

Paper No. ____

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. IPR2025-01027
Patent No. 11,349,200

PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE

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1001	U.S. Patent No. 11,031,677
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1003	U.S. Patent No. 11,349,200
1004	Prosecution History of U.S. Patent No. 11,349,200
1005	U.S. Patent No. 12,095,149
1006	Prosecution History of U.S. Patent No. 12,095,149
1007	Declaration of Daniel van der Weide, Ph.D.
1008	Curriculum Vitae of Daniel van der Weide, Ph.D.
1009	P. Ciais, R. Staraj, G. Kossiavas, and C. Luxey. "Design of an Internal Quad-Band Antenna for Mobile Phones," <i>IEEE Microwave and Wireless Components Letters</i> , vol. 14, no. 4, pp. 148-150, April 2004 ("Ciais-Quadband").
1010	P. Ciais, R. Staraj, G. Kossiavas, and C. Luxey. "Compact Internal Multiband Antenna for Mobile Phone and WLAN Standards," <i>Electronics Letters</i> , vol. 40, no. 15, pp. 920-921, July 2004 ("Ciais-Multiband")
1011	X. Jing, Z. Du, and K. Gong. "Compact Planar Monopole Antenna for Multi-band Mobile Phones," in <i>2005 Asia-Pacific Microwave Conference Proceedings</i> , vol. 4, p. 2657-2660, IEEE, 2005 ("Jing").
1012	H. Nakano, Y. Sato, H. Mimaki and J. Yamauchi. "An Inverted FL Antenna for Dual-Frequency Operation," <i>IEEE Transactions on Antennas and Propagation</i> , vol. 53, no. 8, pp. 2417-2421, Aug. 2005 ("Nakano")
1013	U.S. Patent App. Pub. No. 2007/0200773 ("Dou")
1014	Declaration of James L. Mullins, Ph.D.

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1016	Plaintiff's Disclosure of Asserted Claims and Infringement Contentions Against Geotab Pursuant to Local Patent Rules 3-1 and 3-2, <i>Fractus, S.A., v. Geotab Inc.</i> , No. 2:24-cv-01008 (E.D. Tex.), served March 12, 2025
1017	D.I. 75, Fractus's Opening Claim Construction Brief, <i>Fractus, S.A. v. ADT LLC</i> , No. 2:22-cv-00412 (E.D. Tex. Nov. 16, 2023)
1018	D.I. 75-1, Exhibit 1 to D.I. 75, Fractus's Opening Claim Construction Brief, <i>Fractus, S.A. v. ADT LLC</i> , No. 2:22-cv-00412 (E.D. Tex. Nov. 16, 2023)
1019	D.I. 92, Joint Claim Construction Chart, <i>Fractus, S.A. v. ADT LLC</i> , No. 2:22-cv-00412 (E.D. Tex. Jan. 4, 2024)
1020	D.I. 115, Claim Construction Order, <i>Fractus, S.A. v. ADT LLC</i> , No. 2:22-cv-00412 (E.D. Tex. Feb. 25, 2024) (Payne, M.J.)
1021	D.I. 127, Order, <i>Fractus, S.A. v. ADT LLC</i> , No. 2:22-cv-00412 (E.D. Tex. Mar. 15, 2024) (Gilstrap, D.J.)
1022	D.I. 82, Defendants ADT LLC and Vivint, Inc.'s Responsive Claim Construction Brief, <i>Fractus, S.A. v. ADT LLC</i> , No. 2:22-cv-00412 (E.D. Tex. Dec. 14, 2023)
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1024	D.I. 1, Complaint, <i>Fractus, S.A., v. Geotab Inc.</i> , No. 2:24-cv-01008 (E.D. Tex. Dec. 6, 2024)
1025	3GPP TS 36.101 v8.4.0 (2008-12) Technical Specification: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (Release 8), 2008

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1030	ETSI TS 145 005 V4.3.0 (2001-14) Technical Specification: Digital cellular telecommunications system (Phase 2+); Radio transmission and reception (3GPP TS 45.005 version 4.3.0 Release 4)
1031	ZigBee Specification (Jun. 27, 2005)
1032	ETSI TS 125 308 V6.2.0 (2004-09) Technical Specification: Universal Mobile Telecommunications System (UMTS); UTRA High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2 (3GPP TS 25.308 version 6.2.0 Release 6)
1033	ETSI TS 125 101 V6.5.0 (2004-09) Technical Specification: Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101 version 6.5.0 Release 6)
1034	ETSI TS 125 102 V6.0.0 (2003-12) Technical Specification: Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (TDD) (3GPP TS 25.102 version 6.0.0 Release 6)
1035	ETSI TS 121 101 V6.0.0 (2004-12) Technical Specification: Universal Mobile Telecommunications System (UMTS); Technical Specifications and Technical Reports for a UTRAN-based 3GPP system (3GPP TS 21.101 version 6.0.0 Release 6)
1036	3GPP TR 23.882 V1.2.3 (2006-06) Technical Report: 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; 3GPP System Architecture Evolution: Report on Technical Options and Conclusions (Release 7)

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1037	3GPP TR 23.882 V1.6.1 (2006-11) Technical Report: 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; 3GPP System Architecture Evolution: Report on Technical Options and Conclusions (Release 7)
1038	3GPP TR 23.882 V1.8.0 (2007-02) Technical Report: 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; 3GPP System Architecture Evolution: Report on Technical Options and Conclusions (Release 7)
1039	Pages from E. Dahlman et al., <i>3G Evolution: HSPA and LTE for Mobile Broadband</i> (Academic Press 2d ed. 2008)
1040	U.S. Patent Publication No. 2008/0018543 (Baliarda-543)
1041	U.S. Department of State, <i>United States Delegation Report: World Radiotelecommunications Conference 2007</i> (2007), available at https://2001-2009.state.gov/documents/organization/108955.pdf (visited May 19, 2025)
1042	IEEE Std. 802.11a-1999, Supplement to the IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements— Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: High-speed Physical Layer in the 5 GHz Band (Dec. 30, 1999)
1043	IEEE Std. 802.11b-1999, Supplement to the IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements— Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Higher-Speed Physical Layer Extension in the 2.4 GHz Band (Jan. 20, 2000)
1044	Specification of the Bluetooth System version 2.0, volume 2 (issued Nov. 4, 2004)
1045	Second Report and Order, <i>In re Service Rules for the 698-746, 747-762 and 777-792 MHz Bands (WT Docket No. 06-150); Revision of the</i>

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1046	ITU, Report ITU-R M.2134-0: Requirements related to technical performance for IMT-Advanced radio interface(s) (2008), available at https://www.itu.int/pub/R-REP-M.2134-2008/en (visited May 22, 2025)
1047	Reexamination History of U.S. Patent No. 11,349,200
1048	Global Positioning System Standard Positioning Server (SPS) Performance Standard (October 2001), available at https://www.gps.gov/technical/ps/2001-SPS-performance-standard.pdf
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1060	Wi-Fi Alliance Press Release, “Wi-Fi Celebrates Its Third Birthday” (Apr. 7, 2003) (Wayback Machine copy dated Sep. 28, 2003)
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1075	D.I. 9, Consolidation Order, <i>HyperQuery v. Nemetschek Group</i> , No. 2:25-cv-00043 (E.D. Tex. Apr. 6, 2025)
1076	D.I. 17, Docket Control Order, <i>HyperQuery v. Nemetschek Group</i> , No. 2:25-cv-00043 (E.D. Tex. Jun. 2, 2025)
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1082	D.I. 12, Consolidation Order, <i>QR Switch v. Walmart</i> , No. 2:25-cv-00064 (E.D. Tex. Feb. 18, 2025)
1083	D.I. 22, Docket Control Order, <i>QR Switch v. Walmart</i> , No. 2:25-cv-00064 (E.D. Tex. Mar. 26, 2025)
1084	D.I. 21, Docket Control Order, <i>Valtrus Innovations v. Equinix</i> , No. 2:25-cv-00016 (E.D. Tex. Mar. 27, 2025)
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1098	Declaration of David Ringle [SUPPLEMENTAL EVIDENCE - NOT FILED]
1099	IEEE Std. 802.11b-1999, Supplement to the IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements— Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Higher-Speed Physical Layer Extension in the 2.4 GHz Band (Jan. 20, 2000),

