

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GEOTAB INC. AND GEOTAB USA, INC.
Petitioners,

v.

FRACTUS, S.A.,
Patent Owner.

Case No. IPR2025-01026
Patent 11,031,677

PATENT OWNER'S PRELIMINARY RESPONSE

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Ex. 2001	PACER Docket Reports from July 28, 2025 in <i>Fractus, S.A. v. Verizon Connect Inc. et al</i> , 2:24-cv-01009-JRG-RSP (E.D.Tex.) and <i>Fractus, S.A. v. Geotab Inc.</i> 2:24-cv-01008-JRG-RSP (E.D.Tex.)
Ex. 2002	Defendants' Preliminary Invalidity Contentions dated June 18, 2025 in 2:24-cv-01009-JRG-RSP (E.D.Tex.)
Ex. 2003	Invalidity Contentions for U.S. Patent No. 11,031,677 in 2:24-cv-01009-JRG-RSP (E.D.Tex.)
Ex. 2004	Amended Docket Control Order dated April 10, 2025 in 2:24-cv-01009-JRG-RSP (E.D.Tex.)
Ex. 2005	Complaint dated December 6, 2024 in 2:24-cv-01008-JRG-RSP (E.D.Tex.)
Ex. 2006	Docket Navigator Time to Trial Statistics for Judge Rodney Gilstrap (last accessed July 23, 2025)
Ex. 2007	Declaration of Mark J. DeBoy
Ex. 2008	DECLARATION IN SUPPORT OF PATENT OWNER'S MOTION FOR <i>PRO HAC VICE</i> ADMISSION OF LARRY L. SHATZER
Ex. 2009	RESERVED
Ex. 2010	Declaration of Hossein Hashemi, Ph.D.
Ex. 2011	Jack H. Winters, "Smart Antennas for Wireless Systems," IEEE Personal Communications, February 1998

Ex. 2012	3GPP TSG RAN Meeting #26, Document No. RP-040496, “Report of the 3GPP TSG RAN Long Term Evolution Work Shop,” 2 -3 November 2004, Toronto, Canada”
Ex. 2013	3GPP TSG-RAN meeting #28, Document No. RP-050371, “Presentation of Specification to TSG or WG,” Québec City, Quebec, 1–3 June 2005
Ex. 2014	3GPP TSG-RAN meeting #32, Document No. RP-060226, “List of CRs. Supplement to Report from RAN WG2,” Warsaw, Poland, 31 st May - June 2006
Ex. 2015	Hannes Ekstrom, et al. “Technical Solutions for the 3G long- term evolution,” IEEE Communications Magazine • March 2006
Ex. 2016	Takehiro Nakamura, et al., “Super 3G Technology Trends, Part 1: Super 3G Overview and Standardization Activities,” NTT DoCoMo Technical Journal Vol. 8, No. 1

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I. INTRODUCTION

Fractus, S.A. ("Patent Owner") requests that the Board decline to institute *inter partes* review ("IPR"), because the Petition's invalidity grounds fail to render obvious claims 1-20 of U.S. Patent No. 11,031,677 ("the '677 Patent"). Grounds 1 and 2 of the Petition are predicated on the alleged obviousness of replacing the two antennas of the primary reference Dou with two copies of an antenna described in the secondary reference, Ciais-Quadband. This proposed substitution, however, violates the express teachings of Dou and renders Dou's antenna system inoperable for its intended purpose. An objective of Dou's antenna architecture is to achieve "spatial diversity" between two antennas at opposite ends of a printed circuit board within a wireless device. EX1013 at 1 (Title, Abstract), [0017], [0022], [0023]; EX2010 (Expert Declaration of Dr. Hossein Hashemi) at ¶ 36. Antenna spatial diversity improves communication of wireless signals by increasing the likelihood that at least one antenna is located where signal interference is relatively low. Because closely spaced antennas operating at the same frequency tend to experience similar interference levels, spatial diversity requires separating antennas by a sufficient distance to make their interference levels different. EX2010 at ¶ 35. Consistent with well-known spatial diversity principles, Dou specifies a spacing between its two antennas of at least a quarter-wavelength at the lowest frequency of the antennas. EX1013 at ¶ [0024].

By the very dimensions of the proposed Dou+Ciais-Quadband antenna spelled out in Ground 1 of the Petition, the spacing left between the two antennas is only about half that specified by Dou's explicit at-least-a-quarter-wavelength specification. EX2010 at ¶¶ 47-50. A person having ordinary skill in the art (POSITA) would immediately recognize that this proposed modification would destroy the very spatial diversity that Dou's antenna design sought to achieve. *Id.* Because Ground 1 is based on a proposed modification that renders Dou's antenna system inoperable for its intended purpose and leaves no reasonable expectation of anticipated success, Ground 1 fails to render obvious claims 1-9 of the '677 Patent.

The foundation of Ground 2, alleging the invalidity of claims 1-20, is the same as Ground 1, merely adding another antenna from Nakano "alongside" the Dou+Ciais-Quadband antenna system proposed in Ground 1. Ground 2, consequently, fails for the same reasons as Ground 1. *See id.* at ¶ 53.

Ground 3 purports to show the invalidity of claims 1-5 and 12-20 of the '677 Patent based on a pre-grant publication of an application within the '677 Patent's priority chain, U.S. Patent Publication No. 2008/0018543 to Baliarda *et al.* ("Baliarda-543"). Baliarda-543 and the '677 Patent share an identical disclosure. Petition at 97. The Petition, nevertheless, alleges that the '677 Patent is not entitled to its priority date, or even the priority date of Baliarda-543. This allegation is specious. Petitioners argue that the '677 Patent is not entitled to its priority date

because claims 1 and 12 use the expression "4G communication standard," and the '677 Patent purportedly fails to provide written description for the full scope of this term. The Petition does *not* argue that this expression is unsupported in the '677 Patent specification. The Petition instead argues that Patent Owner's litigation claim construction arguments have, somehow, expanded the scope of the term such that its full scope was not supported by the '677 Patent as of its priority date. Petition at 31. Patent Owner's claims constructions arguments were, however, based on how a POSITA would have understood "4G communication standard" in June of 2006. In other words, the Petition attempts to recast a run-of-the-mill claim construction disagreement as a written description issue in an unsupported effort to convince the Board to deny the '677 Patent its priority date. The '677 Patent, however, is entitled to the priority dates of its parent applications; therefore, Baliarda-543 is not prior art to the '677 Patent, and Ground 3 fails to anticipate or render obvious any claim of the '677 Patent.

