

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

HERA WIRELESS S.A.,
Patent Owner.

IPR2018-01373
Patent 8,934,851 B2

Before MICHAEL R. ZECHER, THOMAS L. GIANNETTI, and
ROBERT L. KINDER, *Administrative Patent Judges*.

ZECHER, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Granting Patent Owner's Motion to Amend to Cancel Claims 1–9
Denying Patent Owner's Motion to Amend to Substitute Claims 10–12
35 U.S.C. § 318(a)

I. INTRODUCTION

Petitioner, Intel Corporation, filed a Petition requesting an *inter partes* review of claims 1–9 of U.S. Patent No. 8,934,851 B2 (Ex. 1001, “the ’851 patent”). Paper 2 (“Pet.”). Patent Owner, Hera Wireless S.A., filed a Preliminary Response. Papers 8, 11, 16, 17.¹ Taking into account the arguments presented in Patent Owner’s Preliminary Response and Petitioner’s Reply, we determined that the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim. Pursuant to 35 U.S.C. § 314, we instituted this *inter partes* review on February 5, 2019, as to all of the challenged claims and all grounds raised in the Petition. Paper 25 (“Dec. on Inst.”).

During the course of trial, Patent Owner did not file a Patent Owner Response. Instead, Patent Owner filed a Motion to Amend, in which it requests “to cancel original claims 1–9 of [the ’851 patent] and substitute . . . new [proposed substitute] claims 10–12.” Paper 33 (“Mot. to Amend”), 1; *see also id.* at 2 (“[Patent Owner] respectfully requests that the Board grant this motion to amend and cancel claims 1–9 and substitute claims 10–12.”). Petitioner filed an Opposition to the Motion to Amend (Paper 34, “Opp.”), Patent Owner filed a Reply to the Motion to Amend (Paper 38, “PO Reply”), and Petitioner filed a Sur-reply to the Reply to the Motion to Amend

¹ Patent Owner originally filed unredacted (Paper 8) and redacted (Paper 11) versions of its Preliminary Response on November 23, 2018. On December 18, 2018, with our authorization, Patent Owner refiled unredacted (Paper 17) and redacted (Paper 16) versions of its Preliminary Response to correct a filing error.

(Paper 42, “Sur-reply”). A consolidated oral hearing with related IPR2018-01371 and IPR2018-01372, along with IPR2018-01418, IPR2018-01419, IPR2018-01420, and IPR2018-01421 (“the Ruckus IPRs”), was held on November 6, 2019, and a transcript of the hearing is included in the record. Paper 47 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision under 35 U.S.C. § 318(a). We *grant* Patent Owner’s Motion to Amend with respect to its request to cancel challenged claims 1–9 of the ’851 patent. We, however, *deny* Patent Owner’s Motion to Amend with respect to its request to substitute proposed claims 10–12 for now-cancelled independent claims 1, 4, and 7.

A. Related Matters

The parties indicate that the ’851 patent is the subject of the following eight district court cases: (1) *Hera Wireless S.A. v. Amazon.com, Inc.*, 1:17-cv-00947 (D. Del.); (2) *Hera Wireless S.A. v. ARRIS Group, Inc.*, 1:17-cv-00948 (D. Del.); (3) *Hera Wireless S.A. v. Belkin Int’l, Inc.*, 1:17-cv-00949 (D. Del.); (4) *Hera Wireless S.A. v. Buffalo Americas, Inc.*, 1:17-cv-00950 (D. Del.); (5) *Hera Wireless S.A. v. Netgear, Inc.*, 1:17-cv-00951 (D. Del.); (6) *Hera Wireless S.A. v. Roku, Inc.*, 1:17-cv-00952 (D. Del.); (7) *Hera Wireless S.A. v. Lenovo Holding Co., Inc.*, 1:17-cv-01088 (D. Del.); and (8) *Hera Wireless S.A. v. LG Electronics USA, Inc.*, 1:17-cv-01089 (D. Del.). Pet. 2; Paper 3, 2.

The ’851 patent is also the subject of IPR2018-01420 and IPR2018-01421 (two of the Ruckus IPRs), which were filed by Ruckus Wireless, Inc., Belkin International, Inc., Amazon.com, Inc., Netgear, Inc., and Roku, Inc. Paper 15, 3–4. In addition, Petitioner has filed petitions requesting an *inter*

partes review of patents related to the '851 patent in the following two cases: (1) IPR2018-01371 (challenging U.S. Patent No. 7,962,103 B2); and (2) IPR2018-01372 (challenging U.S. Patent No. 8,412,115 B2).

