UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG ELECTRONICS CO., Ltd.
Petitioner,

v.

MASSIVELY BROADBAND LLC,
Patent Owner.

IPR2025-01563
Patent 11,876,548

PATENT OWNER'S PRELIMINARY RESPONSE

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I. INTRODUCTION

MASSIVELY BROADBAND LLC ("Patent Owner") submits this Patent Owner Preliminary Response pursuant to 37 C.F.R. § 42.107(a) to the *Inter Partes* Review petition ("Petition" or "Pet.") filed by Samsung Electronics America, Inc. and Samsung Electronics Co., Ltd. ("Petitioner") for all sixteen (16) claims (the "Challenged Claims") of Patent 11,876,548 ("'548 Patent"). The Board should deny institution because Petitioner fails to demonstrate a reasonable likelihood that Petitioner will prevail as to any challenged claim.

Across all asserted grounds, Petitioner fails to identify—let alone demonstrate with particularity—where the cited references disclose or render obvious the central requirement of the Challenged Claims of determining or computing "zones or spans of directions" in three dimensional space corresponding to a user or structure relative to a steerable antenna.

As set forth below, Petitioner's primary anticipation and obviousness theories under Grounds 1 and 2 fail because Schlub does not disclose determining or computing directional zones or spans, and Petitioner's attempt to equate proximity detection or responsive beam steering with the claimed computation is unsupported by the reference itself. Grounds 3 and 4 fare no better. Neither Prasad alone nor Prasad in combination with Seol and Yin discloses or suggests the claimed zone/span determination, and Petitioner's reliance on Yin's image-based

"regions" does not supply the required directional computation relative to a steerable antenna.

Petitioner also improperly relies on expert gloss to fill these gaps. As explained below, Dr. Mahon's declaration merely restates Petitioner's theories in expert form, relabels disclosures in the prior art, and introduces post hoc constructions that are not taught by the cited references. Expert testimony—whether conclusory or otherwise—cannot cure a Petition that fails to identify, with particularity, where each claim limitation is found in the prior art.

Further, Petitioner has failed to articulate a well-reasoned, claim-specific motivation to combine the references under Ground 3. Instead, Petitioner relies on boilerplate, claim-agnostic rationales—such as the general desirability of millimeter-wave communications, the benefits of beamforming, and predictable engineering results—that do not explain why a person of ordinary skill in the art ("POSITA") would have been motivated to modify Prasad in the specific manner required by the Challenged Claims. Such generalized assertions do not satisfy the requirement for articulated reasoning with a rational underpinning.

Petitioner has not shown that the independent claims are unpatentable under any asserted ground, therefore the dependent claims necessarily fail as well. For these reasons, and as detailed below, the Board should deny institution.

II. STATEMENT OF THE PRECISE RELIEF REQUESTED

Patent Owner requests that the Board deny institution of the Petition with respect to all of the Challenged Claims (claims 1-16) and all asserted grounds. A full statement of the reasons for the relief requested is set forth in Section IV of this Preliminary Response.

III. BACKGROUND

A. Summary of the '548 Patent

The '548 Patent concerns antenna-related techniques for wireless devices. The specification describes two principal sets of concepts. First, the '548 Patent discusses architectures for simplifying antenna implementations in wireless devices by enabling an antenna to be used across multiple frequency bands, including embodiments using active tuning and matching to support simultaneous multi-band operation. Ex. 1001, 5:10-10:34, Figs. 1-6C. Second, the '548 Patent describes using steerable antennas—particularly in higher-frequency (e.g., millimeter-wave) contexts—to shape radiated energy away from a user or nearby structure for performance and safety reasons. *Id.*, 10:35-14:32, Figs. 7-8.

The challenged claims are directed to beam-steering techniques for avoiding or reducing radiation toward a user and/or nearby structures in wireless devices operating at frequencies between 10 GHz and 500 GHz. The '548 Patent includes three independent claims—claims 1, 7, and 12—which are similar in overall scope but differ by statutory class and phrasing: claim 1 is directed to a wireless device,

while claims 7 and 12 are directed to methods. Collectively, the independent claims recite a wireless device or corresponding method having at least one steerable antenna and one or more sensors and associated processing configured to:

- detect, in three dimensional space, an orientation of the wireless device relative to a user and/or a structure using one or more specified sensor types (*e.g.*, cameras, microphones or audio sensors, ultrasound sensors/transducers, range finders, capacitive sensors, gyroscopes, light detectors, or motion detectors);
- determine or compute zones or spans of directions in the three dimensional space corresponding to one or more directions of the user and/or the structure relative to the steerable antenna; and
- adjust one or more beams of the steerable antenna, including:
    - in the case of claims 1 and 7, to accentuate the radiation pattern in directions that are not within the zones or spans of directions corresponding to the user and/or structure; and
    - in the case of independent claims 1 and 12, to attenuate the radiation pattern in the zones or spans of directions corresponding to the user and/or structure.

While the specification includes detailed discussion of multi-band antenna

architectures and active tuning techniques, the independent claims focus on sensor-informed spatial determination of user- or structure-related directions and corresponding beam-pattern adjustment in a steerable-antenna wireless device operating on one or multiple frequency bands within the 10 GHz to 500 GHz range.