II. BACKGROUND

A. The '677 Patent

The '677 Patent is entitled "Multiple-Body-Configuration Multimedia and Smartphone Multifunction Wireless Devices," and issued on June 8, 2021. EX1001 at 1. The '677 Patent issued from U.S. Patent Application No. 16/832,820, filed on March 27, 2020, which is a continuation of U.S. Patent Application No. 15/856,626,

filed on December 28, 2017 (now U.S. Patent No. 10,644,380), which is a continuation of U.S. Patent Application No. 14/738,090, filed on June 12, 2015 (now U.S. Patent No. 9,899,727), which is a continuation of U.S. Patent Application No. 14/246,491, filed on April 7, 2014 (now U.S. Patent No. 9,099,773), which is a continuation of U.S. Patent Application No. 11/614,429, filed on December 21, 2006 (now U.S. Patent No. 8,738,103), claiming benefit of U.S. Provisional Patent Application No. 60/831,544, filed on July 18, 2006 and U.S. Provisional Patent Application No. 60/856,410, filed on November 3, 2006.

The aforementioned priority application No. 11/614,429 was also published as U.S. Patent Publication No. 2008/0018543 on January 24, 2008, identified in the Petition as Baliarda-543. EX1040. The subject matter disclosed in the '677 Patent is the same as that disclosed in its priority application Baliarda-543, *i.e.*, no continuation-in-part applications exist in the priority chain, and no new subject matter was ever added at any point in the priority chain. *E.g.*, Petition at 97.

The '677 Patent describes a wireless device having a multiband antenna system with two or more antennas, at least one of which has a complex shape that can be characterized by a set of complexity factors that relate to different structural and functional features of the antenna. By overlaying different-sized grids on a contour of an antenna and evaluating the number of cells within the grid spanned by the contour, attributes of the antenna's complexity can be determined. For example,

a complexity factor F_{21} , determined from the cell counts from grids with large-sized and medium-sized cells, characterizes the complexity and degree of convolution of features of the antenna contour that appear when the contour is viewed at relatively coarser levels of scale. EX1001 at 19:15-18. Consequently, complexity factor F_{21} tends to increase with the number of antenna portions within the structure of the antenna system, typically associated with more frequency bands or radiation modes. *Id.* at 19:37-49. A complexity factor F_{32} , determined from the cell counts from grids with medium-sized and small-sized cells, characterizes the complexity and degree of convolution of features of the antenna contour that appear when the contour is viewed at relatively finer levels of scale. *Id.* at 20:5-9. Consequently, complexity factor F_{32} tends to increase when the antenna contour includes a highly convoluted curve and reveals the degree of miniaturization achieved by the antenna system. *Id.* at 20:16-27. Evaluating an antenna using such complexity factors reveals its suitability for specific applications. *See, e.g., Id.* at 21:23-26:53.

The claims of the '677 Patent recite wireless devices including antenna systems with at least two antennas and which include antenna structures that meet specific complexity factor requirements in distinctive combinations with particular frequency bands that are supported by the antenna systems. As will be evident from the arguments herein, the patentability of the subject matter of these claims is

reinforced by Petitioners' failure to identify prior art that establishes anticipation or obviousness.

B. Technical Background – Antenna Spatial Diversity

Spatial diversity is a technique in wireless communications that uses multiple antennas to improve signal reliability and performance by mitigating the effects of multipath fading and other interference. 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. EX2010 at ¶ 35. The phase-shifted versions of the signal may result in constructive or destructive interference with each other. *Id.* Such interference is spatially dependent – it varies from one spot to another based on the relative phases of the phase-shifted versions of the signal at different locations. *Id.* Two locations separated by a small fraction of the wavelength of the wireless signal tend to experience similar fading and interference characteristics. *Id.* Consequently, two closely spaced antennas cannot provide effective spatial diversity. *Id.* Conversely, by providing sufficient spacing between two antennas, 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.* A commonly accepted rule of thumb is that at least a quarter-wavelength spacing between antennas is

necessary to provide effective spatial diversity and, in some contexts, a larger distance such as a half-wavelength spacing or more may be preferable. *Id.*; EX2011 at 23 (“quarter-wavelength spacing of the antennas is sufficient”).

C. Petitioners' Art

i. Dou

U.S. Patent Application No. 11/361,860 to Dou *et al.*, entitled "Internal Diversity Antenna Architecture" ("Dou" or EX1013), was filed on February 24, 2006, and was published as U.S. Patent Publication No. 2007/0200773 on August 30, 2007. Dou is generally directed to an antenna architecture that includes first and second antennas located near opposite ends of a printed circuit board (PCB) such that the spacing between two antennas provides spatial diversity. EX2010 at ¶ 36. Fig. 2A of Dou shows an internal diversity antenna structure comprising first and second internal antennas 206, 208 on a PCB 204 within a wireless device 200. The first internal antenna 206 is positioned near the top edge of the PCB 204, and the second internal antenna 208 is positioned near the bottom edge of the PCB 204. EX1013 at ¶ [0017]. Dou explains that:

first internal antenna 206 and the 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.

Id. at ¶ [0022], emphasis added. *See also id.* at ¶¶ [0032], [0036] (describing other internal diversity embodiments); EX2010 at ¶ 36.

Consistent with generally accepted spacing requirements to achieve spatial diversity, Dou specifies the following spacing dimensions:

In the embodiment shown in FIG. 2A, for example, the length (L) of the wireless device 200 may be greater than 0.3 wavelength ($>0.3\lambda$) of the lowest frequency, **and the first internal antenna 206 and the second internal antenna 208 may be separated by a distance (D) that is no less than the quarter wavelength ($\geq\lambda/4$) of the lowest frequency.**

Id. at ¶ [0024], emphasis added. *See also* EX2010 at ¶ 37.

