

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Apple Inc.,
Petitioner,

v.

Cobblestone Wireless LLC,
Patent Owner.

IPR2025-01496
Patent 8,891,347

PATENT OWNER'S PRELIMINARY RESPONSE

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35 U.S.C. § 312 -----	3, 7
35 U.S.C. § 314 -----	3, 9, 15, 22

PATENT OWNER’S EXHIBIT LIST

No.	Description
Ex. 2001	<i>Cobblestone Wireless LLC v. Apple Inc.</i> , No. 7:24-cv-00232 ADA, Dkt. No. 23 Scheduling Order
Ex. 2002	Motion to Stay before Judge Albright, Docket Navigator
Ex. 2003	Guidance on USPTO’s recission of “Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation”
Ex. 2004	Western District of Texas Case Management Statistics
Ex. 2005	<i>Cobblestone Wireless LLC v. Apple Inc.</i> , No. 7:24-cv-00232 ADA, Dkt. No. 7 Proof of Service
Ex. 2006	Cobblestone’s Preliminary Infringement Contentions
Ex. 2007	Apple’s Invalidity Contentions – Ex. A4 (“Hardacker”)
Ex. 2008	Apple’s Invalidity Contentions – Ex. A2 (“Medbo”)
Ex. 2009	Apple’s Invalidity Contentions – Ex. A6 (“Wallace ’467”)
Ex. 2010	Interim Processes for PTAB Workload Management
Ex. 2011	RIN 0651-AD89 Revision to Rules of Practice before the Patent Trial and Appeal Board, Dkt. No. PTO-P02025-0025
Ex. 2012	<i>T-Mobile USA, Inc. et al v. Cobblestone Wireless LLC</i> , IPR2024-00316, Paper 18, (PTAB Jun. 5, 2024)
Ex. 2013	<i>Samsung Electronics America Inc., et al v. Cobblestone Wireless, LLC</i> , IPR2024-00319, Paper 16, (PTAB Jun. 24, 2024)
Ex. 2014	<i>Cobblestone Wireless, LLC v T-Mobile USA, Inc.</i> , Case No. 2:22-00477-JRG-RSP – Subpoena to Apple, Proof of Service
Ex. 2015	<i>Cobblestone Wireless, LLC v T-Mobile USA, Inc.</i> , Case No. 2:22-00477-JRG-RSP – Subpoena to Apple

I. INTRODUCTION

The Petition should be denied because Petitioner fails to demonstrate a reasonable likelihood of prevailing as to any of the challenged claims. The challenged claims of U.S. Patent No. 8,891,347 (“the ’347 patent”) address a specific class of wireless techniques in which a first transmission over a particular propagation path is used to estimate that path’s characteristics, and those estimated path parameters are then used to predistort a subsequent transmission in the time, frequency, and spatial domains along that same path. The claims are not directed to generic channel measurements or generic equalization; they recite a path-specific feedback and predistortion scheme implemented between a wireless device and a base station.

The Petition advances four obviousness grounds relying on Hardacker (APPLE-1004) and Wallace (APPLE-1006) for single-reference obviousness for Grounds 1 and 3. But as explained below, neither of those references discloses, or even suggests, the core features of the claimed invention: (1) performing a channel estimation “to obtain path parameter information of the first propagation path”; (2) feeding that path-specific information back to a transmitter; and (3) using that information to predistort a second signal in the time, frequency, and spatial domains and transmit it back over the same propagation path. Instead, the Petition repeatedly re-labels generic distortion measurements and global channel-state information as

“path parameter information,” and then assumes—without analysis or evidentiary support—that a person of ordinary skill “would have understood and found obvious” to implement the claimed multi-domain, path-specific predistortion.

These defects are not minor gaps; they go to the heart of Petitioner’s obviousness theory. As discussed in Section IV below, the Petition never performs the obviousness analysis that *Graham* and its progeny require. It does not identify the actual differences between the prior art and the challenged claims, does not articulate any concrete rationale for modifying the prior art to supply the missing claim features, and relies instead on boilerplate assertions that each limitation “would have been understood and found obvious” in view of general knowledge. Grounds 1 and 3—directed to Hardacker and Wallace, respectively—never meaningfully grapple with the claim language as a whole, particularly the requirements for path-parameter information of a first propagation path and predistortion in three distinct domains. Grounds 2 and 4, which merely layer additional references on top of those flawed theories for certain dependent claims, do nothing to cure the failures as to the independent claims.