B. Priority

The '548 Patent application was filed June 13, 2021. Ex. 1001, field code (22). The '548 Patent claims priority as a continuation to application Serial No. 13/966,853, now Patent 11,063,025. *Id.*, field code (63); Ex. 2040. Patent 11,063,025 in turn claims priority as a continuation-in-part to predecessor applications dating back to August 14, 2009 and a provisional application filed August 14, 2008. *Id.*, field codes (63), (60); *see also* Exs. 2038-2039.

The challenged claims recite, among other things, sensor-informed determination of zones or spans of directions corresponding to a user or structure and dynamic adjustment of beam radiation patterns to attenuate radiation in those zones or spans of directions, which, as Petitioner acknowledges, is not disclosed in the predecessor applications. Pet., 4-5; Exs. 2038–2039. Accordingly, for purposes of this proceeding, the earliest filing date to which the challenged claims are entitled is August 14, 2013. The AIA provisions of 35 U.S.C. §§ 102, 103 apply. *See* Pub. L. No. 112-29, § 3(n)(1), 125 Stat. 284, 293 (2011).

C. Parallel Proceedings

The ’548 Patent, along with other patents owned by Patent Owner, is involved in parallel district court proceedings between Petitioner and Patent Owner. *See* Paper 8 (Patent Owner updated mandatory notice); Paper 9 (Patent Owner request for discretionary denial).

In related *inter partes* reviews involving other patents of Patent Owner asserted in the parallel district court litigation, Petitioner asserts that Petitioner has “full access” to the inventor’s “research … in return” for the parties’ “multi-decade collaboration.” *See Samsung Elecs. Co. v. MASSIVELY BROADBAND LLC*, IPR2025-01595, Paper 10, 5 (PTAB Jan. 6, 2026); *Samsung Elecs. Co. v. MASSIVELY BROADBAND LLC*, IPR2025-01564, Paper 12, 5 (PTAB Jan. 6, 2026); *Samsung Elecs. Co. v. MASSIVELY BROADBAND LLC*, IPR2025-01565, Paper 11, 4 (PTAB Jan. 7, 2026); *Samsung Elecs. Co. v. MASSIVELY BROADBAND LLC*, IPR2025-01594, Paper 10, 5 (PTAB Jan. 8, 2026). Petitioner’s unsubstantiated implication is that it has rights to the patents. Contrary to Petitioner’s assertion, however, Petitioner cites no evidence that Petitioner has any intellectual property rights to the ’548 Patent or any other patent involved in the parallel litigation. *Id.* In fact, to the best of Patent Owner’s knowledge, Petitioner has no intellectual property rights to the ’548 Patent or any other patent involved in the parallel litigation, nor has Petitioner produced any written

documentation evidencing such rights.

In these same filings, Petitioner asserts that the inventor did not advise standard-setting bodies about the patents, yet Petitioner offered no evidence that either (i) any of the patents read on some applicable technical standard; (ii) the inventor or Patent Owner participated in any development of any applicable technical standard for the patents (they did not), or (iii) the inventor or Patent Owner had an obligation to disclose the patents to any standard-setting body. *Id.* Nothing in the Petition for the '548 Patent relies on any technical standard for a basis for invalidity of any Challenged Claim. Whether the '548 Patent is subject to some technical standard would not be resolved by instituting this IPR.

D. Level of Ordinary Skill

For purposes of this Preliminary Response, Patent Owner accepts the skill level proposed by Petitioner for a POSITA. Petitioner's proposed POSITA is a person having "at least a Bachelor's degree in electrical engineering, computer engineering, physics, or a related field, and at least two years of experience working with design and integration of RF circuits and antennas for wireless communication devices," where "[m]ore education can substitute for practical experience and vice versa." Pet., 2. Patent Owner reserves the right to address or refine the level of ordinary skill at a later stage of this proceeding or in any parallel litigation, should the POSITA's skill level become relevant.

E. Claim Construction

Patent Owner agrees with Petitioner that, for the purposes of this Preliminary Response, all claim terms should be given their plain and ordinary meaning as understood by a POSITA in the context of the '548 Patent and its prosecution history. Pet., 7.

To the extent any dispute exists regarding the meaning of a claim term, such dispute does not provide a basis for institution. *See, e.g.*, *Catalyst OrthoScience Inc. v. Shoulder Innovations, Inc.*, PGR2024-00042, Paper 17, 43 n. 13 (PTAB Dec. 19, 2024) (Board "need not resolve the expression construction of [disputed claim terms] because doing so would not change the outcome of our compelling-merits analysis"). The Petition fails under the plain and ordinary meaning of the claim terms, and Patent Owner reserves the right to address claim construction post-institution if necessary.

F. The Petitioner's Asserted Grounds

1. Grounds Asserted in the Petition

Petitioner asserts that the Challenged Claims are unpatentable under the following asserted grounds:

Ground	Basis	Reference(s)	Claims
1	§§ 102, 103	Schlub	1-3, 6-9, 12-14
2	§ 103	Schlub in view of Oshiyama	4-5, 10-11, 15-16

Ground	Basis	Reference(s)	Claims
3	§ 103	Prasad in view of Seol and Yin	1-3, 6-9, 12-14
4	§ 103	Prasad in view of Seol, Yin and Oshiyama	4-5, 10-11, 15-16

There are only two asserted grounds for each claim in the Petition. For example, only Grounds 1 and 3 are applied to independent claims 1, 7, and 12.