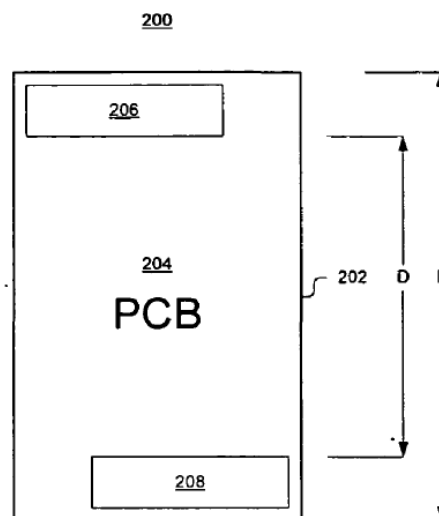


FIG. 2A

In fact, Dou emphasizes the importance of the quarter-wavelength spacing between the two antennas by reciting this limitation in the claims themselves:

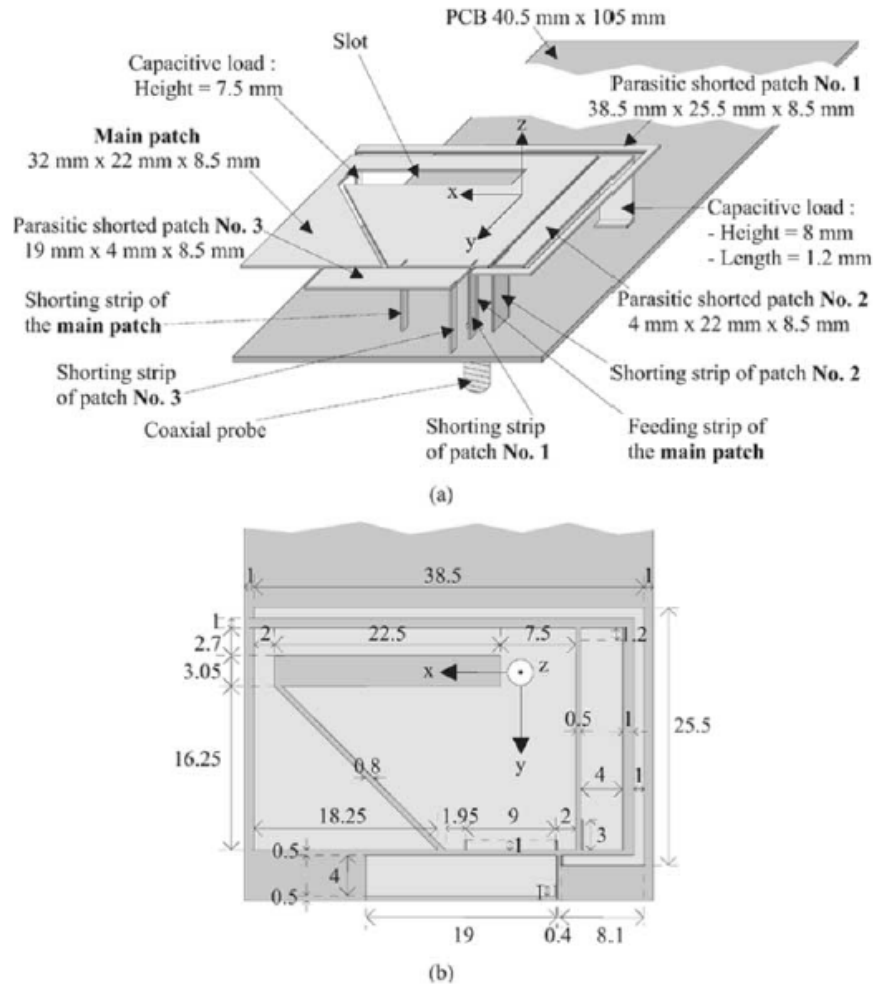
8. The wireless device of claim 2, **said first diversity antenna and said second diversity antenna separated by a distance greater than or equal to a quarter wavelength of a lowest operating frequency of said wireless device.**⁷

Id. at Claim 8 (emphasis added). *See also* EX2010 at ¶ 38.

Applying Dou's antenna spacing specification to a frequency of, for example, 870 MHz results in a minimum spacing between the antennas of 86.2 mm. EX2010 at ¶ 39. Specifically, the wavelength λ corresponding to a frequency of 870 MHz is 344.8 mm. At this wavelength, the spacing D between Dou's first and second antennas 206, 208, which is specified to be $\geq \lambda/4$, must be at least 86.2 mm. *Id.*

ii. Ciais-Quadband

Pascal Ciais et al., "Design of an Internal Quad-Band Antenna for Mobile Phones," *IEEE Microwave and Wireless Components Letters*, vol. 14, no. 4, pp.148-150, April 2004 ("Ciais-Quadband" or EX1009) discloses a planar inverted-F antenna (PIFA) suitable for cellular telephone applications. In the sole embodiment described by Ciais-Quadband and shown in Figs. 1A and 1B, a single antenna is located at a short end of a PCB ground plane and consists of a main patch with a slot, three quarter-wavelength parasitic elements, and capacitive loads that create additional resonances at four different frequencies. EX1009 at 148; EX2010 at ¶¶ 40-42.

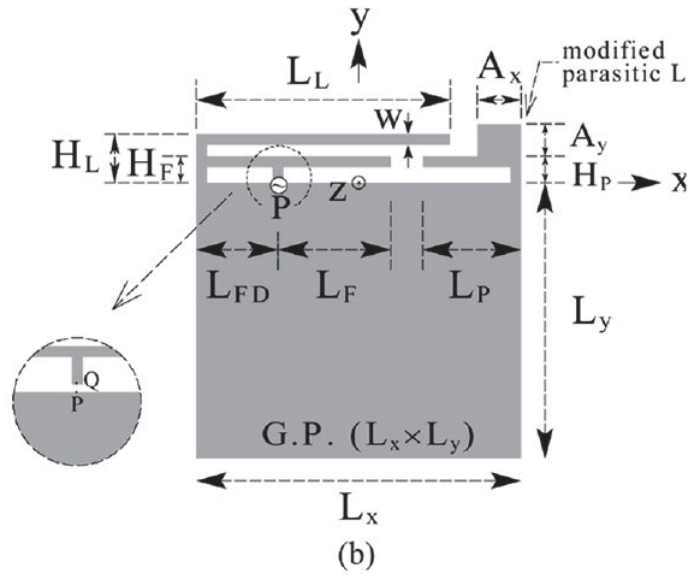


As shown in Figs. 1A and 1B, the overall dimensions of Ciais-Quadband's antenna are 38.5 mm x 28.5 mm with a height (spacing from the PCB) of 8.5 mm. The antenna has clearances of 0.5 mm from the end (short) edge of the PCB and 1.0 mm from each of the side (long) edges of the PCB. The PCB dimensions are 40.5 mm x 105.0 mm. *Id.* at 148-149. Ciais-Quadband identifies the lowest band of the antenna as 870-960 MHz, i.e., 870 MHz is the lowest frequency of the Ciais-Quadband antenna. *Id.* at 149.