Exhibit	Description
	<i>available at</i> https://ieeexplore.ieee.org/document/817038 [SUPPLEMENTAL EVIDENCE - NOT FILED]
1100	Declaration of Dara Del Rosario [SUPPLEMENTAL EVIDENCE - NOT FILED]
1101	D.I. 104, Claim Construction Order, <i>Fractus, S.A. v. Verizon Connect Inc. et al.</i> , No. 2:24-cv-01009 (E.D. Tex. Mar. 18, 2026)
1102	D.I. 114, Order, <i>Fractus, S.A. v. Verizon Connect Inc. et al.</i> , No. 2:24-cv-01009 (E.D. Tex. Apr. 6, 2026)
1103	Declaration of Daniel van der Weide, Ph.D. In Support of Petitioners' Reply to POR
1104	Dr. Hashemi's declaration in support of Patent Owner's Preliminary Response, filed by Fractus as EX2008 in IPR2025-00929
1105	Steven E. Ellingson, <i>Electromagnetics II</i> (2025) (available at https://commons.libretexts.org/book/eng-19441 (last accessed April 25, 2026)), filed by Fractus as EX2009 in IPR2025-00929
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1107	Internet Archive copy of "Capitol Broadcasting Who We Are" web page captured on April 8, 2002
1108	Internet Archive copy of "Capitol Broadcasting Home" web page captured on March 31, 2002
1109	SEC Form 10-Q (Quarterly Report) for Lin TV Corp. (June 30, 2002)
1110	S. Derek Turner & Mark Cooper, <i>Out of The Picture 2007: Minority & Female TV Station Ownership in the United States</i> (Free Press 2007)
1111- 1113	<i>Intentionally left blank</i>

Exhibit	Description
1114	U.S. Patent Application No. 2009/0002248 to Zhao et al. (“Zhao”)
1115	Declaration of Dara Del Rosario
1116	Amendment of Parts 2 and 73 of the Commission’s AM Broadcast Rules concerning the use of the AM carrier, FCC 84-301 (Aug. 14, 1984)
1117	614-902 MHz (National Telecommunications and Information Administration Mar. 1, 2014) <i>available at</i> http://www.ntia.gov/files/ntia/publications/compendium/0614.00-0902.00_01MAR14.pdf
1118	Rodney Vaughan et al., “Channels, Propagation and Antennas for Mobile Communications,” 50 <i>IET Electromagnetic Waves Series</i> 577-580 (2003)

I. GROUND 2

As the Board found, Fractus alleged claims 1-20—which recite a wireless device having an antenna configured to support frequencies associated with a 4G communications standard—cover a device with an antenna supporting the Long-Term Evolution (LTE) standard, including LTE Band 12 operating within the 698-806 MHz spectrum. Paper 21, (“DI”), 61-66; *see also* Petition (Paper 29), 28-30, 76-77; EX1024, ¶51(b). Fractus doubled down on that assertion in the district court (EX1106, 8-9, 11), its Director Review request (Paper 24 at 13), and its POR (Paper 30) at 2-3 and 17-20. Ground 2 demonstrates claims 1-20 are unpatentable under that construction. DI, 52-69 (crediting Ground 2).

A. The Dispute Is Over Written Description.

The parties dispute whether the ’429 Application provides written description for the claims under the agreed-upon construction of the 4G terms. It does not. Petition, 73-81.

The disagreement is not “one of claim construction.” POR, 37. The Board recognized this. DI, 62-64. Petitioners adopted *Fractus’s* claim construction and noted “there is no dispute over the meaning of the ‘4G’ terms that requires the Board’s resolution to decide Ground 2.” Petition, 27-30 (citing *Nidec*). Fractus admitted no claim construction differences are “directly pertinent to any of the arguments Patent Owner is making.” POR, 17.

Petitioners never argued that “the 698-806 MHz frequency band is ‘expressly excluded’ from the construction of ‘4G communication standard.’” POR, 38-39 (citing “Petition at 80-81”). Petitioners argue that the ’429 Application “expressly excluded an *antenna* receiving signals at 698-806 MHz”¹ from its disclosure of an *antenna supporting 4G* because in December 2006 that frequency range was allocated to TV—not yet “part of a 4G genus”—and the ’429 Application describes *different* antennas providing TV reception (including at 698-806 MHz). Petition, 80-81.

The Board should again reject Fractus’s assertion that, because the Petition explained that the ’429 Application lacks written description of an antenna supporting LTE Band 12’s operation in the 698-806 MHz spectrum, the Petition’s claim construction somehow differs from the one Fractus proposed. DI, 65. No authority precludes Petitioners from adopting Fractus’s claim construction and demonstrating the claims unpatentable thereunder. Paper 31 (rejecting Fractus’s Director Review request).

¹ Emphasis is added unless otherwise indicated.

B. The Inventors Did Not Possess Antennas Meeting the Full Scope of Any Claim Ground 2 Challenges.

1. The Specification Acknowledges “4G” Refers to As-Yet-Undefined Standards That Might Operate at Undisclosed Frequencies.

When Fractus filed the '200 Patent's specification (in the '429 Application) on December 21, 2006, many standards later recognized as 4G standards (including LTE) had not yet been adopted; their specifications—including the frequency ranges at which they would operate—were not defined until years later. E.g., Petition, 74-78.

The '200 Patent acknowledges that its reference to 4G standards encompasses “*other* high-speed wireless standards” nowhere described in the specification, which “might require operation in *additional* frequency bands” including “*other* bands” the specification does not describe. EX1003, 25:14-22; POR, 19 (admitting the specification only discloses “*examples* of the claimed ‘frequency bands being used by a 4G communication standard.’”). Based on this intrinsic evidence, as a matter of claim construction “4G communications standard” encompasses “other” standards not described in the specification, including those operating at “other” frequency bands not described in the specification. EX1003, 25:14-22.

The District Court recently construed “4G communications standard(s)” to mean “4G communications standards that had been adopted or proposed as of the

effective filing date of the '677 Patent and the '200 Patent, including but not limited to Long Term Evolution ('LTE')." EX1101, 14-18; EX1102 (Judge Gilstrap adopting Judge Payne's construction). The Court did so despite finding that "LTE standards were not finalized until after the effective filing date." EX1101, 17. The Court did not reference particular LTE bands in its construction but noted the parties' agreement "that '4G communication standard(s)' include frequency bands associated with/used by LTE, such as LTE Bands 12, 13, and 14." *Id.*, 16.

Fractus chose to claim a wireless device with an antenna configured to support *any* 4G communication standard, including those like LTE that were not finalized in December of 2006. The consequence is that the specification does not support the full scope of those claims. The '429 Application nowhere discloses an antenna configured to support "*other* [4G] high-speed wireless standards" like LTE that operate in "*other* [frequency] bands" (EX1003, 25:14-22) (e.g., 698-806 MHz) nowhere disclosed in the '429 Application.

2. The '429 Application Discloses No Antenna Meeting the Claimed Complexity Factors and Supporting Frequencies Associated with LTE Band 12.

Every claim Ground 2 challenges is directed to a wireless device with *an antenna* that meets the claimed complexity factors *and* supports frequencies associated with a 4G communications standard. The '429 Application does not

disclose such an *antenna* that supports LTE Band 12 communications in the 698-806 MHz spectrum. *See infra* §I.B.5.b.i. Fractus does not even allege that it does.

3. No Expert Testimony Supports Fractus’s Written Description Argument.

Petitioners’ expert explained that a POSA would not have understood the ’429 Application to demonstrate that the inventor possessed an antenna meeting the claimed complexity factors and configured to support LTE communications at 698-806 MHz. EX1007 (“Weide”), ¶¶232-234.

Fractus offers no expert testimony refuting this. EX2010, ¶50 (“refrain[ing] from offering an opinion on” Ground 2); EX2029 (ignoring Ground 2).