2. Summary of the Prior Art of the Asserted Grounds

a. Schlub (Ex. 1005) – Pub. 2011/0250928

Schlub describes wireless-capable electronic devices that adjust operation of their wireless circuitry based on whether a user's body or another external object is near one or more antennas. Ex. 1005, ¶¶[0006]-[0009], [0021]-[0023], [0056]-[0057]. Schlub emphasizes detecting proximity—*e.g.*, whether an object is within a threshold distance of an antenna—using antenna-impedance measurements derived from monitoring RF signal phase and magnitude (including reflected signals), optionally augmented with other device sensors such as thermal/infrared sensors, motion sensors, capacitive touch/proximity sensors, ambient light and IR proximity sensors, acoustic sensors (including ultrasound), electrical sensors, and cameras. *Id.*, ¶¶[0006]-[0007], [0021]-[0022], [0040]-[0049], [0057], [0060].

When the device determines that an external object is in the vicinity of an antenna, Schlub teaches a range of responsive actions focused on managing

emissions while maintaining wireless performance. *Id.*, ¶¶[0009], [0023], [0057], [0086]-[0089]. The responsive actions include adjusting transmit power, switching among antennas (e.g., diversity), changing communications mode (including reducing or altering MIMO operation), changing protocol or data rate, changing the active communications band, delaying transmissions, issuing user prompts, and tuning antenna-related circuitry (*e.g.*, matching networks, feed locations, resonating element geometry, and other tunable components and switches). *Id.*, ¶¶[0009], [0023], [0030]-[0031], [0088]-[0089].

Schlub also contemplates multi-antenna arrays, including a phased array controlled by phase controllers to implement beam steering. *Id.*, ¶¶[0005], [0032], [0078]-[0081].

b. Prasad (Ex. 1006) – Pub. 2013/0237272

Prasad describes a radiation-reduction system for mobile devices that is primarily concerned with lowering user exposure to radio-frequency energy, as measured by Specific Absorption Rate ("SAR"), while maintaining acceptable communication performance. Ex. 1006, ¶¶[0007], [0016], [0025]. Prasad focuses on actively varying and controlling a mobile device antenna system based on device proximity to the user, usage mode or operating scenario, device orientation, and signal quality parameters. *Id.*, ¶¶[0007], [0016], [0021]-[0025].

The system of Prasad includes sensors, such as proximity sensors, contact

sensors, orientation sensors (*e.g.*, gyroscopes and accelerometers), and sensors indicative of usage scenarios (*e.g.*, handset mode, speaker mode, headset detection, data transfer mode, and cradle or holder detection), with signals from the sensors of Prasad being processed, together with signal quality parameters from the transceiver, to generate control signals that adjust the radiation behavior of the antenna for purposes of reducing user exposure. *Id.*, ¶¶[0008]-[0010], [0020]-[0027].

c. Seol (Ex. 1007) – Patent 9,362,994

Seol describes hybrid analog/digital beamforming for millimeter-wave ("mmWave")[1] wireless communications, combining directional analog beams (via RF phase shifters and antenna arrays) with digital MIMO/precoding/combining to improve link performance. Ex. 1007, 2:31-35, 7:14-45, 8:17-64, 13:34-63, 14:25-50. Seol discloses procedures in which a base station sweeps multiple beams, a mobile station measures channel quality and reports preferred beam(s)/beam pair(s), the base station selects a final beam, and the mobile station provides feedback for digital beamforming (*e.g.*, precoder/codebook, stream/rank, CSI/CQI) based on an effective channel matrix for the selected beam(s). *Id.*, 2:43-63, 9:48-

[1] Millimeter-wave communications include operations at frequencies such as at 28 GHz and 38 GHz. Exs. 2013-2014.

57, 10:28-64, Figs. 8-9.

d. Yin (Ex. 1008) – WO 2014/194455

Yin discloses reducing human exposure to electromagnetic radiation from a wireless client device by using a camera (optionally infrared/panoramic processing) to detect nearby people, identify spatial region(s) occupied by those people, and then compute antenna-array control weights (beamforming /spatial suppression techniques) so the device transmits with an EM radiation pattern that steers energy away from the detected people/regions, potentially triggered when transmissions begin or when link quality degrades. Ex. 1008, 3:19-26, 7:1-15, 8:6-19, 9:6-27.

e. Oshiyama (Ex. 1014) – Pub. 2006/0097918

Oshiyama discloses antennas that use a single antenna element to transmit and receive in multiple frequency bands, including simultaneous operation in those bands. Ex. 1014, ¶¶[0001], [0011], [0012], [0016]. One end of the antenna element is connected to a feed point and the other end, along with at least one intermediate point, is connected to ground through switches, resonant circuits, or filters, with electrical lengths set to resonate at different frequency bands. *Id.*, ¶¶[0011]–[0016], [0047]–[0055].

IV. THE PETITION FAILS TO ESTABLISH A REASONABLE LIKELIHOOD OF SUCCESS ON A SINGLE CLAIM

The Board should deny institution of the *inter partes* review because

Petitioner has failed to establish a likelihood that Petitioner will succeed in showing that any Challenged Claim is unpatentable under any asserted ground. 35 U.S.C. § 314(a) ("Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."); *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1298 (Fed. Cir. 2017) (similar).