B. The '851 Patent

The '851 patent is titled “Radio Apparatus, and Method and Program for Controlling Spatial Path.” Ex. 1001, code (54). The '851 patent generally relates to a radio apparatus capable of establishing multiplex communication between a radio terminal and a radio base station via a plurality of paths formed by space division, as well as to a method and a program for controlling a spatial path. *Id.* at 1:19–25. The '851 patent describes a modification to a Japanese wireless communication system known as the PHS (“Personal Handy phone System”) standard. *Id.* at 1:66–2:19.

According to the '851 patent, one alleged problem with prior art multi-path communications systems was that, once established, the paths could not be modified, even if a failure occurred in one of the designated paths. Ex. 1001, 4:14–17. The '851 patent, therefore, proposes the following solution:

a radio apparatus capable of adaptive modification in connection of a plurality of paths between a terminal and a base station in accordance with a communication condition in a mobile communication system where communication is established with a multiple-paths-for-one-user scheme such as the MIMO scheme, as well as a method and a program for controlling a spatial path.

Id. at 4:23–30.

The '851 patent discusses use in PHS of PDMA (“Path Division Multiple Access”) to improve efficiency. Ex. 1001, 2:20–26. In PDMA, in

order to achieve efficiency in using a given frequency of a radio wave, mobile radio terminal units of a plurality of users establish spatial multiple connections to a radio base station through a plurality of paths formed by spatially dividing an identical time slot of an identical frequency. *Id.* at 2:22–27.

The '851 patent proposes a MIMO (“Multi Input-Multi Output”) scheme in which multiplex communication is established between one terminal having a plurality of antennas and a PDMA base station via a plurality of spatial paths of an identical frequency and an identical time slot. Ex. 1001, 3:24–28.

Figure 2 of the '851 patent is reproduced below.

FIG.2

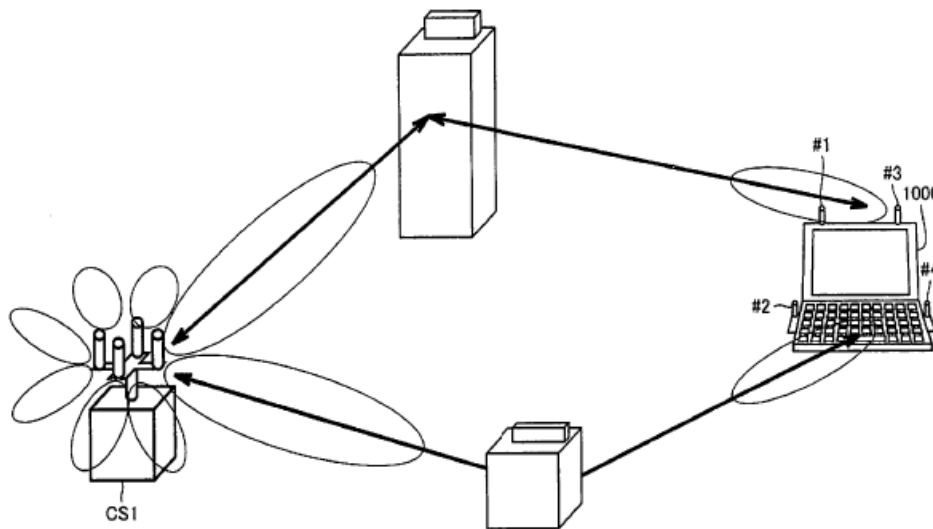


Figure 2 illustrates communication between PDMA terminal 1000 and an array antenna of base station CS1 using multiple spatial paths, where terminal antennas 1 and 3 are used for Path 1, and terminal antennas 2 and 4 are used for Path 2. Ex. 1001, 7:27–30, 9:26–34.

In the embodiment of Figure 2 (identified as the “First Embodiment”), a memory within terminal 1000 stores “antenna number information.” Ex. 1001, 9:45–46. Terminal 1000 transmits the antenna number information to base station CS1 at a prescribed timing. *Id.* at 9:46–48. Base station CS1 issues an instruction for the number of paths to be set to base station 1000 “based on the antenna number information from terminal 1000.” *Id.* at 9:48–51. “Terminal 1000 sets the number of paths to be formed in accordance with the instruction from base station CS1.” *Id.* at 9:51–52.

The ’851 patent further explains, with reference to Figure 3, that antenna number information is transmitted to the base station from terminal 1000 as control information in requesting establishment of a link channel (LCH allocation request). Ex. 1001, 9:61–64. “Base station CS1 gives an instruction for the number of paths stating that the number of paths to be set should be equal to or smaller than the number of antennas, as the control information for link channel allocation instruction, for example, based on the antenna number information from the terminal.” *Id.* at 9:65–10:3.