With respect to Hardacker (Grounds 1 and 2), the Petition conflates receiver-side measurements of aggregate distortion on a “communication path” with the claimed channel estimation that yields “path parameter information of the first propagation path,” and it mischaracterizes Hardacker’s generic list of “types of

distortion” as teaching the claimed predistortion in the time, frequency, and spatial domains. With respect to Wallace (Grounds 3 and 4), the Petition equates Wallace’s global channel-state information matrices and diversity concepts with the claimed per-path channel estimation and multi-domain predistortion, even though Wallace neither models a single propagation path nor applies any predistortion in the claimed sense.

Because Petitioner has not identified prior-art teachings that actually meet the claim language nor render them obvious, has not articulated a supported rationale for the sweeping modifications it assumes, and has not addressed the claimed inventions as a whole, it has failed to satisfy its burden under 35 U.S.C. §§ 312(a)(3) and 314(a). For the reasons set forth in the sections that follow, the Board should deny institution on all grounds and for all challenged claims.

II. LEVEL OF ORDINARY SKILL IN THE ART

The Petition proposes that a POSITA in the field of the ’347 Patent “would have had a bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and two to three years of experience in the design or development of wireless telecommunication systems, or the equivalent. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.” Pet. at 5. For purposes of this preliminary response, Patent Owner does not challenge that

definition.

III. CLAIM CONSTRUCTION

The Petition states that “no formal claim constructions are necessary because claim terms need only be construed to the extent necessary to resolve the controversy” and identifies no specific terms for construction. *Id.* at 5 (internal quotation and citation omitted). Patent Owner agrees for purposes of this preliminary response.

IV. THE PETITION FAILS TO PERFORM A PROPER OBVIOUSNESS ANALYSIS

The Grounds in the petition rest solely upon obviousness, not anticipation. Pet. at 1. As such, the Petition must identify the differences between the challenged claims and the alleged prior art. *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 794 (Fed. Cir. 2021) (“[T]he scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved.” (quoting *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17 (1966))); see also *Nat'l Rsch. & Dev. Corp. v. Varian Assocs., Inc.*, 883 F. Supp. 976, 984 (D.N.J. 1995) (“Although the claim must be considered as a whole, ‘the differences between the claim and the prior art need to be identified to place the obviousness analysis into proper perspective.’” (quoting *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 717 (Fed. Cir.1991))).

Despite this clear precedent, the Petitioner fails to identify which limitations or elements are disclosed in the prior art or the differences between the prior art and the claims at issue, instead merely stating that each limitation is rendered obvious by the respective references, and that a POSITA “would have understood and found obvious” the references disclosures “would satisfy or encompass the understanding” of the claim limitation. *See* Pet. at 10, 13. Similarly, the Petitioner failed to identify any motivation to modify the references relied upon in Grounds 1 and 3, instead repeating for every limitation the vague language quoted above. The only time Petitioner provided a motivation in support of its obviousness case was with respect to the motivation to combine references for Grounds 2 and 4.¹ Pet. at 37-41, 78-82.

Petitioner’s failure to perform a proper obviousness analysis for Grounds 1 and 3 requires a finding that it failed to meet its burden as to all claims. Grounds 2 and 4 are only directed to certain dependent claims. Petitioner did not perform a proper obviousness analysis as to any of the independent claims, which are addressed solely in Grounds 1 and 3. When addressing the dependent claims in Grounds 2 and 4, Petitioner did not revisit or otherwise address the limitations in the independent claims which the dependent claims incorporate.

¹ Patent Owner does not agree with the stated motivations to combine, but reserves such disagreements for any later filings.