A. Petitioner Has Failed To Carry Its Burden of Showing that Cited References, for All Grounds, Teach or Suggest All Elements of the Challenged Claims

1. Applicable Legal Standard

In an *inter partes* review, the petitioner bears the burden of proving its asserted invalidity grounds by a preponderance of the evidence. 35 U.S.C. § 316(e); *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1334 (Fed. Cir. 2016). For anticipation and obviousness challenges, as Petitioner asserts here, the petitioner must show that the cited references teach or suggest every element of the challenged claims. *See Verdegaal Bros. Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987) ("A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."); *Par Pharma., Inc. v. TWI Pharma., Inc.*, 773 F.3d

1186, 1194 (Fed. Cir. 2014) (patent challenger must prove that all claim limitations are disclosed in the prior art for an obviousness challenge). If the petitioner fails to meet its burden, the challenge fails. *Dynamic Drinkware, LLC v. National Graphics, Inc.*, 800 F.3d 1375, 1378-79 (Fed. Cir. 2015).

2. Petitioner Has Failed To Carry Its Burden of Showing that the Cited References Teach or Suggest Determining or Computing the Zones or Spans of Directions in a Three Dimensional Space Corresponding to a Direction of a User/Structure

Independent claims 1, 7, and 12 all recite some form of determining or computing the "zones or spans of directions" in the three dimensional space corresponding to the user or structure:

- Independent claim 1 recites "determining[] … zones or spans of directions in the three dimensional space corresponding with one or more directions of said user or structure relative to said at least one steerable antenna" (limitation 1[b][2]);
- Independent claim 7 recites "computing zones or spans of directions corresponding with one or more directions of said user or structure relative to said at least one steerable antenna in the three dimensional space" (limitation 7[c]); and

[2] Limitation identifiers refer to Petitioner's notation at pp. vii to xi of the Petition.

- Independent claim 12 recites "computing … zones or spans of directions in the three dimensional space" (limitation 12[b]).

Petitioner has failed to carry its burden of showing (i) that Schlub discloses, teaches or suggests these claim limitations under Ground 1 and (ii) that the Prasad-Seol-Yin combination discloses, teaches or suggests these claim limitations under Ground 3.

a. Ground 1: Schlub

Petitioner's Ground 1 relies on both § 102 anticipation and § 103 obviousness theories. Pet., 7. For limitations 1[b], 7[c], and 12[b], Petitioner does not explicitly assert whether its theory is that Schlub discloses, teaches, or suggests these limitations. *Id.*, 15-19, 28, 30. In any case, Petitioner has failed to show that Schlub either discloses, teaches, or suggests limitations 1[b], 7[c] and 12[b].

In particular, Petitioner does not identify any disclosure in Schlub of determining or computing "zones or spans of directions" in three dimensional space, as required by limitations 1[b], 7[c], and 12[b]. Schlub is directed to antenna-based proximity detection and responsive adjustment of wireless circuitry. Ex. 1005, Abstract. Schlub discloses monitoring antenna impedance and other sensor data to determine whether an external object, such as a user's body, is within a given distance of an antenna, and then taking responsive action, such as reducing transmit power, switching antennas, or steering a phased antenna array.

Id., ¶¶[0006]–[0009], [0021]–[0023].

Petitioner's theory that Schlub discloses limitations 1[b], 7[c], and 12[b] proceeds as follows: (1) Schlub detects whether a user's body is "in the vicinity" of the antenna; (2) Schlub may take a responsive action, such as beam steering; (3) because a user's body exists in three dimensions, a POSITA would understand the user's body to constitute a "zone or span of directions" in three dimensional space; and (4) with reference to the diagram below, that the zones or spans of directions corresponding to the user's body (or external object) are shaded blue and the antenna of Schlub can be adjusted to radiate in a different direction, such as the green area. Pet., 17–18.

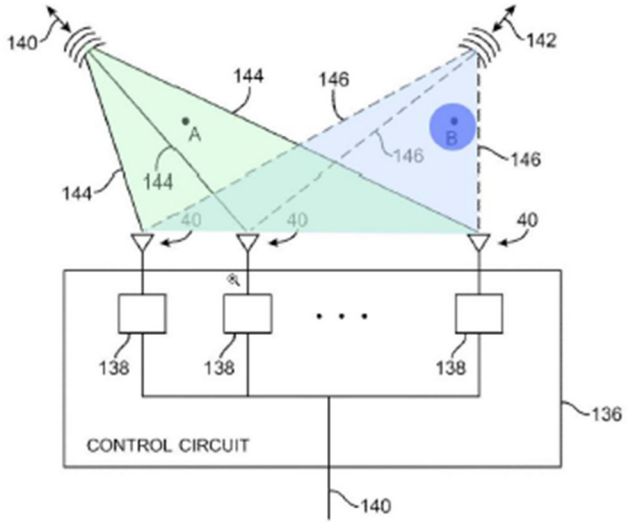


Diagram at p. 18 of Petition

Even accepting as true Petitioner's characterizations and even accepting Petitioner's assertion that the blue shared area in the diagram corresponds to the

boundaries of the user or external object, ***conspicuously absent*** from Petitioner's analysis and logic is any assertion that Schlub computes or determines the zones or spans of directions in three dimensional space corresponding to the user or external body. Petitioner's reasoning fails simply because Petitioner never identifies any determination or computation by Schlub of directional zones, angular spans, or excluded spatial regions corresponding to the user relative to the antenna.