II. ANALYSIS

A. *Motion to Amend*

Pursuant to 35 U.S.C. § 316(d)(1) and 37 C.F.R. § 42.121(a), Patent Owner requests “to cancel original claims 1–9 of [the ’851 patent] and substitute . . . new [proposed substitute] claims 10–12.” Mot. to Amend 1; *see also id.* at 2 (“[Patent Owner] respectfully requests that the Board grant this motion to amend and cancel claims 1–9 and substitute claims 10–12.”). The Motion to Amend, therefore, is not contingent on our determination as to whether a preponderance of the evidence establishes that challenged

claims 1–9 of the '851 patent are unpatentable. *See id.* at 1–2. To support its positions, Patent Owner relies on the Declaration of Dr. Jacob Sharony filed with its Motion to Amend, as well as a Second Declaration of Dr. Sharony filed with its Reply to the Motion to Amend. Exs. 2016, 2025.

1. Proposed Substitute Claims

Patent Owner requests to substitute claims 10–12 for now-cancelled independent claims 1, 4, and 7, respectively. Mot. to Amend 1, Claims App'x. Claims 10–12 are independent. Independent claim 10 recites the following (with underlining indicating language added to independent claim 1 and brackets indicating language removed from independent claim 1):

10. (substitute for claim 1) A radio apparatus capable of communicating with another radio apparatus, comprising:
a communication unit configured to communicate using an antenna; and
a reception unit configured to receive, from said another radio apparatus, a value indicating [possible multiplicity associated with] the maximum number of spatial paths that can be formed by said another radio apparatus for multiplex communication[, at a predetermined timing] in a request to establish a link channel.

Mot. to Amend, Claims App'x. Independent claim 11 recites the following (with underlining indicating language added to independent claim 4 and brackets/strikethrough indicating language removed from independent claim 4):

11. (substitute for claim 4) A radio apparatus capable of communicating with another radio apparatus, comprising:
a communication unit configured to communicate using a plurality of antennas;
a storage unit configured to store prior to any request to establish a link channel from the another radio apparatus [beforehand] a value indicating [possible multiplicity associated

with] the maximum number of spatial paths formable by said communication unit for multiplex communication; and

a control unit configured to control a processing of transmitting the value [indicating possible multiplicity] to said another radio apparatus[, at a predetermined timing] in a request to establish a link channel.

Id. Independent claim 12 recites the following (with underlining indicating language added to independent claim 7 and brackets indicating language removed from independent claim 7):

12. (substitute for claim 7) A radio apparatus capable of communicating with another radio apparatus, comprising:

a communication unit configured to communicate using a plurality of antennas; and

a reception unit configured to receive, from said another radio apparatus, a value indicating [possible multiplicity associated with] the maximum number of spatial paths that can be formed by said another radio apparatus for multiplex communication[, at a predetermined timing] in a request to establish a link channel.

Id.

2. Statutory and Regulatory Requirements

We first determine whether the motion to amend meets the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121. *See Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 and IPR2018-01130, Paper 14 (PTAB Feb. 25, 2019) (precedential) (“*Lectrosonics*”).

a. Reasonable Number of Substitute Claims

A motion to amend may, “[f]or each challenged claim, propose a reasonable number of substitute claims.” 35 U.S.C. § 316(d)(1)(B) (2012). “The presumption is that only one substitute claim would be needed to replace each challenged claim, and it may be rebutted by a demonstration of

need.” 37 C.F.R. § 42.121(a)(3) (2018). Patent Owner proposes three substitute claims—one for each of cancelled independent claims 1, 4, and 7. Mot. to Amend 1, Claims App’x. We determine that the number of proposed substitute claims is reasonable under 35 U.S.C. § 316(d)(1)(B) and 37 C.F.R. § 42.121(a)(3).

b. Responding to a Ground of Unpatentability

“A motion to amend may be denied where . . . [t]he amendment does not respond to a ground of unpatentability involved in the trial.” 37 C.F.R. § 42.121(a)(2)(i). In its proposed substitute claims, Patent Owner adds limitations to each challenged independent claim being replaced and explains how the proposed substitute claims are patentable over the prior art references that serve as the basis of the grounds of unpatentability involved in this trial and two of the Ruckus IPRs—namely, Wallace² alone, Wallace in combination with Ling,³ Paulraj⁴ alone, Paulraj in combination with Mukerjee,⁵ and Reudink⁶ alone. Mot. to Amend 3–4, 12–23, Claims App’x. We determine that the amended language in the proposed substitute claims is

² Mark Wallace & Jay Rod Walton, U.S. Patent Application Pub. No. 2002/0193146 A1, filed June 6, 2001, published Dec. 19, 2002 (Ex. 1003, “Wallace”).

³ Fuyun Ling et al., U.S. Patent Application Pub. No. 2003/0003880 A1, filed Sept. 18, 2001, published Jan. 2, 2003 (Ex. 1004, “Ling”).