Petitioner cannot rely on its expert declaration to cure the deficiencies identified above. Petitioner’s expert declaration copies the text of the Petition, with unsupported, conclusory opinions of obviousness. Such assertions cannot satisfy Petitioner’s burden. *In re Magnum Oil Tools*, 829 F.3d 1364,1380 (Fed. Cir. 2016) (“[A] petitioner cannot satisfy its burden of proving obviousness by employing mere conclusory statements.”); *TQ Delta v. Cisco*, 942 F.3d 1352, 1359 (Fed. Cir. 2019) (rejecting obviousness theories depending solely on expert ipse dixit).

Moreover, the Petition fails to consider or address the obviousness of the challenged claims as a whole, instead merely addressing each limitation separately in Grounds 1 and 3. The Petition is thus facially deficient as to the independent claims. *Ruiz v. A.B. Chance Co.*, 357 F.3d 1270, 1275 (Fed. Cir. 2004). “The ‘as a whole’ instruction in title 35 prevents evaluation of the invention part by part. This form of hindsight reasoning, using the invention as a roadmap to find its prior art components, would discount the value of combining various existing features or principles in a new way to achieve a new result—often the very definition of invention.” *See also Princeton Biochemicals, Inc. v. Coulter, Inc.*, 411 F.3d 1332, 1337 (Fed. Cir. 2005) (“[S]imply identifying all of the elements in a claim in the prior art does not render a claim obvious.”).

Thus, Petitioner failed to perform a proper obviousness analysis for **any** challenged claims. Petitioner’s failure to identify its position with particularity, by

itself, compels a finding that Petitioner fails to meet its burden. *See* 35 U.S.C. § 312(a)(3); 37 C.F.R. §§ 42.104, 42.22; *Intelligent Bio- Systems, Inc. v. Illumina Cambridge, Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016).

V. THE PETITION FAILS TO SHOW A REASONABLE LIKELIHOOD OF PREVAILING FOR ANY CHALLENGED CLAIM.

The Petition raises four Grounds of invalidity; Grounds 1 and 3 alone address the independent claims. As shown below, Grounds 1 and 3 fail both grounds fail because neither Hardacker nor Wallace discloses or renders obvious multiple limitations. Grounds 2 and 4 are directed to limitations found in the independent claims are do not cure the deficiencies in Grounds 1 and 3 as to the independent claims. As such, Grounds 1 through 4 fail to show invalidity in multiple ways; thus institution should be denied.

A. The Petition’s Grounds 1 and 2 Fail as to All Challenged Claims

The challenged claims all recite either a wireless device configured to perform specific steps or a method comprising those same steps, namely (1) receiving a first signal over a first propagation path, (2) performing a channel estimation that yields path-parameter information of that same propagation path, (3) sending that channel-estimation information to a transmitter, and (4) receiving a second signal that has been predistorted “in a time domain, a frequency domain, and a spatial domain” according to the channel estimation. The Petitioner asserts that Hardacker renders obvious each of these limitations. Pet. at 10-34. But the Petition misreads Hardacker,

conflates its receiver-side distortion measurement operations with the claimed channel-estimation operations performed by a wireless device, and improperly assumes that Hardacker discloses (or makes renders obvious) multi-domain predistortion based solely on generalized statements about “types of distortion.” None of these assumptions is supported by Hardacker’s actual disclosure or by the Petition’s evidence.

Ground 2 only addresses certain dependent claims and only certain limitations of those claims. Ground 2 does not address the independent claims or the deficiencies of Ground 1. For these reasons, Petitioner fails to meet its burden under § 314(a), and Ground 1 and Ground 2 should be denied as to all challenged claims.

1. Petitioner Has Not Shown that Hardacker Discloses or Renders Obvious the Claimed Channel Estimation Producing “Path Parameter Information of the First Propagation Path”

The independent claims (and thus the dependent claims as well) all require performing a channel estimation “to obtain path parameter information of the first propagation path.” APPLE-1001 at Cl. 1, 8, 15, 19. The Petition argues that the limitation requiring “performing a channel estimation based on the first signal to obtain path parameter information of the first propagation path” is taught by Hardacker’s disclosure that of a “signal specifically utilized to determine the nature of the distortion or interference on the communication path,” relying on Hardacker’s

“distortion determination circuit 250 determines the distortion on the communication path” for this limitation *See e.g.*, Pet. at 14-15 (addressing claim 19).² But Hardacker does not disclose that the system performs any channel estimation of the sort required by the independent claims nor that it derives the “path parameter information” that the claims require.