Rather than identifying a disclosure in Schlub, Petitioner instead argues that Schlub "includes far more disclosure" on limitation 1[b] than both "the Dorsey reference that the Board determined discloses an equivalent limitation during prosecution of the parent '358 Application" and Patent Owner's infringement contentions in the parallel litigation (Pet., 18), as if that argument satisfies Petitioner's burden of showing that the cited references disclose each limitation, including limitation 1[b] (it does not). *See* 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.104(b)(4); *smaXtec Inc. v. ST Reprod. Techs., LLC*, IPR2024-00875, Paper 18, 17 (PTAB Nov. 22, 2024). Petitioner's comparison of Dorsey with Patent Owner's infringement contentions, however, cannot make up for the absence of disclosures in Schlub.

Moreover, there is no relevant "parent '358 Application" mentioned by Petitioner. To the extent Petitioner meant to refer to the parent '853 Application, the Office allowed Patent Owner's parent '853 Application over Dorsey. Ex.

2040, 2. Showing that Schlub has more disclosure than a reference—Dorsey—over which the Office ***allowed*** the parent application, fails as a matter of logic, because such analysis does nothing to show that Schlub renders the claims invalid.

Furthermore, the disclosure requirements for infringement contentions are different than the disclosure requirement for an *inter partes* review, contrary to Petitioner's assertions at p. 18 of the Petition. Parallel litigation is pending in the Eastern District of Texas. Paper 8 (Patent Owner updated mandatory notices); Paper 9 (Patent Owner request for discretionary denial). The Local Patent Rules of the Eastern District of Texas merely require that infringement contentions provide ***notice*** of the patentee's infringement theories beyond merely parroting the claim language. *See Realtime Data, LLC v. Rackspace US, Inc*., 6:16-CV-00961 RWS-JDL, 2017 WL 1927749, at *1 (E.D. Tex. May 10, 2017). An *inter partes* review petition requires ***more than mere notice*** of the asserted invalidity theories. 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.104(b)(4); *smaXtec Inc.*, IPR2024-00875, Paper 18, 17. Petitioner's "apples and oranges" comparison of the contentions to Schlub does not close the gap between the disclosures in Schlub and the requirements of the Challenged Claims.

In substance, Petitioner impermissibly reduces the claimed determination of "zones or spans of directions" to mere proximity detection. The Challenged Claims, however, require determining or computing directional regions in three

dimensional space relative to the antenna—not merely detecting that an object is nearby. Petitioner never explains how Schlub performs the claimed determination or computation, nor how the proximity-based sensing of Schlub teaches or suggests a determination or computation of the zones or spans of directions.

b. Ground 2: Schlub in view of Oshiyama

Ground 2 does not implicate any independent claims of the '548 Patent and Petitioner does not assert that Oshiyama discloses limitations 1[b], 7[c], or 12[b] in connection with Ground 2. Pet., 33-40. Instead, Petitioner relies on Oshiyama solely for disclosure of antennas capable of transmitting/receiving in multiple bands simultaneously. *Id*., 33. Because Petitioner has failed to show that Schlub discloses or suggests the "zones or spans of directions" determination or computation required by independent claims 1, 7, and 12, the addition of Oshiyama cannot render claims 4–5, 10–11, and 15–16 obvious.

c. Ground 3: Prasad in view of Seol and Yin

For Ground 3, Petitioner asserts that Prasad discloses determination or computation of the "zones or spans of directions" limitations (limitations 1[b], 7[c], and 12[b]), or, in the alternative, that Yin "renders … obvious" determination or computation of the "zones or spans of directions." Pet., 48-53. Petitioner has not carried its burden under either theory.

i. Petitioner has not shown that Prasad discloses determining or computing "zones or spans of directions"

Petitioner's first theory for limitations 1[b], 7[c], and 12[b] is that Prasad discloses determination or computation of the "zones or spans of directions" in three dimensional space (Pet., 48-50, 63-64), but Petitioner's showing falls short.

While Petitioner relies on Prasad for disclosures relating to adjusting radiation characteristics based on user proximity, orientation, or device usage, the Petition does not identify where Prasad discloses determining or computing zones or spans of directions in three dimensional space corresponding to the user or structure. Rather, Petitioner relies on the disclosure of Prasad of identifying a "direction facing the head" or a user-facing direction, and controlling radiation in that direction. *Id.*, 48-50; Ex. 1006, Figs. 1–2.

That disclosure does not satisfy the requirements of limitations 1[b], 7[c], or 12[b]. Petitioner has not shown that the conduct Petitioner attributes to Prasad—identifying a user-facing direction or controlling radiation "toward" or "away from" a user—constitutes determining or computing "zones or spans of directions" in three dimensional space relative to the steerable antenna, as expressly required by the claims. In that connection, Petitioner fails to identify any disclosure in Prasad of determining or computing angular regions, directional spans, or spatial zones corresponding to the user or structure, or any representation, modeling, or

computation of the claimed zones or spans of directions as an intermediate result used to control antenna behavior.

Accordingly, Petitioner has not demonstrated that Prasad discloses limitations 1[b], 7[c], or 12[b].

ii. Petitioner has not shown that Yin renders obvious determination or computation of the claimed "zones or spans of directions."

Petitioner alternatively asserts that, if Prasad does not disclose the determination or computation of "zones or spans of directions," the claimed determination of the zones or spans of directions would have been obvious in view of Yin. Pet., 51-52. Petitioner's alternative theory based on Yin also fails.

Yin describes identifying "regions" within a captured area—such as regions containing detected people—based on image data and adjusting electromagnetic radiation accordingly. Ex. 1008, 2:19-26, 9:27-10:7. Petitioner, however, does not adequately explain how the region-identification teachings of Yin satisfy the specific claim requirement of determining or computing zones or spans of directions in three dimensional space corresponding to the user or structure relative to the steerable antenna. *See* Pet., 51-52.