Because Ciais-Quadband does not attempt to provide antenna diversity, Ciais-Quadband includes only a single quad-band antenna located at one of the short ends of the PCB. Ciais-Quadband, consequently, does not contend with the issue of a suitable spacing between two such antennas to provide spatial diversity or whether the size and shape of such an antenna is practical to enable spatial diversity in a wireless device. EX2010 at ¶ 42

iii. Nakano

H. Nakano et al. "An Inverted FL Antenna for Dual-Frequency Operation," *IEEE Transactions on Antennas and Propagation*, vol. 53, no. 8, pp. 2417-2421, Aug. 2005 ("Nakano" or EX1012) describes an inverted FL antenna (InvFLA) designed to obtain dual-frequency operation for the wireless LAN frequencies of 2.45 GHz and 5.2 GHz. EX1012 at 2417. Nakano's antenna is made of a thin, flat conducting film implemented in a card-type structure in which the antenna is coplanar with a ground plane and extends from a long side of the ground plane. *Id.* at 2417-2418. The ground plane dimensions are 30 mm (L_x) x 25.5 mm (L_y), and the antenna dimensions are 30 mm x 5.5 mm. *Id.* at 2418-2420. As shown in Fig. 1(b) of Nakano, the antenna includes three sub-elements: an inverted L element, an inverted F element, and a parasitic inverted L element. *Id.* at 2418.



iv. Baliarda-543

U.S. Patent Publication No. 2008/0018543 to Baliarda et al. ("Baliarda-543") is the pre-grant publication of U.S. Application No. 11/614,429 (the "'429 Application"). The '429 Application is contained within the '677 Patent's priority chain:

This application is a continuation of U.S. patent application Ser. No. 15/856,626 filed Dec. 28, 2017, which is a continuation of U.S. patent application Ser. No. 14/738,090 filed Jun. 12, 2015, which is now U.S. Pat. No. 9,899,727, issued on Feb. 20, 2018, which is a continuation of U.S. patent application Ser. No. 14/246,491 filed Apr. 7, 2014, which is now U.S. Pat. No. 9,099,773, issued on Aug. 4, 2015, which is a continuation of U.S. patent application Ser. No. 11/614,429 filed Dec. 21, 2006, which is now U.S. Pat. No. 8,738,103, issued on May 27, 2014, which claims the benefit of U.S. Provisional Application No. 60/831,544, filed on Jul. 18, 2006, and claims the benefit of U.S. Provisional Application No. 60/856,410, filed on Nov. 3, 2006, the entire contents of which are hereby incorporated by reference. This patent application further claims priority from, and incorporates by reference the entire disclosure of European Patent Application No. EP 06117352.2, filed Jul. 18, 2006.

EX1001 at 1.

The Parties agree that the specifications of the '429 Application and Baliarda-543 are materially identical to that of the '677 Patent. Petition at 97.

III. CLAIM CONSTRUCTION

Claims in this IPR are construed "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art." 37 C.F.R. § 42.100. Patent Owner does not necessarily agree with Petitioners' claim construction as presented in the Petition (Petition at 13-31), or in any other proceeding, but any differences are not directly pertinent to any of the arguments Patent Owner is making in this Preliminary Response and, accordingly, are not addressed. Patent Owner, however, reserves the right to challenge Petitioners' claim construction and to provide different and additional constructions if an IPR is instituted.

Patent Owner respectfully submits that for the purpose of this Preliminary Response the Board can resolve all issues without an explicit construction of any claim term – the plain and ordinary meaning of all terms amply illustrates that the invalidity grounds presented in the Petition fail to show a likelihood of invalidating any claim of the '677 Patent. Nevertheless, Patent Owner provides the following

discussion of how a POSITA would have understood "4G communication standard" at the time of the earliest priority date for the '677 Patent.

Claim 1 recites "a first antenna within the wireless device and configured to support at least three frequency bands ... at least one of the three frequency bands being associated with a **4G communication standard**." Claim 12 includes a similar recitation of "a first antenna within the wireless device ... configured to transmit and receive signals from a **4G communication standard**." Patent Owner's position has consistently been that "4G communication standard" should be given its ordinary and customary meaning under the *Phillips* claim construction standard, which evaluates how the expression "4G communication standard" would have been understood by a POSITA as of the priority date of the application in light of the specification, claims, and prosecution history of the '677 Patent and appropriate extrinsic evidence. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc).

To the extent, however, that a construction of the term is necessary for the Board's resolution of the issues in this proceeding, Patent Owner submits that a POSITA would have understood that "4G communication standard" refers to a technical specification related to the Fourth Generation (4G) of broadband cellular network technology, a position consistent with Patent Owner's position in the ADT litigation. *See* EX1017 at n. 9. A "first antenna ... configured to support at least three

frequency bands ... at least one of the three frequency bands being associated with a 4G communication standard" would be an antenna configured to support a frequency band associated with a technical specification related to the Fourth Generation (4G) of broadband cellular network technology.

The Specification of the '677 Patent explains that "4G standards" (which it sometimes calls "4G services") include "HSDPA, WiBro, WiFi, WiMax, UWB, or other high-speed wireless standards." EX1001 at 25:1-12. Thus, examples of the claimed "frequency bands being associated with a 4G communication standard" may include 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), as well as "additional frequency bands corresponding to said 4G standards." *Id.* at 25:1-12.