In Hardacker, the receiver-side circuit 250 measures aggregate distortion affecting the received signal. APPLE-1004 at [¶0024]. The Petition characterizes this as “channel estimation...to obtain path parameter information of the first propagation path.” Pet. 14-17. But Hardacker does not describe the operation as channel estimation, does not identify any channel or path parameters (*e.g.*, estimation of a delay, an estimation of a Doppler frequency, an estimation of a direction of arrival, an estimation of a direction of departure, and an estimation of a complex amplitude of the first propagation path), and does not disclose extracting the parameters of a propagation path as the claim explicitly requires. Instead, Hardacker’s measurement is expressly described as determining the “nature of the distortion” on a “communication path.” APPLE-1004 at [¶0016, ¶0024]. That

² For this limitation, Petitioner only provides substantive argument or evidence as to claim 19. The remaining independent claims provide no new evidence or argument as to this limitation, instead providing only a citation back to claim 19. *See* Pet. at 25 (limitation 1.4); 33 (limitation 8.3). Although Petitioner provides some additional argument with respect to limitation 15.4 (Pet. at 34), that argument is not directed to the “path parameter information of the first propagation path,” but rather the requirement that a base station receive such information.

distortion may include various impairments, but Hardacker does not provide a model of the propagation path or any parameterization of the path.

Petitioner further contends that “a POSITA would have understood and found obvious that Hardacker’s “distortion [] on the communication path” is at least one type of path parameter information because Hardacker discloses that “types of distortion includ[e] equalization, multi-path, amplitude, frequency, phase and other well[-]known types” of wireless communication path distortion” (Pet. at 15), but these are generic types of signal impairment, not information of a specific propagation path as required by the claims. Indeed, the very language quoted by Petitioner’s makes this clear: “Thereafter, signals to be transmitted on the communication path are pre-distorted as a function of the determined distortion. **The pre-distortion may be accomplished using various types of distortion including equalization, multi-path, amplitude, frequency, phase, and other well known types.**” APPLE-1004 at [¶0003]; *see also* Pet. at 15 (citing same).

The Petitioner then appears to equate the mention of “data” in Hardacker to the claimed requirement of a “channel estimation.” Pet. at 16 (“Specifically, Hardacker teaches ‘data [(*channel estimation*)] indicating the distortion [(*path parameter information of the first propagation path*)].” (emphasis in original)). But again, the generic disclosure of “data indicating the distortion” is not a disclosure of the claim limitation-at-issue, and Petitioner provides no evidence or argument to the

contrary.

Hardacker never attributes the measured distortion components to a specific propagation path or distinguishes among multiple propagation paths, which is a required aspect of the challenged claims’ “path parameter information of the first propagation path.” The Petition identifies no disclosure in Hardacker that provides such path-specific channel parameters.

The Petition conflates distortion-related data with claim-required “path parameter information.” But Hardacker’s feedback includes only the distortion, not the parameters of a propagation path, and the Petition fails to articulate any reasoning—let alone evidentiary support—explaining how a POSITA would have converted Hardacker’s distortion metric into the claimed path-parameter information. Unsupported assertions of “obviousness” are insufficient. See *Magnum Oil Tools*, 829 F.3d at 1380 (“[C]onclusory statements alone are insufficient and the Board must articulate a reasoned explanation...”).

2. Petitioner Fails to Show that Hardacker Discloses or Renders Obvious Receiving a Second Signal Predistorted in the Time, Frequency, and Spatial Domains

The independent claims all require a second signal that is predistorted in “a time domain, a frequency domain, and a spatial domain” based on the first signal. Cl. 1, 8, 15, and 19. The Petition’s treatment of this limitation is legally and factually

deficient. *See* Pet. at 17-22.³

The Petition cites Hardacker’s statements that distortion “types” may include multi-path, amplitude, frequency, or phase distortion. Pet. 20 (citing APPLE-1004 at [¶0033]). But Hardacker never states that predistortion is applied in all of the time, frequency, and spatial domains. Nor does Hardacker perform predistortion using channel-estimation data derived at the receiver.