In particular, Petitioner does not show that Yin determines directional zones or spans relative to the radiation pattern of the antenna, as opposed to identifying regions within a visual or sensed field. Nor does Petitioner explain how the region

information of Yin would be translated into the claimed zones or spans of directions in three dimensional space relative to the steerable antenna, as required by limitations 1[b], 7[c], and 12[b]. Instead, Petitioner again relies on conclusory assertions that the "regions" of Yin are equivalent to the claimed "zones or spans of directions," without explaining how or why a POSITA would understand them to be the same. Pet., 51-52.

Absent a demonstrated teaching or suggestion in Yin of determining or computing zones or spans of directions relative to a steerable antenna—as opposed to identifying regions in sensed or image data—the Petition does not establish that Yin renders obvious limitations 1[b], 7[c], and 12[b].

Because Petitioner has not adequately shown that either Prasad alone or Prasad as modified in view of Yin teaches or suggests the claimed zone or span determination, Petitioner has failed to carry its burden under Ground 3.

d. Ground 4: Prasad in view of Seol, Yin, and Oshiyama

Like Ground 2, Ground 4 also does not implicate any independent claims of the '548 Patent and Petitioner does not assert that Oshiyama discloses limitations 1[b], 7[c], or 12[b] in connection with Ground 4. Pet., 65-70. Instead, Petitioner relies on Oshiyama solely for disclosure of antennas capable of transmitting/receiving in multiple bands simultaneously. *Id.*, 33. Because Petitioner has failed to show that Schlub discloses or suggests the "zones or spans

of directions" determination or computation required by independent claims 1, 7, and 12, the addition of Oshiyama cannot render claims 4–5, 10–11, and 15–16 obvious.

3. Petitioner's Expert Gloss Cannot Supply the Missing Disclosure

Dr. Mahon's declaration does not cure the deficiencies in the Petition with respect to limitations 1[b], 7[c], and 12[b] under Grounds 1 and 3. Expert testimony cannot supply a missing claim element, replace a required disclosure in the prior art, or transform speculation into teaching. 37 C.F.R. § 42.104(b)(4) ("The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon."). The Federal Circuit has emphasized that it "is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify 'with particularity' the 'evidence that supports the grounds for the challenge to each claim.'" *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016); *AMC Multi-Cinema, Inc. v. Fall Line Pats., LLC*, No. 2021-1051, 2021 WL 4470062, at *5 (Fed. Cir. Sept. 30, 2021) (petition itself must include "understandable explanation of the element-by-element specifics of its unpatentability contentions"). Expert testimony cannot substitute for a petition's failure to identify, with particularity, where each claim element is disclosed in the

prior art. *Id.* In any event, conclusory expert opinion—as is the case here—plainly cannot meet Petitioner's burden. *TQ Delta LLC v. Cisco Sys., Inc.*, 942 F.3d 1352, 1358 (Fed. Cir. 2019) ("Conclusory expert testimony does not qualify as substantial evidence.").

a. Ground 1: Dr. Mahon's Opinions Regarding Schlub Are *Ipse Dixit* Recharacterizations of Proximity Detection

With respect to Ground 1, Dr. Mahon opines that Schlub discloses limitation 1[b] because any real-world object exists in three dimensions and therefore "the boundaries of the object … will constitute a zone or a span of directions that the 'array can be adjusted to avoid.'" Ex. 1003, ¶93 (quoting Schlub, Ex. 1008, at ¶[0088]). This reasoning is *ipse dixit*. Dr. Mahon does not identify any disclosure in Schlub of determining or computing zones or spans of directions in three dimensional space. Nor does Dr. Mahon cite any teaching in Schlub that zones, spans, or angular regions corresponding to the user or external body are ever represented, modeled, or computed relative to the antenna.

Instead, Dr. Mahon simply asserts equivalence between (i) detecting that an object is nearby and (ii) determining directional zones in three dimensional space. Ex. 1003, ¶95. Nothing in Schlub discloses the claimed determination or computation of limitations 1[b], 7[c], and 12[b]. The reference describes detecting proximity and taking responsive action, such as adjusting power or steering in a

different direction. Ex. 1005, ¶¶[0086]–[0088]. Schlub does not disclose computing directional regions, angular spans, or excluded spatial zones as an intermediate determination corresponding to limitations 1[b], 7[c], and 12[b]. The shaded zones and annotated figures offered by Dr. Mahon are therefore post hoc constructions introduced by the expert and are not teachings of Schlub itself.

Nor does Dr. Mahon's reliance on prosecution history cure this defect. His assertion that Schlub contains "far more disclosure" than Dorsey (Ex. 1003, ¶95) merely repeats the Petition's argument and suffers from the same legal and logical flaws. As explained above, the Office allowed the parent application over Dorsey, and comparing Schlub to a reference that did not invalidate the parent does not demonstrate that Schlub discloses the claimed determination or computation of zones or spans of directions. Recasting that legally irrelevant comparison in expert form does not convert the expert declaration into evidence of disclosure. Dr. Mahon's reasoning remains unsupported expert opinion, not proof that the cited reference teaches the claimed limitation.

b. Ground 3: Dr. Mahon's Opinions Regarding Prasad and Yin again Rely on Conclusory *Ipse Dixit*

Dr. Mahon's opinions under Ground 3 suffer from the same fundamental defect. As explained above, neither Prasad nor Yin discloses or suggests determining or computing zones or spans of directions in three dimensional space

relative to a steerable antenna. Dr. Mahon nevertheless asserts that Prasad identifies the claimed zones based on sensor information and that the identification of "regions in the area" of Yin is equivalent to the claimed directional zones or spans. Ex. 1003, ¶¶188–194.