This construction is, generally, consistent with the position taken by Petitioners in the Petition:

Thus, "*4G communication standard*" is met by a "wireless standard" for "4G services" and "*antenna... configured to... receive signals from a 4G communication standard*" (or "*receive signals employing a 4G communication standard*") is met by an antenna that is operable in a frequency range used by a "4G service," where the "i.e." signal means that the patent defines a "4G service" as "comprising 3G and **other advanced services** such as for

instance **HSDPA, WiBro, WiFi, WiMAX, UWB or other high-speed wireless standards[.]**”

Petition at 29-30 (emphasis added).

As indicated in the emphases provided above, both Petitioners and Patent Owner agree that a "4G communication standard" as understood at the time of the priority date of the '677 Patent would have included "other high-speed wireless standards" beyond HSDPA, WiBro, WiFi, WiMAX, or UWB. Petitioners reject the suggestion that such "other high-speed wireless standards" would have been understood by a POSITA as including the Long Term Evolution or LTE standard. Petition at 91. The LTE standard, however, was essentially established before the 2006 priority date of the '677 Patent:

1. 3GPP, via the Technical Specification Group for the Radio Access Network (TSG RAN or RAN) defined the all-IP radio/Core split that would become LTE/EPC between 2004 and 2006. EX2012; EX2016 at 56.
2. A full requirements catalogue for the technology that would come to be known as "LTE" was approved at RAN #28 (June 2005). EX2013; EX2016 at 56.

3. In June 2006, a defined scope, objectives, schedule and the new specification list for the technology that became known as LTE was unanimously adopted by RAN. EX2014; EX2016 at 56.

In short: by June 2006, the LTE project within 3GPP TSG RAN shifted from study to reality. The 3GPP TSG RAN locked in the requirements for the technology, essentially laying down the architecture and performance foundation for LTE. Further, work understood as being representative of LTE was being performed prior to June 2006. EX2015, EX2016 at 56. Accordingly, by June 2006, prior to the earliest possible priority date for the '677 Patent, a POSITA would have understood that LTE was one of the "**other high-speed wireless standards**" disclosed in the '677 Patent. EX1001 at 25:2-4. Therefore, a "4G communication standard" would have been understood by a POSITA at the time of the '677 Patent's priority date as including LTE communication standards.

IV. THE PERSON OF ORDINARY SKILL IN THE ART

For purposes of this Preliminary Response only, Patent Owner assumes a POSITA definition asserted in the Petition. Petition at 11. Patent Owner, however, reserves the right to present its own definition in the event an IPR is instituted.

V. ARGUMENT

The Board may institute IPR of the claims of the '677 Patent only if the Petition "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.

The Petition has not met this threshold.

A. Ground 1 – Claims 1-9 are patentable over Dou in view of Ciais-Quadband

The Petition alleges that claims 1-9 would have been obvious to a POSITA at the time of invention based on the combined teachings Dou and Ciais-Quadband. Petition at 32-69. Because the proposed combination of Dou with Ciais-Quadband provided in the Petition directly contradicts the teachings of Dou, the combination would not have been obvious and a POSITA would not have had a reasonable expectation of success in implementing the combination. Therefore, *inter partes* review should not be instituted based upon Ground 1.

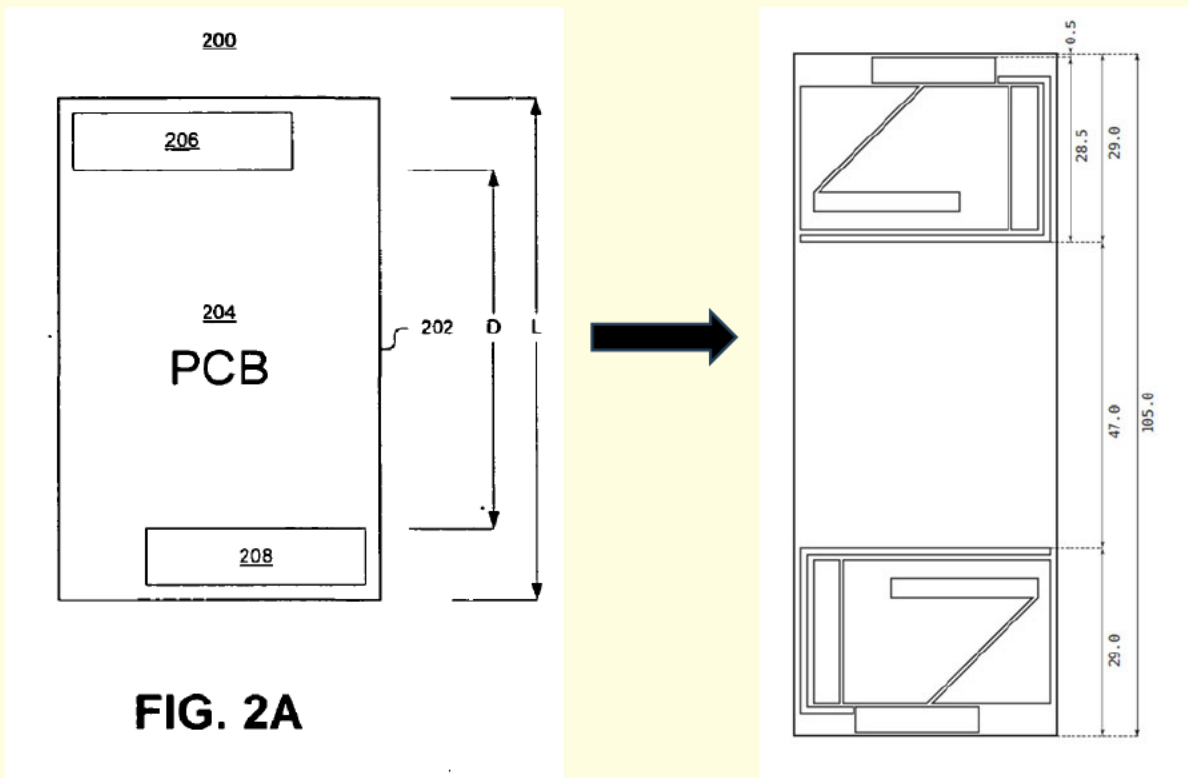
An objective of Dou's antenna design is to achieve spatial diversity between two antennas. EX1013 at ¶¶ [0017], [0022], [0023]; EX2010 at ¶ 46. The combination of Dou and Ciais-Quadband proposed in the Petition would construct an antenna that violates the explicit design constraints specified by Dou – design constraints that are well known in the art as being necessary to achieve the spatial diversity Dou's antenna design seeks. EX2010 at ¶ 46. Because the Petition modifies Dou's antenna in a way that is contrary to Dou's design constraints, the proposed combination would not have been obvious. *Id.*

