioner that Baliarda-543 (filed as the '429 application) qualifies as prior art for claims 1–5 and 12–20. *See* Pet. 28–31, 89–97; Ex. 1007 ¶¶ 103–111, 292–317.

Claim 1 requires a "first antenna" configured to "support at least three frequency bands" including "at least one" frequency band "associated with a 4G communication standard." Ex. 1001, 42:50–57. Claim 12 requires a "first antenna" configured to "transmit and receive signals from a 4G communication standard" and a "second antenna" configured to "receive signals from a 4G communication standard." *Id.* at 44:20–25.

The parties agree that "4G communication standard" recited in claims 1 and 12 encompasses LTE frequency bands. *See* Pet. 28–31, 91;

Prelim. Resp. 13–17; Prelim. Reply 4; Prelim. Sur-reply 5. LTE frequency bands include the following FDD bands for uplink (UL) and downlink (DL):[12]

Band	Frequencies UL/DL (MHz)
1	1920-1980/2110-2170
2	1850-1910/1930-1990
3	1710-1785/1805-1880
4	1710-1755/2110-2155
5	824-849/869-894
6	830-840/875-885
7	2500-2570/2620-2690
8	880-915/925-960
9	1750-1785/1845-1880
10	1710-1770/2110-2170
11	1428-1453/1476-1501
12	698-716/728-746
13	777-787/746-756
14	788-798/758-768
17	704-716/734-746

Ex. 1026, 11 (Table 1); *see* Ex. 1039, 498 (Table 20.1).

In the Geotab litigation, Patent Owner identified LTE band 12 as a frequency band covered by a "4G communication standard." Ex. 1024 ¶ 43(b); *see* Ex. 1007 ¶ 110. At this stage of the proceeding, Patent Owner does not dispute that it identified LTE band 12 as a frequency band covered

[12] LTE "uses Frequency Division Duplexing (FDD)" that "separates uplink and downlink transmissions into distinct frequency sub-bands." Ex. 1007 ¶ 144.

by a "4G communication standard." *See* Prelim. Resp. 2–3, 13–17, 25–31; Prelim. Sur-reply 5.

To satisfy the written-description requirement, the inventor must have possession of the claimed invention as interpreted to encompass an allegedly infringing product. *See Rivera*, 857 F.3d at 1319–22; *ICU Med.*, 558 F.3d at 1372–73, 1377–79. For purposes of the written-description requirement, the "invention" is "whatever is now claimed." *Vas-Cath*, 935 F.2d at 1564 (emphasis omitted).

Based on the current record, and as Petitioner asserts, LTE band 12 was not available for "use with mobile communications" or "use in any cellular communication, let alone LTE or 4G communication," as of the '429 application's December 21, 2006, filing date. *See* Ex. 1007 ¶¶ 308, 310; Pet. 92–94. For instance, a Federal Communications Commission report adopted on July 31, 2007, notes that the 698-806 MHz spectrum "currently is occupied by television broadcasters in TV Channels 52-69." Ex. 1045, 1, 3; *see* Ex. 1007 ¶ 310. The 698-806 MHz spectrum includes LTE band 12 with 698-716 MHz for uplink and 728-746 MHz for downlink. *See* Ex. 1026, 11 (Table 1); Ex. 1039, 498 (Table 20.1). At this stage of the proceeding, Patent Owner does not dispute that as of July 31, 2007, the 698-806 MHz spectrum was "occupied by television broadcasters in TV Channels 52-69." *See* Prelim. Resp. 2–3, 25–31; Prelim. Sur-reply 5.

Thus, based on the current record, Petitioner demonstrates a reasonable likelihood that as of the '429 application's December 21, 2006, filing date, the '429 application did not "reasonably convey[] to those skilled in the art that the inventor had possession" of "an antenna configured to send or receive signals in the 698-806 MHz spectrum," including LTE band 12

that Patent Owner relies on in the Geotab litigation, for "communication with any '4G communication standard' because those frequencies were not usable for any mobile device communications at the time of filing." *See* Pet. 94 (emphasis omitted); Ex. 1007 ¶¶ 310, 312–313, 316–317; Ex. 1045, 1, 3; *Ariad*, 598 F.3d at 1351.