These assertions are conclusory and untethered to the disclosures of the references themselves. Prasad discloses identifying a user-facing direction and controlling radiation intensity in that direction. Ex. 1008, ¶¶[0007]-[0010], [0020]-[0027]. Prasad does not disclose computing angular spans or directional zones in three dimensional space relative to the antenna. Yin discloses identifying regions within a captured or sensed area—such as regions containing people—and directing radiation away from those regions. Ex. 1008, 3:19–26, 7:1-15, 8:6-19; 9:6-27. Neither reference discloses translating region identification into the claimed determination or computation of directional zones or spans relative to a steerable antenna.

With respect to the Prasad–Yin combination, Dr. Mahon does not identify any teaching in either reference explaining how the image-based "regions" of Yin would be translated into antenna-relative zones or spans of directions in three dimensional space. Instead, he asserts—without a technical explanation—that a POSITA would have configured the systems to do so using "routine software and programming." Ex. 1003, ¶¶196–197. Assertions that such a transformation of

Prasad based on Yin would have been routine, common, or achievable through ordinary engineering practices do not identify a teaching or suggestion in the prior art, nor do they explain how the claimed determination or computation would actually be performed.

c. *Ipse Dixit* Expert Testimony Cannot Carry Petitioner's Burden at Institution

In sum, Dr. Mahon's declaration does not cure the Petition's failure to identify where the cited references disclose or suggest determining or computing zones or spans of directions in three dimensional space corresponding to a user or structure relative to a steerable antenna. His opinions merely restate Petitioner's theories in expert form and relabel disclosures in the prior art without identifying any teaching of the claimed determination or computation. Because Petitioner relies on *ipse dixit* expert gloss rather than actual teachings of the cited references, Petitioner has not carried its burden to establish a reasonable likelihood of prevailing under any asserted ground. *See TQ Delta*, 942 F.3d at 1359-62 (conclusory and unspecific expert testimony does not constitute substantial evidence and cannot support the Board's conclusions regarding obviousness); *DSS Tech. Mgmt., Inc. v. Apple Inc*., 885 F.3d 1367, 1374–75 (Fed. Cir. 2018) (references to "common sense" or expert conclusions cannot substitute for reasoned analysis and evidentiary support, especially when a limitation is missing

from the prior art); *Apple Inc. v. Corephotonics, Ltd.*, 81 F.4th 1353, 1362–63 (Fed. Cir. 2023) (Board may reject even uncontroverted expert testimony if it is intrinsically unpersuasive, and that conclusory expert testimony is inadequate to support an obviousness determination).

B. Petitioner Fails to Articulate Well-Reasoned Rational Underpinnings Motivating the Combination of Ground 3

1. Applicable Legal Standard

To institute on an obviousness ground based on a combination of references, a petitioner must demonstrate a reasonable likelihood that petitioner would prevail by articulating a reasoned rationale underpinning the proposed combination. *KSR Int'l Co. v. Teleflex, Inc*., 550 U.S. 398, 418 (2007); *Dish Network L.L.C. v. TQ Beta, LLC*, IPR2015-01791, Paper 30, 19 (PTAB Jan. 30, 2017) (petitioner failed to show claim unpatentable because petitioner failed to provide articulated reasoning with some rational underpinning for combining references). A petition must do more than identify prior art elements and assert that they could be combined; the petition must explain why a POSITA would have been motivated to combine the references in the manner proposed. *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1378-81 (Fed. Cir. 2016). Conclusory assertions, general design goals, or labels such as "simple substitution" or "obvious to try" do not suffice. *See, e.g., TQ Delta,* 942 F.3d at 1358-59 ("Conclusory expert testimony does not qualify as substantial evidence."); *Arendi S.A.R.L. v. Apple, Inc.*, 832 F.3d

1355, 1362 (Fed. Cir. 2016) ("references to 'common sense' . . . cannot be used as a wholesale substitute for reasoned analysis and evidentiary support"); *In re Nuvasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (conclusory statements alone insufficiently articulate a motivation to combine); *Hunting Titan, Inc. v. DynaEnergetics Europe GmbH*, PGR2020-00080, Paper 7, 11 (PTAB Feb. 12, 2021) (petitioner's reliance "on generalized statements that such [obviousness] combinations would, for instance, be 'predictable,' 'simple substitution,' application of 'known techniques,' and 'obvious to try'" insufficient to meet burden to justify institution).

Among other things, Petitioner must explain why and how a POSITA would have combined the references in the manner asserted, with a reasonable expectation of success. *See Procter & Gamble Co. v. Teva Pharm. USA, Inc.*, 566 F.3d 989, 994 (Fed. Cir. 2009) (party asserting obviousness must demonstrate that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so). Expert testimony may support such a showing, but only if the expert testimony provides independent technical reasoning and does more than merely repeat Petitioner's conclusions. *See InTouch Techs., Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1349-52 (Fed. Cir. 2014) (reversing finding of obviousness where expert "failed to provide the

necessary 'articulated reasoning with some rational underpinning' to support a conclusion of invalidity based on these combinations").

As set forth below, Petitioner fails to meet these requirements for the independent claims under Ground 3.