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. *See* Section II.C.i, *supra*; EX1013 at ¶ [0017]; EX2010 at ¶ 47. The Petition proposes to implement Patent Owner's claimed antenna system by replacing Dou's first antenna 206 with a first copy of Ciais-Quadband's quad-band antenna and by replacing Dou's second antenna 208 with a second copy of Ciais-Quadband's quad-band antenna. Petition at 35. Despite the Petition showing many annotated diagrams throughout and carefully identifying the dimensions of the proposed combination, the Petition tellingly provides no diagram showing the structure resulting from the proposed combination of Dou and Ciais-Quadband. Nor does the Petition include any discussion of whether Dou's antenna arrangement – modified by substituting two copies of Ciais-Quadband's single antenna – satisfies Dou's specification of having at least a quarter-wavelength spacing between the two antennas to provide spatial diversity, the primary objective of Dou's antenna design.

The Petition relies on the embodiment shown in Figs. 2A and 2B of Dou, replacing each of antennas 206 and 208 with a copy of Ciais-Quadband's antenna. Petition at 45. As explained in Section II.C.i, *supra*, Dou specifies that the first and second antennas 206 and 208 be "separated by a distance (D) that is no less than the quarter wavelength ($\geq \lambda/4$) of the lowest frequency." EX1013 at ¶ [0024]. The lowest frequency of Ciais-Quadband's antenna is 870 MHz. EX1009 at 149. The

wavelength λ corresponding to a frequency of 870 MHz is 344.8 mm, and a quarter of this wavelength – the minimum spacing specified by Dou to achieve spatial diversity at this wavelength – is 86.2 mm. See Section II.C.i, *supra*. EX2010 at ¶ 48.

In the proposed combination of Dou and Ciais-Quadband, the Petition "uses Dou's ground plane 210" (Petition at 37) but implements it using the 40.5 mm x 105 mm dimensions from Ciais-Quadband because it is "representative of the Printed Circuit Board (PCB) of a typical mobile phone." EX1009 at 148; Petition at 45-46. The Petition further asserts that the antenna rectangle of the Ciais-Quadband antenna is 38.5 x 28.5 mm. EX1009 at 149; Petition at 49. Factoring in the Ciais-Quadband antenna's clearances of 0.5 mm from the end edge of the PCB (EX1009 at 148), the recipe for combining Dou and Ciais-Quadband prescribed by the Petition yields the following structure:



EX2010 at ¶ 49.

Subtracting 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. This distance is **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). EX2010 at ¶ 50. Such a spacing between antennas 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. The proposed modification, therefore, would not have been obvious to a

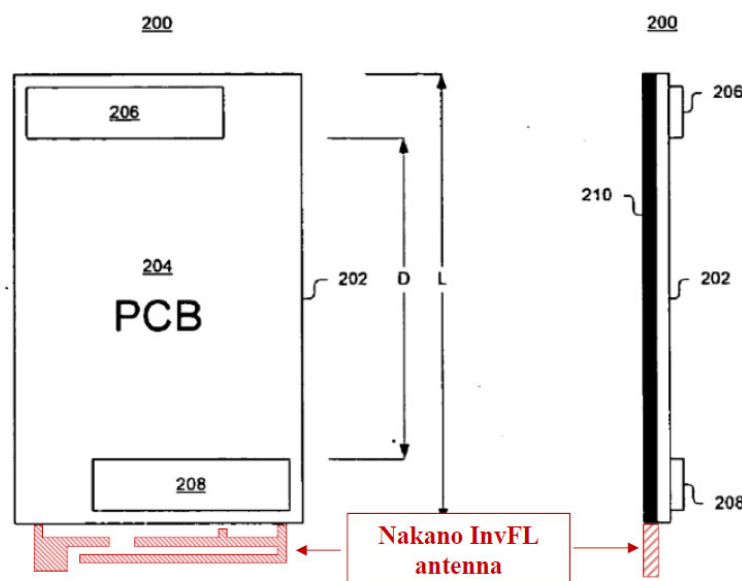
POSITA at the time of invention of the '677 Patent. *See In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (finding that a modification that renders the invention inoperable for its intended purpose is not obvious because it teaches away from the invention); *see also Ex Parte Bjarne Harbo & Lucas Willemoes Hesselhof*, No. APPEAL 2024-002314, 2025 WL 2159181, at *3 (P.T.A.B. July 25, 2025).

A POSITA, 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 combination proposed in Ground 1 of the Petition to successfully provide the spatial diversity Dou's antenna arrangement is intended to provide. EX2010 at ¶ 50. Thus, the Petition fails to meet its burden of establishing that a POSITA would have been motivated to make such a combination, let alone yield predictable results doing so. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) (noting that if an ordinarily skilled artisan would not believe that a particular combination would have a reasonable expectation of "anticipated success," the combination may not be obvious). The combination of Dou and Ciais-Quadband proposed in Ground 1 of the Petition, consequently, would not have been obvious to a POSITA at the time of invention. Accordingly, there is no reasonable likelihood that Petitioners would prevail with respect to invalidating claims 1 and 6 or their dependent claims under Ground 1.

B. Ground 2 – Claims 1-20 are patentable over Dou in view of Ciais-Quadband and Nakano

The Petition alleges in Ground 2 that claims 1-20 would have been obvious to a POSITA at the time of invention based on the combined teachings of Dou, Ciais-Quadband, and Nakano. Because Nakano does nothing to remedy the deficiencies of the combination of Dou and Ciais-Quadband proposed in Ground 1 of the Petition, a POSITA would not have combined Dou, Ciais-Quadband, and Nakano for substantially the same reasons explained in Section V.A., *supra*.