4. Some Frequency Ranges Being Considered for Reallocation in 2006 Does Not Show Possession of Any Challenged Claim.

The ’429 Application does not support the *full* scope of any claim Ground 2 challenges because it does not disclose an *antenna* that meets the claimed complexity factors and supports future-defined 4G standards—like LTE—that are nowhere described in the specification with frequency bands in spectrum—like 698-806 MHz—the specification never mentions. *Supra* §I.B.1.

Fractus never disputes that LTE was undefined in 2006, or that the ’429 Application does not disclose an antenna that meets the claimed complexity factors and supports 698-806 MHz communications. That is fatal to Fractus’s Ground 2 arguments.

Fractus obfuscates by citing indications from the FCC, in 1998 and 2002 respectively, that the 746-806 MHz (“Upper 700 MHz band”) and 698-746 MHz (“Lower 700 MHz band”) spectrum were going to be reallocated at some future time. POR, 2-4. Based on this, Fractus says a POSA “understood that ‘4G communication standards,’ ... would operate in the Upper and Lower 700 MHz Frequency Bands.” POR, 4. Extrinsic evidence cannot establish written description. Petition, 73-74 (citing authority). Even if it could, Fractus badly mischaracterizes the evidence.

a. Disclosure of Different 4G Standards Operating at Different Frequencies Is Not Disclosure of LTE Operating Within the 698-806 MHz Spectrum.

Fractus cites the specification’s disclosure that a wireless device “incorporating 3.5G or 4G features... such as... HSDPA, WiBro, WiFi, WiMAX, UWB or other high-speed wireless standards... might require operation in additional frequency bands corresponding to said 4G standards” such as “2-11 GHz.” POR, 32-34 (citing EX1003, 25:14-26). Fractus says this discloses that “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... as well as ‘additional frequency bands corresponding to said 4G standards.’” POR, 33-34. As the Board observed, none of these frequency ranges includes LTE Band 12. DI, 66.

Despite that, Fractus alleges “the knowledge of the POSITA shows that these disclosed examples would indicate to the POSITA that the inventors were in possession of the 698-806 MHz spectrum.” POR, 33. Even if it were sufficient to show “possession of the 698-806 MHz spectrum” rather than an *antenna* configured to support (1) a frequency band (2) associated with a 4G communication standard (3) within it—it is not (*supra* §I.B.2)—no *evidence* supports Fractus’s attorney argument about the alleged “knowledge of the POSITA.” *Supra* §I.B.3 (Fractus’s expert does not support this argument). Petitioners’ expert directly refutes it. EX1103 (“Weide-Reply”), ¶¶7-10.

b. Extrinsic Evidence Cannot Provide Written Description Support.

Fractus’s assertion that “the inventors were in possession of the 698-806 MHz spectrum” is based on extrinsic evidence. POR, 33. That fails because written description support must be *within the specification’s four corners*. Petition, 73-74 (citing *Ariad* and *Broad*).

c. The 698-806 MHz Spectrum Was Not Earmarked in December 2006 Exclusively for Wireless Communications, Let Alone for LTE.

Fractus’s allegation that the FCC had earmarked 698-806 MHz for *some type* of mobile communication (POR, 2-4 and 20-28) is insufficient to show that this frequency range was earmarked any *4G standard*, let alone for LTE. Fractus

never disputes that in December 2006 it was an “open issue what frequency ranges might be assigned to LTE.” Petition, 74-78; *supra* §I.B.1.

Moreover, while the FCC had announced plans to reallocate the Upper and Lower 700 MHz Bands it had not decided *how* they would be reallocated. The POR itself shows that in 2002 the FCC noted possible ways in which the Lower 700 MHz Band “*could*” be reallocated. POR, 26. Contemplated uses included “*new broadcast operations*” as well as wireless communications. POR, 26; EX2018, ¶70. EX2018’s table (reproduced below with Fractus’s highlighting and Petitioners’ red annotation) is not “the FCC order illustrating the allocation of the Lower 700 MHz Band.” POR, 27. No frequencies were “allocated” in EX2018. *Various* uses were under consideration for a *future* 698-746 MHz spectrum allocation, including “Broadcasting NG128,” “Broadcast Radio (TV),” and “Auxiliary Broadcasting.” Weide-Reply, ¶11.

49 MHz (UHF)		Page 37
United States Table		FCC Rule Part(s)
Federal Government	Non-Federal Government	
470-608	470-512 BROADCASTING NG128 NG149 FIXED NG127 LAND MOBILE NG66 NG114	Public Mobile (22) Broadcast Radio (TV) (73) Auxiliary Broadcasting (74) Private Land Mobile (90)
	512-608 BROADCASTING NG128 NG149	Broadcast Radio (TV) (73) Auxiliary Broadcasting (74)
608-614 RADIO ASTRONOMY US74 LAND MOBILE US350		Personal (95)
US246		
614-890	614-698 BROADCASTING NG128 NG149	Broadcast Radio (TV) (73) Auxiliary Broadcasting (74)
	698-746 BROADCASTING NG128 FIXED MOBILE NG159	Wireless Communications (27) Broadcast Radio (TV) (73) Auxiliary Broadcasting (74)

Fractus’s Upper 700 MHz Band evidence fares no better. Fractus’s reproduced chart (POR, 24) shows that in addition to “wireless communications,” other contemplated uses including TV, i.e., “Broadcast Radio (TV).” Weide-Reply, ¶12. Fractus’s *own evidence* refutes Fractus’s assertion that POSAs knew the *entire* Upper 700 MHz Band “was going to be used for expanded cellular services as of 1998” (POR, 24-25).

Fractus says EX2019 shows “*portions* of the Lower 700 MHz Band were auctioned off in the Fall of 2002... to wireless communications companies.” POR,

28. Fractus never alleges the *entire* Lower 700 MHz Band was auctioned off, or that *all* auctioned “portions” went to “wireless communications companies.” *Id.* Many auctioned frequencies were awarded to *broadcasting companies* (“Capitol Broadcasting” and “Banks Broadcasting”). EX2019, 2, 4-5, 7, 9 and 13-14; EX1107 (Capitol Broadcasting broadcasts High Definition TV); EX1108; EX1109 at 19 (Banks Broadcasting “owns and operates” TV stations); EX1110 at 40-41 (Banks Broadcasting owned “Broadcast TV Stations”); EX1115; Weide-Reply, ¶13. Moreover, the auctioned-off “portions” (710-716 and 740-746 MHz) are subsets of the spectrums later used by LTE Band 12 (698-716 and 728-746 MHz). EX2020, 2 (“710-716, 740-746 MHz”); EX2022 (same); Weide-Reply, ¶13. Fractus does not show that the full 36 MHz LTE Band 12 later used was auctioned for wireless communication, nor that POSAs expected the purchasers of the auctioned-off portions to allow them to be used for LTE. Weide-Reply, ¶13. No evidence supports that.

Thus, Fractus’s own evidence refutes its assertion that in 2006 a POSA knew the entire Lower 700 MHz Band (698-746 MHz) would be used for some wireless communications standard, let alone a “4G” communication standard or LTE. POR, 4.

In December 2006 it was an “open issue” what frequency ranges might be assigned to LTE, which was not defined until March 2009. Petition, 74-78 (citing

evidence). Fractus cannot demonstrate possession of the *full* scope of the claimed wireless device comprising an antenna supporting 4G communications—including LTE Band 12 in the 698-806 MHz spectrum—by showing that *some but not all* frequencies in that spectrum had been auctioned for some other type of wireless communication.

Finally, even if in December 2006 POSAs expected that a 4G standard might define frequency band(s) within the Lower 700 MHz Band (698-746 MHz) and even if it might have been obvious in 2006 how to design an antenna that *meets the claimed complexity factors and supports communications in the Lower 700 MHz band* (which Fractus never even attempts to establish), “a description that merely renders the invention obvious does not satisfy the [written description] requirement.” DI, 54 (quoting *Ariad*).

5. Fractus Misapplies the Law.

Fractus says there need not be written description of an antenna configured to send/receive LTE Band 12 signals in the 698-806 MHz spectrum because “this is not recited in the claims.” POR, 28-29. But Fractus never disputes that such an antenna is within the scope of the claims Ground 2 challenges and that the law requires written description for the full scope of the claim. Petition, 73-74 (citing authority).