Accordingly, based on the current record, Petitioner demonstrates a reasonable likelihood that the '429 application does not satisfy the written-description requirement for independent claims 1 and 12 and their respective dependent claims 2–5 and 13–20. *See* Ex. 1007 ¶¶ 313, 316–317. Hence, Petitioner demonstrates a reasonable likelihood that the '677 patent is not entitled to the benefit of priority to the '429 application's December 21, 2006, filing date, and that Baliarda-543 qualifies as prior art for claims 1–5 and 12–20.

As for Patent Owner's assertion that Petitioner improperly relies on Patent Owner's statements in the Geotab litigation because the district court in the Geotab litigation has not "issued a claim construction," we disagree. *See* Prelim. Resp. 27 n.2. Patent Owner's statements in the Geotab litigation constitute an opposing party's statements. Fed. R. Evid. 801(d)(2). Patent Owner cites no authority for the proposition that a party may rely on an opposing party's statements only if a district court has "issued a claim construction." *See* Prelim. Resp. 27 n.2. Petitioner does not rely on judicial estoppel, which requires an earlier judicial decision.[13] *See* Pet. 30–31, 91; Prelim. Reply 4.

[13] "Judicial estoppel is an equitable doctrine that prevents a litigant from taking a litigation position inconsistent with one successfully asserted in an earlier court proceeding." *Egenera, Inc. v. Cisco Sys., Inc.*, 972 F.3d 1367,

As for Patent Owner's assertion that Petitioner improperly relies on Patent Owner's statements in the Geotab litigation because the test for written-description support "requires an objective inquiry into the four corners of the specification from the perspective of" a person of ordinary skill in the art, Petitioner does not rely Patent Owner's statements in the Geotab litigation as evidence of what the four corners of the '429 application disclose. *See* Pet. 30–31, 91; Prelim. Resp. 27 n.2; Prelim. Reply 4. Rather, Petitioner relies on Patent Owner's statements in the Geotab litigation to show claim scope, i.e., that "4G communication standard" encompasses LTE frequency bands including LTE band 12. *See* Pet. 30–31, 91; Prelim. Reply 4.

As for Patent Owner's reliance on the '429 application's disclosures about "the frequency region 2-11 GHz," "other high-speed wireless standards," and "additional frequency bands corresponding to said 4G standards," those disclosures do not show possession of LTE band 12 with 698-716 MHz for uplink and 728-746 MHz for downlink. *See* Prelim. Resp. 30–31; Ex. 1001, 25:1–12; Ex. 1007 ¶¶ 316–317; Ex. 1040 ¶ 212. Even if LTE band 12 would have been obvious based on the '429 application's disclosures, "a description that merely renders the invention obvious" does not satisfy the written-description requirement. *See Ariad*, 598 F.3d at 1352.

1378 (Fed. Cir. 2020). Whether judicial estoppel applies depends on: (1) whether a party's earlier and later positions are "clearly inconsistent"—that is, "mutually exclusive"; (2) whether the party "succeeded in persuading a court to accept" the earlier position; and (3) whether the party would "derive an unfair advantage or impose an unfair detriment" on the other side if not estopped. *Id.* (quoting *New Hampshire v. Maine*, 532 U.S. 742, 750–51 (2001)).

Although Patent Owner asserts that the LTE project "shifted from study to reality" by June 2006 and that the "LTE standard" was "essentially established" before the '429 application's December 21, 2006, filing date, Patent Owner cites nothing showing that the "LTE standard" as it may have existed on that filing date contemplated any part of the 698-806 MHz spectrum. *See* Prelim. Resp. 16–17 (citing Ex. 2012; Ex. 2013; Ex. 2014; Ex. 2016, 56); Ex. 2012; Ex. 2013; Ex. 2014; Ex. 2015; Ex. 2016.