Instead, Hardacker’s transmitter applies a mathematical inverse function to compensate for the distortion determined in paragraph 24. APPLE-1004 at [¶0024, ¶0027]. That is a single-function predistortion that does not itself demonstrate distinct predistortion components applied in three separate domains. The Petition’s assertion that a POSITA “would have understood and found obvious” (Pet. at 21) Hardacker’s distortion types to equate to time-, frequency-, and spatial-domain predistortion is unsupported by Hardacker and rests solely on a conclusory expert statement. That is insufficient. *Magnum Oil Tools*, 829 F.3d at 1380.

The Petition attempts to fill this gap with a second reference, despite presenting Ground 1 as based single-reference obviousness. Pet. 21–22 (citing APPLE-1007). Petitioner provides no motivation to combine these reference.

³ For this limitation, Petitioner only provides substantive argument or evidence as to claim 19. The remaining independent claims provide no new evidence or argument as to this limitation, instead providing only a citation back to claim 19. *See* Pet. at 26 (limitation 1.6); 33 (limitation 8.5); 35 (limitation 15.5).

Similarly, the Petition offers no reason that Hardacker's invention would perform any spatial-domain operation. The PTAB has repeatedly held that broad statements of general knowledge cannot substitute for articulated rationale supported by prior art disclosure.

3. The Dependent Claims

Because the independent claims are not obvious, the Board should deny the Petition on the dependent claims for the same reasons. *See Neptune Generics, LLC v. Eli Lilly & Co.*, 921 F.3d 1372, 1378 (Fed. Cir. 2019).

B. The Petition's Grounds 3 and 4 Fail as to All Challenged Claims

Ground 3, based on Wallace (APPLE-1006) fails for many of the same reasons as Ground 1. The challenged claims all recite either a wireless device configured to perform specific steps or a method comprising those same steps, namely (1) performing a channel estimation that yields path-parameter information of that same propagation path, (2) sending that channel-estimation information to a transmitter, and (3) receiving a second signal that has been predistorted "in a time domain, a frequency domain, and a spatial domain" according to the channel estimation. Nothing in Wallace performs any of these operations.

Wallace never derives path-parameter information for a specific propagation path, never transmits such information back to a transmitter, and does not teach predistortion of any kind—let alone multi-domain predistortion based on path-

specific channel estimates. Instead, Wallace deals with long-term averaged channel quality indicators used for system-level adaptation, not per-path estimations that the claims require. Moreover, the Petition misrepresents the disclosure in Wallace, inaccurately pasting disparate portions of the reference into a single quotation in an effort to meet its burden as to this disclosure. Because the Petition substitutes missing disclosures with incorrect citations, speculation, and conclusory expert assertions, Ground 3 fails.

Ground 4, like Ground 2, only addresses certain dependent claims, and only certain limitations of those claims. Ground 4 does not address the independent claims or the deficiencies of Ground 3. For these reasons, Petitioner fails to meet its burden under § 314(a), and Grounds 3 and 4 should be denied as to all challenged claims.

1. Petitioner Has Not Shown That Wallace Discloses or Renders Obvious the Claimed Channel Estimation Producing “Path Parameter Information of the First Propagation Path”

The independent claims (and thus the dependent claims as well) all require performing a channel estimation “to obtain path parameter information of the first propagation path. APPLE-1001 at Cl. 1, 8, 15, 19. The Petition argues that the limitation requiring “performing a channel estimation based on the first signal to obtain path parameter information of the first propagation path” is taught by

Wallace’s disclosure that of a “channel state information” or “CSI” for this limitation *See e.g.*, Pet. at 56-59 (addressing claim 19).⁴ But Wallace does not disclose that the system performs any channel estimation of the sort required by the independent claims nor that it derives the “path parameter information of the first propagation path” as the claims require. Nothing in Wallace describes *identifying a single propagation path* or estimating parameters *of that specific path*. Rather, Wallace repeatedly explains that CSI is a *complete characterization of the overall channel matrix between* the transmit and receive antenna arrays APPLE-1006 at 8:53-9:3 (“Full CSI includes sufficient characterization of the propagation path (i.e., amplitude and phase) between all pairs of transmit and receive antennas for each sub-band.”). This description confirms that Wallace’s CSI relates to every transmit-receive antenna pair in the array, not a single propagation path. Wallace’s CSI is not a decomposition into discrete physical propagation paths; it is a matrix representing the aggregate behavior of the channel. *Id.* at 13:16-19. Wallace never suggests that these matrix elements correspond to distinct “propagation paths” of the type recited in the independent claims, nor that the system identifies or estimates separate