To demonstrate possession of the *full* scope of any claim Ground 2 challenges under the agreed-upon construction of “4G communication standard,” Fractus must demonstrate possession of an antenna configured to send/receive LTE Band 12 signals in the 698-806 MHz spectrum.

a. Fractus Cannot Demonstrate Possession of the Claimed Antenna by Purportedly Demonstrating Possession of 4G Standards and Frequency Bands.

As the Board found, “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.” DI, 63-64. Fractus does not even allege that it does. That is fatal to Fractus’s assertion that the specification supports the full scope of any claim Ground 2 challenges.

Fractus says possession of species of 4G standards and associated frequency bands shows possession “of the genus ‘4G communication standard.’” POR, 32-33. That misses the mark because the claimed invention is a wireless *device* comprising an *antenna*. Even if POSAs believed in 2006 that an as-yet-unidentified 4G standard would someday use the 698-806 MHz spectrum, that is not disclosure of an *antenna* *that meets the claimed complexity factors and is configured to operate in that spectrum*. No such antenna is disclosed in the ’429 Application (*infra* §I.B.5.b.i). Fractus never alleges otherwise.

b. Fractus Does Not Demonstrate Possession of the Claimed Genus of Antennas.

Fractus's assertion that "the inventors were in possession of the 698-806 MHz spectrum" (POR, 33) is factually wrong. *Supra* §I.B.4.c. It is also legally insufficient because it does not even allege that the '429 Application demonstrates that the inventors possessed an *antenna* that meets the complexity factors and supports this frequency range. Weide-Reply, ¶14.

The claims recite a genus of wireless devices with a genus of antennas that meet the claimed complexity factors and collectively support communication via every 4G communication standard. Weide-Reply, ¶15. Written description support for that genus of antennas requires disclosure of "a representative number of species falling within the scope of the genus or structural features common to the members of the genus." Petition, 79-80 (citing *Ariad*); DI, 53-54; POR, 29 (conceding). The '429 Application discloses neither.

i. The '429 Application Does Not Disclose a Representative Number of Species of the Claimed Genus of Antennas.

Fractus identifies alleged species of "wireless *standards*" and "associated *frequencies*." POR, 31-32 (citing EX1003, 25:14 listing "HSDPA, WiBro, Wi-Fi, WiMax, UWB, or other high-speed wireless standards"). That fails to demonstrate possession of the claimed genus of *antennas*. *Supra* §I.B.5.a.

The '429 Application discloses a *single* antenna. EX1040, [0264]-[0265], Figs. 12, 17. This antenna “operates in accordance with two mobile communication standards: GSM and UMTS” whose frequency ranges (“810 MHz-960 MHz,” “1710 MHz-1990 MHz,” and “1900 MHz-2170 MHz”) do *not* include the 698-806 MHz spectrum used by LTE Bands 12-14. *Id.*; *see also* EX1040, [0325]-[0326], Fig. 19 (showing the antenna’s frequency response). The disclosed antenna does not demonstrate possession of a *different* antenna that meets the claimed complexity factors and supports communication using a different 4G standard (LTE) over a different frequency range (698-806 MHz). Weide-Reply, ¶15.

Bilstad’s statement that disclosure of a single species can provide written description for a genus *if the field is predictable and POSAs would have expected all the members of the genus to perform similarly* (POR, 29-30) does not apply because neither factual predicate is met.

Antenna design was unpredictable. Weide-Reply, ¶16. The '200 Patent discusses numerous “difficulties” and “problems” antenna designers face involving interdependent “constraints” where changing one parameter can “counterproductive[ly]” impact others and “[i]t is usually not obvious how to control the counter-productive effects or how to compensate for them without creating still more problems.” EX1003, 4:24-5:26. And for a multi-band antenna

(as in the claims Ground 2 challenges), changing the antenna to “produce a new antenna frequency of resonance” changes the antenna’s other resonant frequencies so prior optimizations are lost. *Id.*, 4:9-23. Producing a multi-band antenna to resonate at different frequencies than the specification’s single antenna would have required a different antenna and the required changes were not predictable. Weide-Reply, ¶¶16-17.

Fractus’s assertion that Petitioners relied on “predictability of the antenna arts” is false. POR, 29-30 (citing Petition, 37-38). On the cited pages, the Petition explained that the ***Dou+Jing combination*** was predictable. That combination uses Jing’s antenna in Dou—it does not redesign Jing’s antenna to support different frequencies. Petitioners never alleged that changing an antenna to resonate at different frequencies was predictable. To the contrary, Petitioners explained the specification nowhere “teaches a POSA how to make” an antenna that meets the claimed complexity factors and supports LTE Band 12. Petition, 79-80.

Moreover, all the members of the genus of claimed do not perform similarly. Weide-Reply, ¶18. The genus encompasses antennas supporting different standards (e.g., LTE and the GSM and UMTS standards disclosed in the specification) operating at different frequencies. Weide-Reply, ¶18.

Petitioners’ expert is unequivocal that antenna design was unpredictable, the claimed genus of antennas do not all perform similarly, and the ’429 Application

does not demonstrate possession of an antenna that meets the claimed complexity factors and supports LTE Band 12 communications. Weide-Reply, ¶¶16-18. That testimony is undisputed. *Supra* §I.B.3 (Fractus offers no expert testimony addressing Ground 2). The **evidence** refutes Fractus’s assertion that the specification’s single antenna supports the claimed genus under *Bilstad*.

ii. The ’429 Application Does Not Describe Structural Features Common to the Genus of Claimed Antennas.

Fractus says the ’429 Application describes “structural features of the genus in the form of multiple example *frequencies* at which the antennas operate, as well as their highspeed operation.” POR, 31-32. Species of *frequencies* do not describe “structural features common to” the a claimed genus of *antennas*. Petition, 80; *supra* §I.B.5.a. Fractus’s cited evidence (EX1003, 25:14-26)² describes **no** structural feature of any *antenna*, let alone structural features common to the claimed genus of antennas that meet the complexity factors and support every 4G

² Fractus’s POPR citations fail because the POPR is not evidence, arguments cannot be incorporated therefrom (37 C.F.R. §42.6(a)(3)), and the POPR cites no evidence describing structural features common to the claimed genus of antennas.

communications standard. The '429 Application has no such explanation. Weide-Reply, ¶19.

c. Fractus Cannot Distinguish Petitioners' Cases Fails.

Fractus says Petitioner's cases found a lack of written description because the patent claims "recite subject matter that is unambiguously broader than the disclosures of the priority applications." POR, 37-38. The same is true here. The claims recite an antenna configured to support any 4G standard, including LTE, which is not disclosed in the specification and operates at frequencies unsupported by the specification's single antenna. *Supra* §§I.B.1- I.B.2, I.B.5.b; Weide-Reply, ¶20.

The Board did not require description of "every specific variant within the scope of the claim." POR, 5, 30. The Director agreed. Paper 31, 2 (rejecting Fractus's same "legal error" argument in Paper 24, 8). Petitioners concede the claims recite a "genus." POR, 29-31. Petitioners and the Board properly applied *Ariad*'s test for determining whether a written description supports a claimed genus. Petition, 73-81; DI, 53-54 and 63-66. Under *Ariad*, the written description must disclose a representative number of species or the structural features common to the genus. The '429 Application does neither. *Supra* §I.B.5.b.

C. Fractus Ignores Differences Between the Claim Construction and Written Description Standards.

After mischaracterizing Petitioners' claim construction position as excluding 698-806 MHz from "4G communications standard" (*supra* §I.A), Fractus says "regardless of who is correct about the scope of '4G communication standard,' the alleged written description problem falls away." POR, 38-39. Fractus alleges it would be inconsistent to "interpret[] the claims as covering the 698-806 MHz spectrum based on the evidence presented but, on the other hand, find[] that evidence insufficient to show possession of the claims as so interpreted." POR, 39.

Fractus made this same argument to the Director. Paper 24 at 13. The Director rejected it (Paper 30). The Board should too.