3. WHETHER BALIARDA-543 ANTICIPATES OR RENDERS OBVIOUS CLAIMS 1–5 AND 12–20

Petitioner contends that "Baliarda-543 has the same specification as the '677 patent" and anticipates or renders obvious claims 1–5 and 12–20. *See* Pet. 97–98. As support, Petitioner provides the following table showing where Baliarda-543 allegedly discloses each limitation in claims 1–5 and 12–20:

'677 claim limitation	**Corresponding Disclosure in Baliarda-543**
1.pre	Abstract, [0002], [0037], claim 16
1.a	Abstract, [0082]-[0084], [0097], [0152], [0212]-[0215], claim 16
1.b	[0082]-[0084], [0213]-[0217]
1.c	[0032]-[0035], [0098]-[0100], [0103], [0117]-[0118], [0212]-[0215], [0265], [0300], [0324]-[0325], Figs. 12A, 19A
1.d	*See* [1.c]; [0040], [0092], [0098]-[0100], [0212]-[0215], [0241]
1.e	[0137], [0141]-[0144], [0213]-[0215], Fig. 12B
1.f	[0181]-[0183], [0213]
1.g	[0212]-[0215]
1.h	[0198], [0215]
2	[0141]-[0149], [0270], Fig. 12A
3	*See* claim 2

'677 claim limitation	**Corresponding Disclosure in Baliarda-543**
4	[0103], [0212]-[0215]
5.a	*See* [1.e]
5.b	*See* [1.f]
12.pre	*See* [1.pre]
12.a	*See* [1.a]
12.b	*See* [1.b]
12.c	*See* [1.c]
12.d	*See* [1.d]
12.e	*See* [1.e]
12.f	*See* [1.f]
12.g	*See* [1.d]
12.h	*See* [1.d]
12.i	[0114]-[0116], [0226], Fig. 1B
12.j	[0133]-[0134], [0227]
12.k	[0154]-[0162], [0213]
13	*See* claim 2
14	*See* claim 2
15	[0213]
16.a	*See* [1.e]
16.b	*See* [1.f]
17	*See* claim 2
18	[0103], [0212]-[0215]
19.a	*See* [5.a]
19.b	*See* [5.b]
20	[0213]-[0215]

Id. at 98–100.

Petitioner explains that because "Baliarda-543's specification is materially identical to the '677 patent," Baliarda-543 "discloses species

within each" of claims 1–5 and 12–20 even if Baliarda-543 "does not disclose the full scope of each claim to a broad genus." Pet. 97–98 (citing *Chester v. Miller*, 906 F.2d 1574, 1577 (Fed. Cir. 1990)).

At this stage of the proceeding, Patent Owner does not dispute that Baliarda-543 anticipates or renders obvious claims 1–5 and 12–20 if Baliarda-543 qualifies as prior art. *See, e.g.*, Prelim. Resp. 2–3, 25–31; Prelim. Sur-reply 5. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. van der Weide's testimony, Petitioner establishes sufficiently for purposes of institution that Baliarda-543 anticipates or renders obvious claims 1–5 and 12–20. *See* Pet. 97–100; Ex. 1007 ¶¶ 320–323.

4. SUMMARY

For the reasons discussed above, Petitioner demonstrates a reasonable likelihood of proving that Baliarda-543 qualifies as prior art for claims 1–5 and 12–20 and that Baliarda-543 anticipates or renders obvious claims 1–5 and 12–20. *See supra* §§ III.G.2(e), III.G.3. Hence, Petitioner demonstrates a reasonable likelihood of proving that claims 1–5 and 12–20 are unpatentable under § 102 or § 103 based on Baliarda-543.

IV. PETITIONER'S MOTION TO SEAL

A. Introduction

Petitioner filed a confidential version of the Petition as Paper 3 and a public version of the Petition as Paper 4. Petitioner filed confidential and public versions of Dr. van der Weide's declaration (Exhibit 1007). Additionally, Petitioner filed confidential versions of Exhibits 1047

and 1048. Concurrently with filing these confidential materials, Petitioner filed a Motion to Seal these confidential materials. Paper 5 ("Mot.").

Patent Owner has not submitted a paper responding to Petitioner's Motion to Seal.