⁴ For this limitation, Petitioner only provides substantive argument or evidence as to claim 19. The remaining independent claims provide no new evidence or argument as to this limitation, instead providing only a citation back to claim 19. *See* Pet. at 72 (limitation 1.4); 76(limitation 8.3). Although Petitioner provides some additional argument with respect to limitation 15.4 (Pet. at 77), that argument is not directed to the “path parameter information of the first propagation path,” but rather the requirement that a base station receive such information.

parameters of any distinct propagation path. These disclosures establish that Wallace's CSI at best represents the *aggregate multi-path, multi-antenna channel*, not any single propagation path.

Tellingly, the Petition misrepresents the text of Wallace, combining two different discussions in the reference into a single quotation that does not exist. The Petition contends that Wallace describes “[f]ull CSI includes sufficient characterization of the propagation path (i.e., amplitude and phase) between all pairs of transmit and receive antennas for each sub-band.... [and] also includes the information of the relative levels of interference and noise in each sub-channel.” Pet. at 58 (citing APPLE-1006, 8:53-9:3). But the cited portion of Wallace only contains the first half of the quote. The second half (“also includes the information of the relative levels of interference and noise in each sub-channel”) appears four columns later. APPLE-1006 at 13:14-03. The second half of the quote describes full CSI in multi-antenna systems, again emphasizing the multiple antennas and transmit and receive pairs. *Id.*

The mention of “relative levels of interference and noise in each sub-channel” refers to channel-quality metrics aggregated over subcarriers of a wideband channel—not parameters of a single propagation path as required by the independent claims. Rather, Wallace expressly explains that full CSI represents the entire multi-path, multi-antenna channel via matrices of complex gains—composite quantities

that collapse all propagation paths between each antenna pair into a single frequency-domain transfer value per subcarrier. APPLE-1006 at 8:53–9:3.

Petitioner points to Wallace’s alternative channel-estimation method in column 18, lines 33–45, which describes an alternative to the methods for compressing CSI information, including computing time-domain channel impulse responses and extracting “amplitudes and delays” for multipath components. Pet. at 58-59. But this passage likewise describes global channel estimation, not path-specific estimation based on the first signal as the claim requires. Wallace’s discussion concerns how CSI may be represented for compression and feedback—not how individual propagation paths are identified or used in subsequent transmissions. Nothing in this disclosure identifies any one “first propagation path” or produces “path parameter information” that corresponds to only that path.

Finally, Wallace’s treatment of CSI confirms this interpretation. When Wallace discusses deriving channel impulse responses and translating them into amplitudes and delays (APPLE-1006 at 18:33–45), it describes these parameters only in the aggregate, across all multipath components. Wallace does not attribute any amplitude or delay to a specific propagation path, nor does it identify the “first propagation path” or any singular path that corresponds to the claim requirement. Therefore, Wallace’s CSI—even including noise/interference levels—remains a composite channel description, not a path-specific channel estimation “of the first

propagation path” as required.

2. Petitioner Fails to Show that Wallace Discloses or Renders Obvious Receiving a Second Signal Predistorted in the Time, Frequency, and Spatial Domains

The independent claims all require a second signal that is predistorted in “a time domain, a frequency domain, and a spatial domain” based on the first signal. Cl. 1, 8, 15, and 19. Here again, the Petition misreads Wallace in several fundamental respects. *See* Pet. at 61-65.⁵ While Wallace discusses using CSI to derive precoding matrices for MIMO transmission, nothing in Wallace discloses or renders obvious predistorting a second signal in all three claimed domains based on parameter information of a single propagation path.

To begin with, Wallace never identifies or models a “first propagation path,” let alone performs predistortion tied to any parameter information of such a path, as discussed above. Because Wallace’s processing is applied to the *entire channel matrix*, its precoding operations are not directed to any individual path and therefore cannot satisfy the claim requirement that predistortion be performed “according to the channel estimation based on the first signal” for the “first propagation path.”