As a matter of claim construction, "4G communications standard" encompasses "other" standards like LTE that use "other" frequency bands like 698-806 MHz. EX1001, 25:14-22; *supra* §I.B.

Fractus's assertion that the same "evidence" must "show possession of the claims as so interpreted" (POR, 39) is wrong. As detailed *supra* §§I.B.2, I.B.5.b, the '429 Application lacks disclosure of an *antenna* that meets the claimed complexity factors and supports LTE Band 12 communications. There is no "inconsistency" in finding that the claims cover such a device but the specification fails to demonstrate that the inventors possessed such a device.

To the extent Fractus suggests the Board not accept the parties’ agreed-upon construction of “4G communication standard” and adopt a different construction that does not encompass LTE Band 12 so there would be “no need for the ’429 Application to provide written description for” an antenna supporting its frequency band (POR, 38-39), the Board should reject that suggestion. A party may not take different claim construction positions before the Board and district court without good explanation. *Revvo Techs. v. Cerebrum Sensor Techs.*, IPR2025-00632, Paper 20 (Nov. 3, 2025) (precedential). The Board applies the district court’s claim construction standard “to minimize inconsistency in claim construction between forums,” discourage parties from advancing “inconsistent arguments about claim scope,” and “provide greater predictability and certainty.” *Id.*, 4-5 (citing *Sun Pharm. v. Nivagen Pharm.*, IPR2025-00893, Paper 18 at 3 (Dir. Sept. 19, 2025)). Those concerns are implicated by either “party” taking inconsistent claim construction positions. *Revvo*, 4-5; *see also Infineon v. Mosaid*, IPR2025-01456, Paper 27, 4 (Dir. March 17, 2026) (“We are not in the business of aiding parties to stress test claim constructions to see which will prevail.”).

The Board should not allow Fractus to change its claim construction position after the court adopted it. EX1102; EX1101; *supra* §I.A. Under Fractus’s district court claim construction, the claims are unpatentable. Petition, 73-84.

D. Baliarda-543 Anticipates Claims 1-20.

Fractus does not dispute that if it is prior art Baliarda-543 anticipates claims 1-20. Petition, 81-84. As the Petition shows, as the Board determined at institution, as the Director confirmed when rejecting Fractus's review request, and as explained above, Baliarda-543 is prior art to claims 1-20. Baliarda-543 therefore anticipates claims 1-20.

II. GROUND 1

Fractus's sole argument against Ground 1 contends a POSA would not have combined Dou and Jing in the manner alleged. POR, 39-49. Fractus does not refute any of the Petition's reasons to combine, or that POSAs would have succeeded in making the combination. Petition, 31-39. Fractus only alleges POSAs would not have made the Petition's Dou+Jing combination because the combination allegedly cannot provide antenna diversity. POR, 44-45. That argument fails for the reasons below. Fractus waived any other argument. Paper 22, 11.

A. It Is Proper Reply to Refute Fractus's Erroneous Assertion That the Combinations Do Not and Cannot Provide Antenna Diversity.

Fractus says Petitioners' Ground 1 combinations violate Dou's "design constraints" (POR, 40), eliminate spatial diversity which is allegedly "a feature [of] Dou's antenna architecture" (*id.*, 44), and are "not consistent with pattern... diversity" because Jing's antenna has an "omnidirectional radiation pattern[]" (*id.*, 48). Fractus is wrong on all counts.

The Petition meets the content requirements in 37 C.F.R. §§42.104 and 42.22, including specifying where each claim element is found in the prior art. The Petition need not demonstrate how the combinations achieve antenna diversity because no claim requires antenna diversity. Petitioners were not obligated to foresee and preemptively rebut every erroneous argument Fractus might advance in challenging whether POSAs would have made the Dou+Jing combination with an expectation of success. *Rembrandt Diagnostics v. Alere*, 76 F.4th 1376, 1384-1385 (Fed. Cir. 2023); *Apple v. Andrea Elecs.*, 949 F.3d 697, 705-707 (Fed. Cir. 2020).

The Petition established a motivation to combine and explained that the Dou+Jing combination complies with Dou’s “design constraints” and its implementation was well-within a POSA’s capabilities. Petition, 33-38; *infra* §II.B. Fractus contends that Dou+Jing cannot meet one Dou “design constraint” — antenna diversity. POR, 40-45. Consistent with *Rembrandt* and *Apple*, this Reply refutes those false assertions using the same ground that combines the same prior art in the same combination. Contrary to Fractus’s allegations, Dou+Jing meets Dou’s antenna diversity design constraint. While spatial or pattern diversity each provides a separate form of antenna diversity, as shown below Dou+Jing provides at least spatial *and* pattern diversity.

B. The Petition’s Combination Meets Dou’s Design Constraints.

The Petition explained POSAs had an expectation of success in using Jing’s antenna in Dou’s device because, *inter alia*, “***Dou describes antenna placement within the device according to ‘various performance and design constraints’ known to POSAs***” and “[i]t was well within the POSA’s ordinary skill to implement Dou’s device with Jing’s antenna.” Petition, 38.

The Petition acknowledged that Dou’s “design constraints” include antenna diversity. Petition, 31 (Dou’s device has an “internal ***diversity antenna architecture***”), citing Dou Abstract, [0015] and Weide, ¶¶114-115 (“***A diversity architecture such as that described in Dou can be implemented in various forms: spatial diversity*** (using physically separated antennas), ***pattern diversity*** (using antennas with different radiation patterns), ***and/or polarization diversity*** (using orthogonally polarized elements).”).

The Petition mapped the claimed antenna system to Dou’s “**diversity antenna architecture**” implemented using Jing’s antenna. Petition, 40.

C. The Dou+Jing Combination Provides Antenna Diversity.

1. Spatial Diversity

The benefits of spatial diversity were well-known. Dou, [0001]-[0003], [0014]; Weide, ¶¶114-115. Selecting a diversity technique to implement a “diversity antenna architecture” in Dou+Jing was a matter of design choice with a

finite number of options. Petition, 31 (citing Weide, ¶¶114-115) and 40; Weide, ¶115 (Dou’s “diversity architecture... can be implemented in various forms: spatial diversity... pattern diversity..., and/or polarization diversity”); *KSR v. Teleflex*, 550 U.S. 398, 421 (2007). A POSA had reasons to implement the Dou+Jing combination to meet Dou’s antenna diversity “design constraint[]” by employing spatial diversity, consistent with the Petition’s reasons to combine. Petition, 33-36; Dou, [0014]; Weide, ¶¶114-115, 133.

Dou says that to achieve spatial diversity, the distance “D” between antennas 306, 308 should be “no less than the quarter wavelength ($\geq \lambda/4$) of the lowest frequency” the antennas share. Dou, [0024], [0035], Figs. 2A, 3A. Dou+Jing incorporates two Jing antennas and Jing’s ground plane teachings with Dou’s PCB, resulting in two Jing antennas at opposite ends of the PCB separated by a 60 mm long ground plane. POR, 42 (Fractus recognizing); Petition, 35; Weide-Reply, ¶21.

Fractus disingenuously contends that “the lowest frequency of Jing’s antenna is 900 MHz” despite Jing’s statement that the antenna does not support GSM900 at 890-960 MHz. POR, 41; Jing, 2658; Weide-Reply, ¶22. Jing’s antenna does, however, support the ISM band at 902-928 MHz, so that it uses a lowest frequency of 902 MHz. Petition, 47. Regardless, using Fractus’s 900 MHz for simplicity, the *free-space* wavelength, i.e., $\left(\frac{c_0}{f}\right) = \left[\frac{3 \times 10^{11} \left(\frac{mm}{sec}\right)}{900 \times 10^6 \left(\frac{1}{sec}\right)}\right] \approx 333.3 \text{ mm}$, so a

quarter free-space wavelength at 900 MHz is 83.3 mm. Weide-Reply, ¶23. Fractus argues that 83.3 mm is “the minimum spacing” that Dou requires between the Jing antennas “to achieve spatial diversity” at 900 MHz. POR, 41-43, citing EX2010, ¶¶44-46. Fractus is wrong.