2. Petitioner's Asserted Motivation to Combine Prasad, Seol and Yin for Ground 3 Is Untethered to the Claimed Determination of the "Zones or Spans of Directions"

Petitioner's asserted motivation to combine Prasad, Seol, and Yin under Ground 3 rests on generalized statements that millimeter-wave communications provide higher throughput, that beamforming mitigates path loss, and that the references operate in related technical fields. Pet., 43-45; Ex. 1003, ¶¶172-75. These rationales are boilerplate and claim-agnostic. They do not explain why a POSITA would have been motivated to modify Prasad in the specific manner required by the Challenged Claims.

Neither Petitioner nor Dr. Mahon identifies any deficiency, design problem, or limitation in Prasad that would prompt a POSITA to look to Seol or Yin. Nor do they explain why the existing proximity- and orientation-based antenna control of Prasad would be insufficient absent the proposed combination. Instead, Petitioner relies on the generalized proposition that because beamforming and mmWave communications were known, a POSITA would have combined the references with predictable results. *Id.*

Petitioner's generalized reasoning about what a POSITA might have combined is legally insufficient. A petitioner must do more than assert that references are technologically compatible or belong to the same general field. A petitioner must articulate a claim-specific rationale explaining why a POSITA would have combined the references to achieve the claimed invention. *Intelligent Bio-Sys.,* 821 F.3d at 1369 (petition must set out, in the initial filing, the evidence and rationale—including motivation to combine—for each challenged claim); *Vectair Sys. Inc. v. Fresh Prods., Inc.*, IPR2024-00824, Paper 9 (PTAB Nov. 12, 2024) (denying institution where petitioner failed to provide a sufficiently articulated, evidence-supported motivation to combine tied to the claimed invention).

Because Petitioner's asserted motivations apply equally to countless antenna systems that do not compute zones or spans of directions—or perform many other aspects of the Challenged Claims—Petitioner's asserted motivations cannot supply the required rational underpinning for obviousness under Ground 3.

3. Petitioner's Asserted Motivations Are Untethered to the Claimed Zone/Span Determination

Even if Petitioner's generalized rationales were credited, they still do not explain why or how a POSITA would have combined Prasad with Seol and Yin to yield the claim-required determination or computation of "zones or spans of

directions" in three dimensional space corresponding to a user or structure relative to a steerable antenna.

Petitioner's motivation analysis focuses almost entirely on frequency selection and the general benefits of beamforming at mmWave frequencies. Pet., 43–45; Ex. 1003, ¶¶172-75. The Petition does not explain why the existing control scheme of Prasad would be modified to compute directional zones or spans, why image-based region identification of Yin would be selected for that purpose, or how the sensed regions of Yin would be translated into antenna-relative angular spans or excluded spatial zones. *KSR* requires an articulated rationale tied to the claimed invention—not post hoc assumption that disparate teachings could be combined. *KSR,* 550 U.S. at 418 (2007).

4. Dr. Mahon's Declaration Merely Repeats the Petition and Adds No Independent Rationale

Dr. Mahon's motivation-to-combine discussion in his declaration mirrors the Petition nearly verbatim. *Compare* Pet., 43–45 with Ex. 1003, ¶¶172–176. Like the Petition, Dr. Mahon relies on generalized benefits of mmWave communications, beamforming, and predictable engineering results. He does not identify any problem in Prasad that would motivate the proposed combination, nor does he articulate a claim-specific reason for modifying Prasad to perform the claimed zone or span computation.

Dr. Mahon's assertion that the proposed modifications would have required only "routine engineering with predictable results" (Ex. 1003, ¶176) does not satisfy the requirement for articulated reasoning with a rational underpinning. Such conclusory statements cannot substitute for a reasoned explanation of why a POSITA would have made the specific modifications required by the claims.

5. Petitioner Fails to Meet Its Burden Under Ground 3

Because Petitioner has not articulated a well-reasoned, claim-specific rationale explaining why a POSITA would have been motivated to combine Prasad with Seol and Yin in the manner asserted, Petitioner has failed to carry its burden under Ground 3.

V. CONCLUSION

For the reasons set forth above, Petitioner fails to demonstrate a reasonable likelihood that Petitioner will prevail on any challenged claim. Petitioner has not established that any of the independent claims of the '548 Patent are anticipated or would have been obvious under any asserted ground.

Because Petitioner has not shown that any independent claim is unpatentable, Petitioner likewise has not shown that any dependent claim is unpatentable. *See, e.g.*, *Hartness Int'l Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108 (Fed. Cir. 1987) (if an independent claim is nonobvious, a dependent claim is necessarily nonobvious and novel). Each dependent claim incorporates

the limitations of its corresponding independent claim, and Petitioner advances no separate unpatentability theory directed specifically to any dependent claim.

Accordingly, the Board should deny institution.

Dated: January 16, 2026

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE REQUIREMENTS

1. This Patent Owner Preliminary Response complies with the type-volume limitation of 14,000 words, comprising **6,916** words, as counted using the Microsoft Word software that was used to prepare this paper, excluding the parts exempted by 37 C.F.R. § 42.24(a), (b).

2. This Patent Owner Preliminary Response complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft Word 2016 in 14-point Times New Roman.

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CERTIFICATION OF SERVICE

I hereby certify that on January 16, 2026, I caused a true and correct copy of the foregoing to be served on the following counsel for Petitioners by electronic mail to the following email address:

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