Nor does Wallace disclose predistortion in all three of the claimed domains.

⁵ For this limitation, Petitioner only provides substantive argument or evidence as to claim 19. The remaining independent claims provide no new evidence or argument as to this limitation, instead providing only a citation back to claim 19. *See* Pet. at 73 (limitation 1.6); 76 (limitation 8.5); 78 (limitation 15.5).

Wallace discusses time-domain operations only in the context of deriving impulse responses during channel estimation—not as part of any transmit-side predistortion applied to outgoing data. APPLE-1006 at 18:33–45. Wallace discusses frequency-domain operations only in the sense of OFDM sub-band weighting or frequency-selective precoding, which are functions of the global CSI matrix rather than any per-path parameter information. APPLE-1006 at 13:3–21; 15:1–34. And Wallace’s spatial-domain processing—beamforming via matrix multiplication—is likewise derived solely from CSI and applied to antenna arrays without regard to the characteristics of any individual propagation path. APPLE-1006 at 12:20–35. Nowhere does Wallace apply these three types of processing together, nor does it disclose applying *any one* of them “according to the channel estimation based on the first signal” for a specific propagation path, as the claim requires.

The Petition rewrites Wallace’s disclosure of a “combination of antenna diversity, frequency diversity, and temporal diversity allows the communications system of the invention to provide robust performance” to imply disclosure of “spatial *domain*,” “frequency *domain*,” and “temporal *domain*” as claimed. Pet. at 64 (citing APPLE-1006 at 7:33-43). But the actual text of Wallace defines each of the terms “antenna *diversity*,” frequency *diversity*,” and “temporal *diversity*,” making clear that this disclosure does not describe predistortion, does not discuss any transmitter operations, and does not suggest applying channel-specific

predistortion in multiple domains. Instead, it describes how wireless systems may *experience* diversity or *benefit from* diversity—not how a transmitter performs domain-specific predistortion based on path-parameter information of a first propagation path. Nothing in this passage teaches applying any transformation at the transmitter in the claimed manner.

Wallace explains that “antenna diversity” refers to “the transmission and/or reception of data over more than one antenna” (APPLE-1006 at 5:65-55)—not predistortion in the spatial domain. Wallace’s reference to “frequency diversity” refers to “the transmission of data over more than one sub-band.” *Id.* And Wallace’s reference to “temporal diversity” is directed to interleaving and coding across time, “the transmission of data over more than one time period”—not time-domain predistortion. *Id.* In other words, Wallace uses the word “diversity” in its conventional communication-theory sense: increasing robustness by distributing information across antennas, frequency bins, and time slots. That is categorically different from the claimed operation: *predistorting a second signal at the transmitter in the time, frequency, and spatial domains according to path-parameter information derived from a first signal traveling over a specific propagation path.*

Indeed, nothing in the diversity discussion cited by Petitioner teaches any predistortion at all—let alone predistortion simultaneously applied in three domains as claimed. The Petition attempts to repurpose Wallace’s background description of

diversity effects (what the *channel does to the signal*) into teaching about multi-domain predistortion (what the *transmitter must do to the signal*). That leap is unsupported by the reference. Wallace never states that diversity mechanisms are implemented through predistortion, and certainly never ties such techniques to path-specific parameter information extracted from a first signal, as the claim requires.

Thus, Wallace’s broad statements about antenna, frequency, and temporal diversity—untethered to any transmitter-side predistortion and unrelated to any channel estimation of a single propagation path—cannot satisfy the claims’ requirement for multi-domain predistortion according to path-specific parameter information. Petitioner’s reliance on these generic diversity concepts therefore fails to meet its burden under § 314(a).