Jing’s antenna is “printed on a FR4 substrate” having a relative permittivity $\epsilon_r = 4.4$. Jing, 2657-2658. The relative permittivity *reduces* the operating wavelength used to evaluate antenna separation. Weide-Reply, ¶24. Because Jing’s antenna is printed on FR4, POSAs would have accounted for FR4’s relative permittivity when calculating operating wavelength to evaluate the antenna separation in Dou+Jing. Weide-Reply, ¶24; EX1105, 169.

For Dou+Jing’s antenna system, POSAs would have evaluated operating wavelength using an “effective” relative permittivity $\epsilon_{r,eff} \approx \frac{\epsilon_r + 1}{2} \approx \frac{4.4 + 1}{2} = 2.7$ that averages the relative permittivity of FR4 (i.e., 4.4) and free space (i.e., 1). Weide-Reply, ¶25; EX1105, 169. With $\epsilon_{r,eff} \approx 2.7$ a quarter wavelength at 900

MHz is $\left(\frac{1}{4}\right) \left(\frac{c_0}{f}\right) \left(\frac{1}{2.7}\right)^{0.5} \approx \left(\frac{1}{4}\right) \times \left[\frac{3 \times 10^{11} \left(\frac{mm}{sec}\right)}{900 \times 10^6 \left(\frac{1}{sec}\right)} \right] \times \left(\frac{1}{1.64}\right) \approx \mathbf{50.6 \text{ mm}}$. Weide-

Reply, ¶25. *This 50.6 mm is less than the 60 mm antenna separation in*

Dou+Jing (e.g., Petition, 41-42), meaning *Dou+Jing meets Dou’s quarter-wavelength antenna spacing* constraint and provides spatial diversity. Weide-Reply, ¶25.

This effective permittivity analysis to determine wavelength for an antenna on FR4 was conventional. Weide-Reply, ¶26; EX1105, 169. Fractus *admitted* this in IPR2025-00929. *See id.*, Paper 8 at 43 (“The [POSA] would also have understood... that the permittivity of the FR-4 material used in the Zhao [PCB] should be taken into account when determining the operating wavelength of the Zhao antenna,” citing EX1104 (Fractus’s expert), ¶107); *id.*, 44-46 (applying same effective permittivity analysis discussed above, citing EX1104 (Fractus’s expert), ¶¶41, 108-112 and EX1105, 169); Fed. R. Evid. 801(d)(2); Weide-Reply, ¶¶26-27.

The fact that in this case Fractus—and its expert—selectively ignore the effective permittivity analysis that Fractus—and its expert—embraced in IPR2025-00929 deprives Fractus’s analysis (and its expert) of any credibility. Weide-Reply, ¶27. Fractus’s argument that a POSA would not have formed Dou+Jing because the combination would allegedly have failed to provide spatial diversity is factually incorrect and based on flawed analysis that should be given no weight.

2. Pattern Diversity

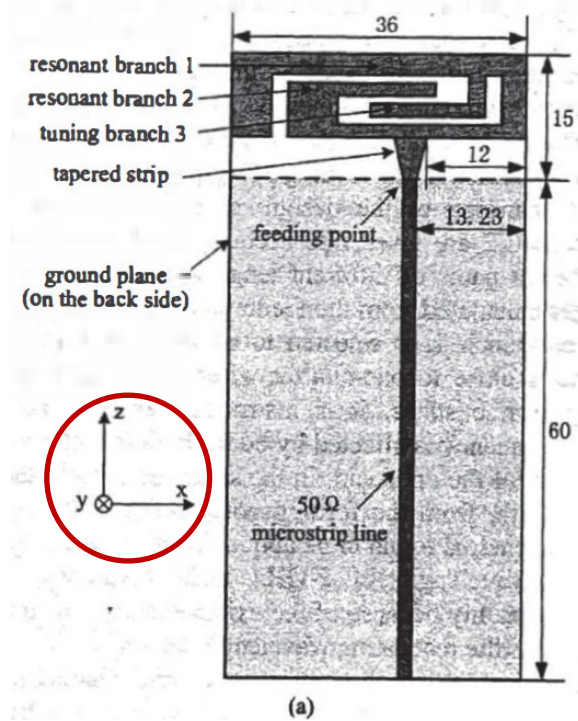
Fractus falsely asserts that Dou’s “objective... is to achieve *spatial* diversity” (POR, 40). Dou describes other “diversity techniques.” Dou, [0018]; Weide, ¶115. Only Dou dependent claim 8 recites “quarter wavelength” separation for spatial diversity. That Dou’s independent claims have no such requirement

confirms Dou does not require *spatial* diversity. The Board recognized this. DI, 47-48 (only “some type of diversity antenna architecture” is required).

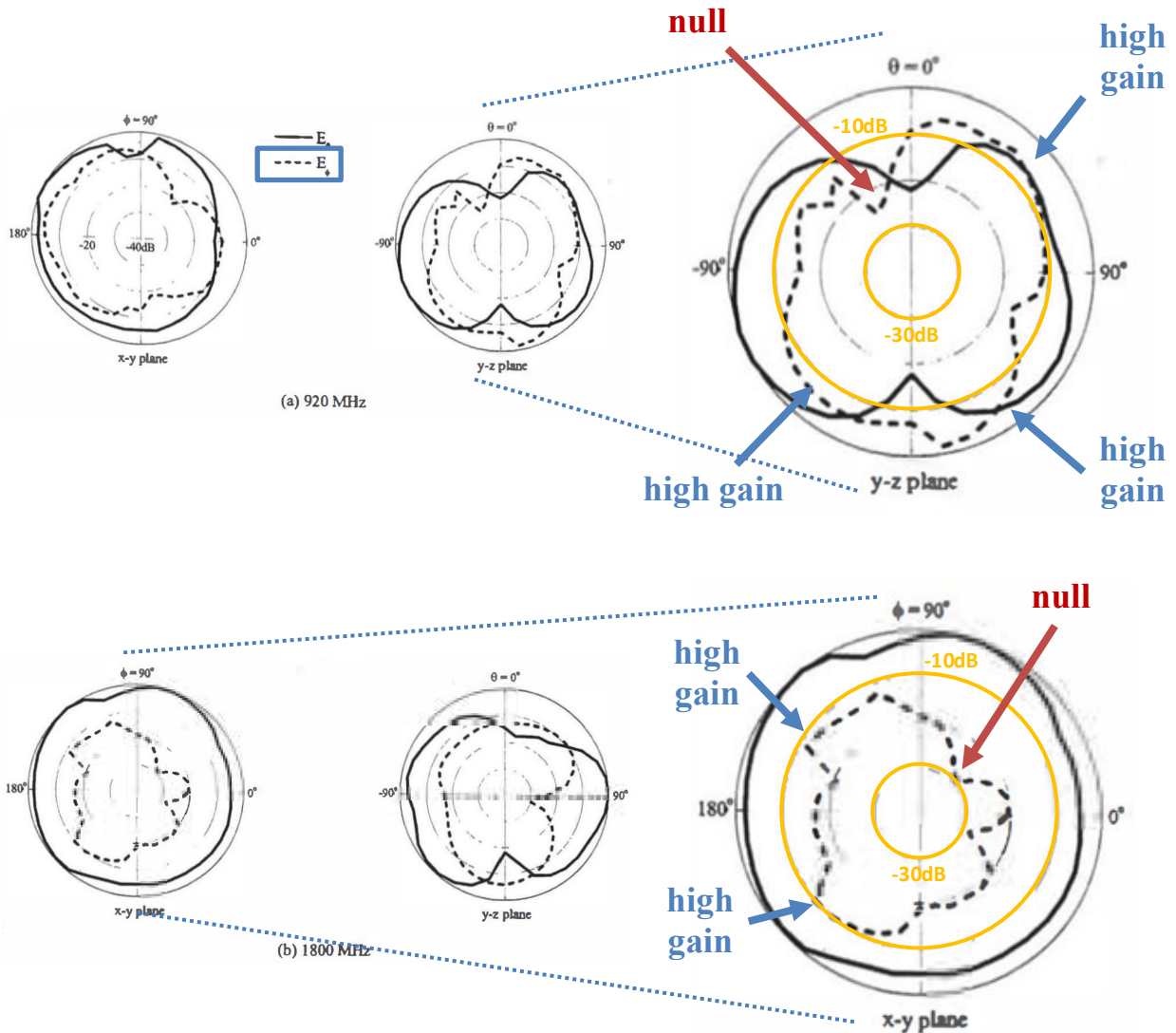
Pattern diversity was a well-known type of antenna diversity using antennas with differently-oriented radiation patterns to improve reliability. Weide, ¶115; Wiede-Reply, ¶28; DI, 46; EX2029, ¶7. Petitioners’ expert is unequivocal that the Dou+Jing combination provides pattern diversity. Weide-Reply, ¶¶29-49.