B. Petitioner's Position

Petitioner contends that the confidential version of the Petition, the confidential version of Dr. van der Weide's declaration, and Exhibits 1047 and 1048 "contain information that [Patent Owner] designated as confidential under a protective order" in the Geotab litigation. Mot. 2. According to Petitioner, "[t]his information is not publicly available." *Id.*

C. Analysis

A strong public policy favors making all information filed in an *inter partes* review open to the public, e.g., because the proceeding determines the patentability of claims in an issued patent and, therefore, affects the rights of the public. *See Garmin Int'l, Inc. v. Cuozzo Speed Techs. LLC*, IPR2012-00001, Paper 34 at 1 (PTAB Mar. 14, 2013). Hence, in an *inter partes* review, the default rule is that all papers and exhibits are open and "available to the public." 35 U.S.C. § 316(a)(1); *see* 37 C.F.R. § 42.14. A party may, however, file papers or exhibits under seal along with a motion to seal, and then the papers or exhibits will be "treated as sealed pending the outcome of the ruling on the motion." 35 U.S.C. § 316(a)(1); *see* 37 C.F.R. § 42.14.

The Board's rules "identify confidential information in a manner consistent with Federal Rule of Civil Procedure 26(c)(1)(G), which provides for protective orders for trade secret or other confidential research, development, or commercial information." PTAB Consolidated Trial

Practice Guide at 19 (Nov. 2019) ("CTPG")[14] (citing 37 C.F.R. § 42.54); *see* 37 C.F.R. § 42.2 (defining "Confidential information"). The Board seeks to "strike a balance between the public's interest in maintaining a complete and understandable file history and the parties' interest in protecting truly sensitive information." CTPG at 19.

The movant bears the burden to establish entitlement to the requested relief. *See* 37 C.F.R. § 42.20(c). In deciding a motion to seal, the Board applies a "good cause" standard. *See* 37 C.F.R. § 42.54(a).

"The 'good cause' standard for granting a motion to seal reflects the strong public policy for making all information in an *inter partes* review open to the public." *Argentum Pharms. LLC v. Alcon Rsch., Ltd.*, IPR2017-01053, Paper 27 at 3 (PTAB Jan. 19, 2018) (informative). When assessing whether that standard has been met, we may consider whether the information at issue is truly confidential, whether harm would result from public disclosure, and whether the interest in maintaining confidentiality as to the information outweighs the strong public interest in an open record. *Id.* at 3–4.

We have reviewed the information at issue and determine that Petitioner has not satisfied the "good cause" standard for granting a motion to seal. The information at issue appears to relate to Patent Owner's contentions concerning how asserted patent claims cover allegedly infringing products that are publicly available. *See* Pet. ix, xii (Exhibit List) (describing Exhibits 1047 and 1048 as charts to Exhibit 1016 titled "Plaintiff's Disclosure of Asserted Claims and Infringement Contentions

[14] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

Against Geotab Pursuant to Local Patent Rules 3-1 and 3-2"). Petitioner's contention that the information at issue (1) "contain[s] information that [Patent Owner] designated as confidential under a protective order" in the Geotab litigation and (2) "is not publicly available" fails to show that the information at issue is truly confidential, that harm would result from public disclosure, or that the interest in maintaining confidentiality as to the information outweighs the strong public interest in an open record. *See* Mot. 2; *Argentum*, IPR2017-01053, Paper 27 at 3–4. Further, Patent Owner has not asserted that the information at issue constitutes "trade secret or other confidential research, development, or commercial information." *See* 37 C.F.R. § 42.2.

For these reasons, we deny Petitioner's Motion to Seal without prejudice.

V. CONCLUSION

Based on the arguments and evidence presented by the parties, we determine that there is a reasonable likelihood Petitioner would prevail with respect to at least one claim challenged in the Petition. Hence, we institute an *inter partes* review of all challenged claims on all challenges included in the Petition. *See SAS Inst. Inc. v. Iancu*, 584 U.S. 357, 364–65 (2018) (noting that the language of 35 U.S.C. § 314(b) "indicates a binary choice—either institute review or don't"); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute as requiring "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"); 37 C.F.R. § 42.108(a).

At this preliminary stage, we have not made a final determination about the patentability of any challenged claim, the construction of any claim term, phrase, or limitation, or any other legal or factual issue.

VI. ORDER

Accordingly, it is

ORDERED that, according to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 in the '677 patent is instituted on all challenges included in the Petition;

FURTHER ORDERED that Petitioner's Motion to Seal (Paper 5) is denied without prejudice; and

FURTHER ORDERED that, according to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial that commences on the entry date of this decision.

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