In Ground 2, the Petition proposes adding Nakano's inverted FL (InvFL) antenna "alongside" the Dou+Ciais-Quadband combination of Ground 1 to cover wireless LAN frequencies. Petition at 69-70. In the proposed arrangement, Nakano's antenna extends off the bottom end of the Dou+Ciais-Quadband PCB.



Id. at 71.

Regarding independent claims 1 and 6, the Petition does not further rely on Nakano in Ground 2, merely referring back to the arguments from Ground 1 and noting that Nakano's InvFL antenna replaces Dou's WiFi/Bluetooth antenna. That is, Ground 2 still proposed to replace Dou's two antennas 206 and 208 with duplicate copies of the Ciais-Quadband antenna. Petition at 72. Likewise, for independent claim 12, Ground 2 relies on this same proposed combination. Petition at 79-83. Consequently, 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, as explained in Section V.A., *supra*. The proposed combination of Dou+Ciais-Quadband+Nakano still destroys the spatial diversity Dou sought to achieve between antennas 206 and 208, because the spacing between the swapped-in Ciais-Quadband antennas is barely half that specified by Dou.¹ EX2010 at ¶¶ 53.

¹ Patent Owner notes for completeness that the Petition incorrectly states that "Nakano's InvFL extends from a 'co-planar ground plate' on the **short side** of a rectangular 'card-type structure.'" Petition at 70. The opposite is true. As shown in Fig. 1 of Nakano and explained in Section II.C.iii, *supra*, Nakano's antenna extends from the **long side** of the structure ($L_X = 30$ mm, $L_Y = 25.5$ mm). Ground 2, which requires extending Nakano's antenna from the **short side** of the ground plane, is premised on this false characterization of Nakano's disclosure.

Accordingly, there is no reasonable likelihood that Petitioners would prevail with respect to invalidating claims 1, 6, and 12 and their dependent claims under Ground 2 for substantially the same reasons as Ground 1 explained in Section V.A., *supra*.

C. Ground 3 – Claims 1-5 and 12-20 are patentable over Baliarda-543

Ground 3 is based upon Baliarda-543. *See* Section II.C.iv, *supra*. Contrary to the allegations in the Petition, Baliarda-543 is not prior art to the '677 Patent.

The Parties agree that the application that published as Baliarda-543, U.S. Application No. 11/614,429 (the "'429 Application"), is contained within the '677 Patent's priority chain:

This application is a continuation of U.S. patent application Ser. No. 15/856,626 filed Dec. 28, 2017, which is a continuation of U.S. patent application Ser. No. 14/738,090 filed Jun. 12, 2015, which is now U.S. Pat. No. 9,899,727, issued on Feb. 20, 2018, which is a continuation of U.S. patent application Ser. No. 14/246,491 filed Apr. 7, 2014, which is now U.S. Pat. No. 9,099,773, issued on Aug. 4, 2015, which is a continuation of U.S. patent application Ser. No. 11/614,429 filed Dec. 21, 2006, which is now U.S. Pat. No. 8,738,103, issued on May 27, 2014, which claims the benefit of U.S. Provisional Application No. 60/831,544, filed on Jul. 18, 2006, and claims the benefit of U.S. Provisional Application No. 60/856,410, filed on Nov. 3, 2006, the entire contents of which are hereby incorporated by reference. This patent application further claims priority from, and incorporates by reference the entire disclosure of European Patent Application No. EP 06117352.2, filed Jul. 18, 2006.

EX1001 at 1.

The Parties agree that the specification of the '429 Application is materially identical to that of the '677 Patent (*see* Petition at 97), and Petitioners have not

alleged that any new matter was added to the '677 Patent compared to any of the applications in its priority chain. U.S. Provisional Application No. 60/831,544 filed on July 18, 2006, is also materially identical to the disclosures of the '677 Patent and Baliarda-543.

Further, Petitioners do not allege that the term "4G communication standard" is unsupported by the specification of the '677 Patent. Quite to the contrary, Petitioners explicitly provide a construction for the term based on the intrinsic evidence provided in the specification of the '677 Patent, repeatedly citing the *Phillips* claim construction standard as the basis for its construction. Petition at 29-30 ("The '677 specification equates '4G standards' with '4G services' providing '4G features' The antecedent for 'said 4G standards' is '4G services,' and the 'frequency bands corresponding to said 4G standards' comprise 'frequency bands of the 4G services[.]' The patent defines a '4G antenna' as an 'antenna covering one or more of the 4G services[.]' EX1001, 25:1-6; *Phillips*, 415 F.3d at 1316.").

Petitioners' argument that the '677 Patent is not entitled to its priority claim is based on an allegation that the '677 Patent purportedly fails to provide written description support for the full scope of the term "4G communication standard." Specifically, Petitioners argue that Patent Owner's claim construction position in a prior litigation that "the claimed '4G communication standard' is met by LTE" somehow expanded the scope of the term beyond how it would have been

understood as of the '677 Patent's priority date, and therefore, the '677 Patent is not entitled to its priority date. Petition at 91.² Patent Owner's litigation positions are, however, based on Patent Owner's position regarding how the term "4G communication standard" would have been understood by a POSITA at the time of the 2006 priority date for the '677 Patent. *E.g.*, EX1017 at 19 ("**A POSITA reading the patents in 2006** would have been able to reference the specifications in order to determine what antenna functions satisfied the '4G communication standard(s)"); *id* at 20-21 (citing evidence from 2006 explaining how a POSITA would have understood "4G communication standard").