Fractus says the Dou+Jing combination cannot provide pattern diversity because Jing’s antenna has an “omnidirectional radiation pattern[.]” POR, 45. That attorney argument is wrong. Weide-Reply, ¶¶50-58. An omnidirectional antenna easily provides an antenna array with pattern diversity. Weide-Reply, ¶¶50-54. Regardless, Jing’s antenna is not omnidirectional. *Id.*, ¶¶38-41, 55-58. Fractus’s expert, who opined on antenna diversity generally, does not disagree. EX2029. He never alleges that the Dou+Jing combinations lack pattern diversity, or supports Fractus’s mischaracterization of Jing’s antenna as omnidirectional.

Jing Figure 4 shows two planes (x-y and y-z) of the radiation pattern at 920, 1800, 2000, and 2400 MHz. Jing, Fig. 4, 2658-2659; Weide-Reply, ¶¶30-41. Jing’s Figure 1(a) (annotated below) defines the x, y, and z axes and thus the planes for the radiation patterns in Figure 4. Jing, 2657, Fig. 1(a); Weide-Reply, ¶¶31-36.



Jing's radiation pattern is asymmetric. Weide-Reply, ¶¶37-41; Jing, Fig. 4 (detail annotated below, showing measured radiation patterns). For example, the E_ϕ measurements (dashed line) in the y-z plane at 920 MHz and in the x-y plane at 1800 MHz are annotated below to highlight the asymmetric shape. Weide-Reply, ¶38.



In these plots each scale circle increments 10 dB in magnitude from -40 dB at center. Weide-Reply, ¶39. In each example above the sensitivity between the directions with “null” and “high gain” differ by at least 20 dB—i.e., a 10-fold increase in field amplitude and a 100-fold increase in power. Weide-Reply, ¶¶39-41.

The Board recognized that Dou+Jing expressly implements two Jing antennas on opposite sides of the PCB's long-axis, with the bottom antenna rotated 180 degrees. DI, 39 (citing Petition, 36):