The Petition further points disparate discussions in Wallace, arguing that “Wallace’s description regarding adjusting transmissions based on channel estimation, teaches the preconditioning of a signal in a time domain, a frequency domain, and a spatial domain.” But here again, the Petition misapprehends Wallace’s disclosures. Wallace discusses time-domain operations only in the context of deriving impulse responses during channel estimation—not as part of any transmitter-side predistortion applied to outgoing data. APPLE-1006 at 18:33–45. Wallace discusses frequency-domain operations only in the sense of OFDM sub-band weighting or frequency-selective precoding, which are functions of the global CSI

matrix rather than any per-path parameter information. APPLE-1006 at 13:3–21; 15:1–34; 19:8-18. And Wallace’s alleged spatial-domain processing, beamforming via matrix multiplication, is likewise derived solely from CSI and applied to antenna arrays without regard to the characteristics of any individual propagation path. APPLE-1006 at 12:20–35. Nowhere does Wallace apply these three types of processing together, nor does it disclose applying *any one* of them “according to the channel estimation based on the first signal” for a specific propagation path, as the claims require.

The claims require predistortion in each domain, applied *because of* the parameters of the *first propagation path*. Wallace’s precoding is a single linear transformation computed from the full CSI matrix, and it does not constitute three distinct predistortion operations, nor does it derive from the characteristics of any single path. The Petition points only to general statements about multipath wireless channels, none of which is tied to any specific teaching in Wallace. Such generalities cannot substitute for a disclosure of the claim limitations. *See In re Magnum Oil Tools Int’l*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

3. The Dependent Claims

Because the independent claims are not obvious, the Board should deny the Petition on the dependent claims for the same reasons. *See Neptune Generics, LLC v. Eli Lilly & Co.*, 921 F.3d 1372, 1378 (Fed. Cir. 2019).

VI. CONCLUSION

For the reasons set forth above, Patent Owner respectfully requests that the instant Petition be denied. All grounds fail to disclose the claimed channel estimation and second signal limitations. Without these limitations, the Petition has not shown a reasonable likelihood of success as to any claim and institution should be denied.

Date: December 10, 2025

Respectfully submitted,

/ Qi Tong /

Qi (Peter) Tong, Reg. No. 74,292
ptong@raklaw.com
Russ August & Kabat
8080 N. Central Expy., Suite 1503
Dallas, TX 75206

Reza Mirzaie, Reg. No. 69,138
Neil A. Rubin, Reg. No. 67,030
Susan Y. Tull, Reg. No. 61,551
Josh Scheufler, (PHV to be Filed)
RUSS, AUGUST & KABAT
12424 Wilshire Blvd., 12th Floor
Los Angeles, CA 90025

Counsel for Patent Owner

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

I certify that there are 5,056 words in this paper, excluding the portions exempted under 37 C.F.R. § 42.24(a)(1), according to the word count tool in Microsoft Word.

Dated: December 10, 2025

/ Qi Tong /

Qi (Peter) Tong, Reg. No. 74,292
ptong@raklaw.com
Russ August & Kabat
8080 N. Central Expy., Suite 1503
Dallas, TX 75206

Reza Mirzaie, Reg. No. 69,138
Neil A. Rubin, Reg. No. 67,030
Susan Y. Tull, Reg. No. 61,551
Josh Scheufler, (PHV to be Filed)
RUSS, AUGUST & KABAT
12424 Wilshire Blvd., 12th Floor
Los Angeles, CA 90025

Counsel for Patent Owner

CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e)(1))

The undersigned hereby certifies that the above document was served on December 10, 2025, by filing this document through the Patent Trial and Appeal Case Tracking System as well as delivering a copy via electronic mail upon the following attorneys of record for the Petitioner:

W. Karl Renner, Reg. No. 41,265
Hyun Jin In, Reg. No. 70,014
Jonathan C. Driesslein, Reg. No. 82,202
IPR50095-0250IP1@fr.com.
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402

Date: December 10, 2025

/ Qi Tong /
Qi (Peter) Tong, Reg. No. 74,292
ptong@raklaw.com
Russ August & Kabat
8080 N. Central Expy., Suite 1503
Dallas, TX 75206

Reza Mirzaie, Reg. No. 69,138
Neil A. Rubin, Reg. No. 67,030
Susan Y. Tull, Reg. No. 61,551
Josh Scheufler, (PHV to be Filed)
RUSS, AUGUST & KABAT
12424 Wilshire Blvd., 12th Floor
Los Angeles, CA 90025

Counsel for Patent Owner