In other words, the Parties agree that the terms of the '677 Patent should be interpreted as understood by a POSITA at its priority date and the Parties agree that the term "4G communication standard" would have been understood by a POSITA

² Petitioners' reliance on litigation statements is inappropriate for at least two reasons. First, the court in the litigation has not issued a claim construction. More importantly, it is improper to rely on such statements for the written description analysis Petitioners seek to undertake. *See Ariad Pharms. v. Eli Lilly*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) ("The test requires an objective inquiry into the **four corners of the specification** from the perspective of a [POSA] to show that the inventor actually invented the invention claimed.") (emphasis added).

at this time based on *at least* the intrinsic evidence provided in the Specification. *E.g.*, Petition at 29-30 ("Thus, '4G communication standard' is met by a 'wireless standard' for '4G services' and 'antenna ... configured to ... receive signals from a 4G communication standard' (or 'receive signals employing a 4G communication standard') is met by an antenna that is operable in a frequency range used by a '4G service,' where the 'i.e.' signal means that the patent defines a '4G service' as 'comprising 3G and other advanced services such as for instance HSDPA, WiBro, WiFi, WiMAX, UWB or other high-speed wireless standards[.]"). The only disagreement between the Parties is *how* "4G communication standard" would have been understood by a POSITA at the '677 Patent's priority date, not if the '677 Patent's priority application provides written description support for "4G communication standard." More specifically, Petitioners are limiting their interpretation of "4G communication standard" to the intrinsic evidence for the '677 Patent, while Patent Owner is including relevant extrinsic evidence available as of the '677 Patent's priority date regarding the meaning of this technical term. *Phillips*, 415 F.3d at 1314 (Sources of claim construction evidence include "extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art."). Petitioners are attempting to twist a run-of-the-mill claim construction disagreement into a non-existent written description problem in order to strip the '677 Patent of its priority date.

The error in Petitioners' argument is readily apparent from the differences in the present case and the cases the Petition cites purportedly in support of its position. Consider, for example, *Arthrex, Inc. v. Smith & Nephew, Inc.*, 35 F.4th 1328, 1343–44 (Fed. Cir. 2022). In *Arthrex*, the subject patent's priority chain included *continuations-in-part*. Accordingly, the subject patent specification described embodiments that included both "flexible" and "rigid" eyelets, and generically claimed "an eyelet," encompassing both embodiments. *Id.* at 1340–42. The subject patent's priority chain, however, included a reference with a different disclosure that failed to provide written description support for the "flexible eyelet" embodiment, and instead discouraged the use of such flexible eyelets. *Id.* at 1342. Accordingly, the priority chain in *Arthrex* included applications having differing disclosures, some of which failed to provide written description for all the disclosed embodiments in the subject patent. In the current case, however, the '677 Patent, Baliarda-543, and their shared priority applications have *identical* disclosures, and, therefore, present a completely different posture.

Or consider *ICU Medical v. Alaris Med. Sys.*, 558 F.3d 1368, 1377-78 (Fed. Cir. 2009), in which every embodiment of the disclosed medical valve contained a "spike," and therefore, "a person of skill in the art would not understand the inventor of the ... patents to have invented a spikeless medical valve." *ICU Med.*, 558 F.3d at 1378-79. As some claims of the patent in that case did not include a "spike," the

court held that the subject patent failed to provide written description support for the full breadth of the "spikeless" claims. In contrast, in the present case, a POSITA would have understood the inventors of the '677 Patent to have invented "a first antenna ... configured to support ... [a frequency band] being associated with a 4G communication standard." Here, the disagreement between the Parties is not whether a POSITA would have understood the inventors as being in possession of "a first antenna ... configured to support ... [a frequency band] being associated with a 4G communication standard." It is clear from the specification of the '677 Patent that the inventors were in possession of such antennas due to the disclosure of multiple examples of 4G standards and their associated frequencies, as well as "other high-speed wireless standards" and "additional frequency bands corresponding to said 4G standards." *E.g.*, EX1001 at 25:1-12; *see also e.g.*, Petition at 29-30. Rather, the disagreement here is one of claim construction: how would a POSITA have understood a "4G communication standard" as of the priority date for the '677 Patent, not whether the inventors were in possession of such an antenna at the relevant priority date.

Or consider *Google LLC v. Valtrus Innovations Ltd.*, IPR2022-01406, Paper 40 (Apr. 3, 2024), in which the claims explicitly recite "virtual machines," but the priority application "does not mention virtual machines and does not include Figure 7 or any of the other portions of the '005 patent pertaining to the virtual machine

embodiment." *Id.* at 18. In contrast, in the present case, the '677 Patent and Baliarda-543 have identical disclosures that discuss "4G standards" and provide ample examples of 4G services and their associated frequencies. *E.g.*, EX1001 at 25:1-12; *see also e.g.*, Petition at 29-30. In the present case, reference to a "4G communication standard" is not new matter added in a later application.

There is a clear pattern to the cases cited by Petitioners – the claims of the patents deemed to lack written description all recite subject matter that is unambiguously broader than the disclosures of the priority applications. That is not the case in the present proceeding. The claims of the '677 Patent recite a "4G communication standard" and the priority applications for the '677 Patent provide sufficient disclosure of 4G standards and services such that a POSITA would have understood the inventors as being in possession of the claimed invention no later than July 18, 2006, the filing date of U.S. Provisional Application No. 60/831,544 and EP App. No. 06117352. This disagreement between the Parties lies in what those terms meant as of the priority date for the '677 Patent, not whether the '677 Patent provides written description support for the term.

Therefore, the '677 Patent is entitled to its priority date, and Baliarda-543 is not prior art to the '677 Patent. Because Baliada-543 is not prior art to the '677 Patent, there is no likelihood that Petitioners will succeed in invalidating any claim based on Ground 3.

VI. CONCLUSION

In light of the foregoing, there is no "reasonable likelihood that Petitioners would prevail with respect to at least one of the claims challenged in the Petition," and *inter partes* review should not be instituted based upon the proposed invalidity grounds. Accordingly, pursuant to 35 U.S.C. § 314, Patent Owner respectfully requests that the Board refuse to institute *inter partes* review for the reasons stated herein.

Dated: October 1, 2025

Respectfully submitted,
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CERTIFICATE OF SERVICE

The undersigned certifies that pursuant to 37 C.F.R. § 42.6(e), a copy of the foregoing **PATENT OWNER'S PRELIMINARY RESPONSE** and accompanying **EXHIBITS** were served via email (as previously consented to by counsel) on October 1, 2025 to lead and backup counsel of record for Petitioners as follows:

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Dated: October 1, 2025

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that this brief complies with the type-volume limitation of 37 C.F.R. § 42.24 because this brief contains 7041 total words.

Dated: October 1, 2025

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