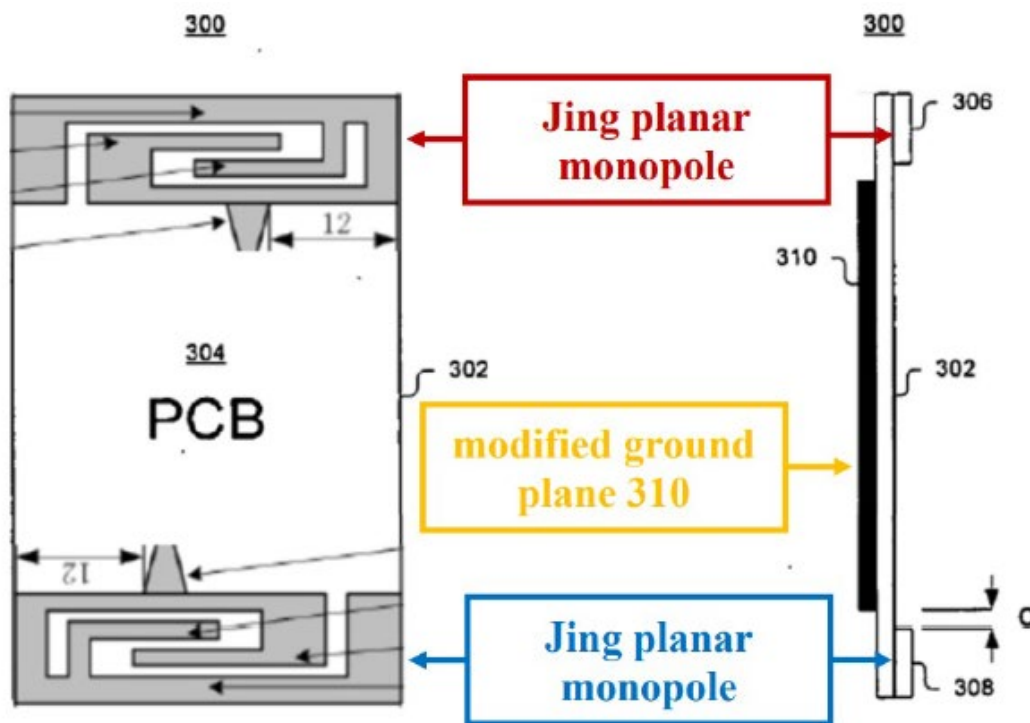


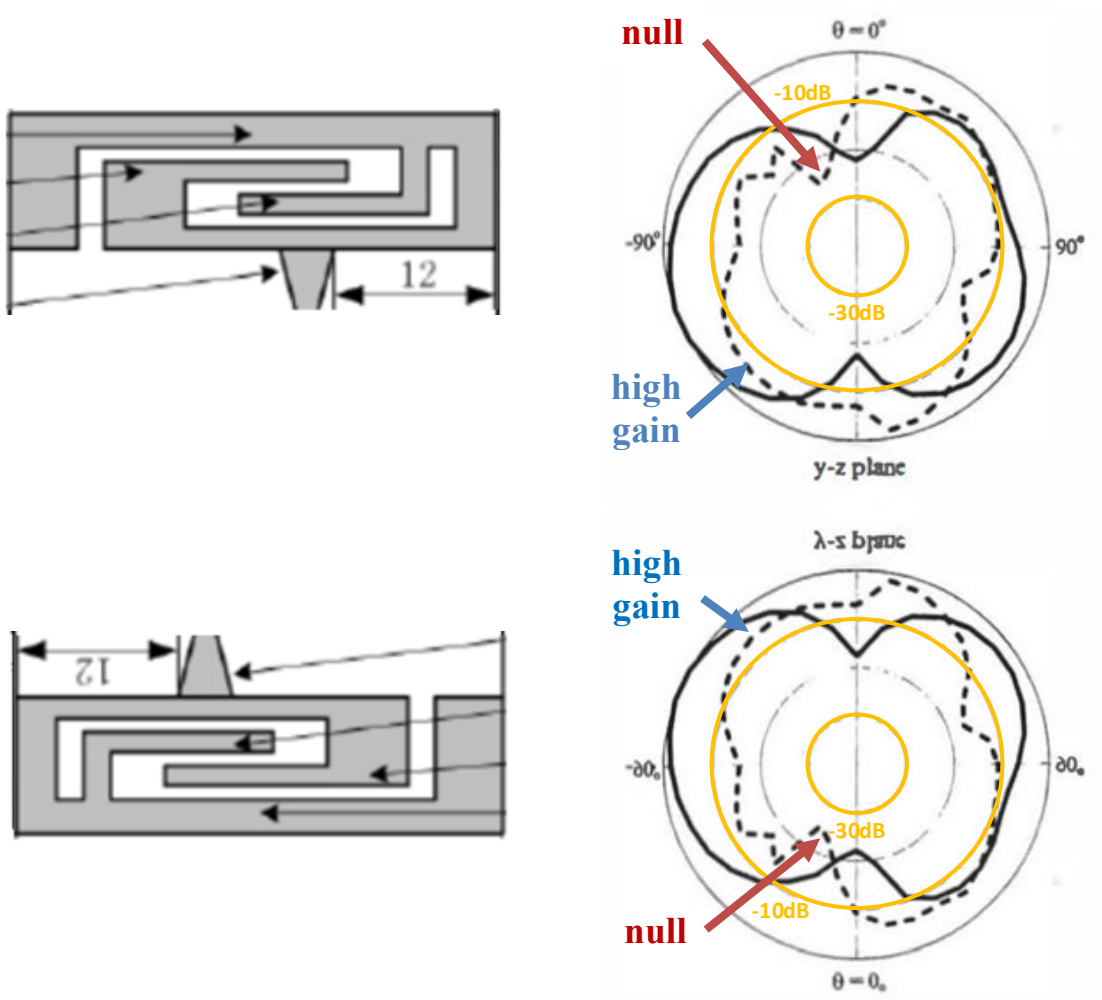
FIG. 3A

FIG. 3B

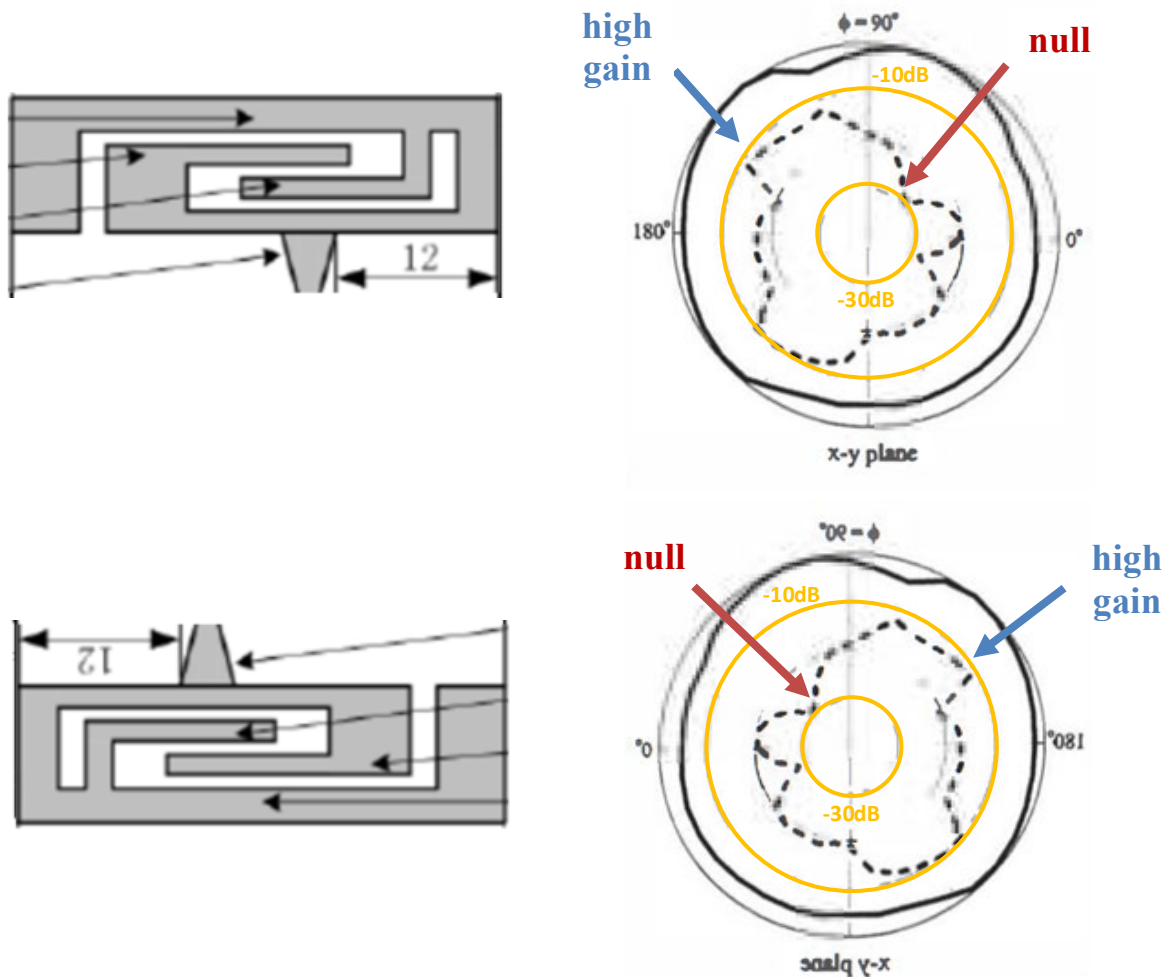
Dou implemented with Jing

See also Petition, 35-36; Jing, Fig. 1(a); Dou, Figs. 3A-3B; POR, 41. This is because Jing's antenna is asymmetric and oriented relative to the PCB "end" and ground plane such that the "feeding point" is positioned toward the ground plane. Jing, Fig. 1(a) (above); Weide-Reply, ¶42.

This antenna array provides pattern diversity in the Dou+Jing combination because, as shown below (y-z plane at 920 MHz), the antennas so positioned have complementary radiation patterns given that a null in the radiation pattern of one antenna corresponds to direction having high gain for the other antenna, and vice versa. Weide-Reply, ¶¶43-44 (explaining antenna patterns corresponding to each antenna rotation). Fractus’s expert ignores this antenna placement. EX2029, ¶7 (alleging identical “*similarly oriented*” antennas would not provide pattern diversity).



The x-y radiation patterns at 1800 MHz (annotated below) likewise confirms the array's pattern diversity because each antenna provides higher sensitivity in a direction that the other antenna has lower (null) sensitivity. Weide-Reply, ¶¶45-46.



POSAs would have implemented the Dou+Jing combination as described (Petition, 35-36) with a reasonable expectation of success, consistent with the Petition's reasons to combine Dou and Jing in a manner meeting Dou's "design constraints" (Petition, 33-38), because the benefits of antenna diversity were well-

known and POSAs would have understood that implementing Dou+Jing in this way would provide pattern diversity. Weide-Reply, ¶¶47-49. This refutes Fractus's false assertion that "the only diversity possibly implemented in the Dou+Jing combination is spatial diversity" (POR, 45-46) and that it "*does not provide pattern diversity*" (*id.*, 48).

* * *

Fractus's assertion that the Dou+Jing combination violates Dou's antenna diversity design constraint fails because the combination provides spatial (*supra* §II.C.1) and pattern diversity (*supra* §II.C.2). Each of those results by themselves refute Fractus's argument challenging the Dou+Jing combination in Ground 1 on the false contention that the combination would not achieve antenna diversity.

Fractus does not dispute any mapping from the claims challenged in Ground 1 to Dou+Jing. Fractus did not make (and thereby waived) any argument against the invalidity showing in Ground 1 other than its factually unsupportable challenge to the Dou+Jing combination. Fractus has no credible argument disputing Ground 1's demonstration that claims 1-15, 17, and 19-20 are unpatentable.

III. CONCLUSION

Claims 1-20 are unpatentable.

Respectfully submitted,
Geotab Inc. and Geotab USA, Inc.

Date: May 20, 2026

By: /Adam R. Wichman/
Adam R. Wichman, Reg. No. 43,988
WOLF, GREENFIELD & SACKS, P.C.

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, the undersigned certifies that the foregoing **PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE** contains 5,591 words excluding; a table of contents, a table of authorities, a certificate of service or word count, or appendix of exhibits or claim listing. Petitioners have relied on the word count feature of the word processing system used to create this paper in making this certification.

Date: May 20, 2026

/Dara Del Rosario/
Dara Del Rosario
Paralegal
WOLF, GREENFIELD & SACKS, P.C.

CERTIFICATE OF SERVICE UNDER 37 C.F.R. § 42.6 (E)(4)

I certify that on May 20, 2026, a copy of the foregoing document, including any exhibits filed therewith, is being served via electronic mail, as previously consented to by Patent Owner, upon the following:

Mark J. DeBoy	mdeboy@esfip.com
Patrick Finnan	pfinnan@esfip.com
Larry Shatzer	lshatzer@esfip.com
	Fractus_GeoTab_IPRs@esfip.com

Date: May 20, 2026

/Dara Del Rosario/
Dara Del Rosario
Paralegal
WOLF, GREENFIELD & SACKS, P.C.