⁴ Arogyaswami J. Paulraj et al., U.S. Patent No. 6,351,499 B1, filed Dec. 15, 1999, issued Feb. 26, 2002 (Ex. 1005, “Paulraj”).

⁵ Sandip Mukerjee & Ralph Utano, U.S. Patent No. 5,479,484, filed May 31, 1994, issued Dec. 26, 1995 (Ex. 1028, “Mukerjee”).

⁶ Douglas O. Reudink & Mark D. Reudink, U.S. Patent No. 7,039,441 B1, filed Oct. 19, 1999, issued May 2, 2006 (Ex. 2022, “Reudink”).

responsive to the ground of unpatentability involved in this trial under 37 C.F.R. § 42.121(a)(2)(i).

c. Scope of the Proposed Substitute Claims

A motion to amend “may not enlarge the scope of the claims of the patent.” 35 U.S.C. § 316(d)(3); *see* 37 C.F.R. § 42.121(a)(2)(ii). Patent Owner contends that “proposed substitute independent claims 10–12 retain all of the features of original claims 1, 4, and 7, and do not enlarge the scope of the claims in any way, instead adding only narrowing features.” Mot. to Amend 2. We have reviewed proposed substitute claims 10–12 and determine that they do not enlarge the scope of the original challenged claims.

A motion to amend also “may not . . . introduce new matter.” 35 U.S.C. § 316(d)(3); *see* 37 C.F.R. § 42.121(a)(2)(ii). “New matter is any addition to the claims without support in the original disclosure.” *Lectrosonics*, IPR2018-01129, Paper 15 at 7 (citing *TurboCare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001)). In order to show that an amendment does not introduce new subject matter, a motion to amend must set forth “[t]he support in the original disclosure of the patent for each claim that is added or amended” and “[t]he support in an earlier-filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought.” 37 C.F.R. § 42.121(b)(1), (2).

The test for compliance with the written description requirement of 35 U.S.C. § 112 ¶ 1 is whether “the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad*

Pharm., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). One shows “possession” by descriptive means such as words, structures, figures, diagrams, and formulas that set forth fully the claimed invention. *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). “It is not sufficient for purposes of the written description requirement . . . that the disclosure, when combined with the knowledge in the art, would lead one to speculate as to modifications that the inventor might have envisioned, but failed to disclose.” *Id.* “[T]he hallmark of written description is disclosure. . . . [T]he test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Ariad*, 598 F.3d at 1351. The “description need not recite the claimed invention *in haec verba* but must do more than merely disclose that which would render the claimed invention obvious.” *ICU Med., Inc. v. Alaris Med. Sys., Inc.*, 558 F.3d 1368, 1377 (Fed. Cir. 2009).

In its Motion to Amend, Patent Owner provides citations, for each respective limitation of the claims, showing that proposed substitute claims 10–12 are supported by U.S. Patent Application No. 13/786,888 (Ex. 2018, “the ’888 application”), which issued as the ’851 patent. Mot. to Amend 5–11. Patent Owner also provides citations, for each respective limitation of the claims, showing that proposed substitute claims 10–12 are supported by earlier filed disclosures for which benefit of the filing date is sought—namely, U.S. Patent Application No. 10/508,655 (Ex. 2019, “the ’655 application”), filed on March 11, 2003, and the English translation of Japanese Patent Application No. JP-2002-081375 (Ex. 2020, “the ’375 application”; Ex. 2021 (English Translation)), filed on March 22, 2002. Mot. to Amend 5–11.

Of particular relevance to this case is whether the original disclosure of the '888 application, and the earlier filed disclosures of the '655 application and the '375 application, provide sufficient written description support for the limitation of transmitting “a value indicating the maximum number of spatial paths formable” in “a request to establish a link channel,” as recited in proposed substitute claim 11. Mot. to Amend, Claims App'x. Proposed substitute claims 10 and 12 each recite a similar limitation, except these claims require receiving the claimed value in “a request to establish a link channel.” *Id.*

For each proposed substitute claim, Patent Owner cites as support two embodiments disclosed in the '888 application. First, Patent Owner cites three lines of the '888 application that describe an embodiment illustrated in Figure 3 disclosing “antenna number information” as written description support for “a value indicating the maximum number of spatial paths [that can be formed/formable].” Mot. to Amend 7, 9, 11 (citing Ex. 2018, 16:10–12⁷ (“First, the antenna number information is transmitted to the base station from terminal 1000 as control information in requesting establishment of a link channel (LCH allocation request).”)). Patent Owner also cites to the same or similar disclosures in the '655 application and the '375 application.

⁷ All references to the page numbers in the '888 application refer to the original page numbers in the center of each page in Exhibit 2018 and not the page numbers inserted by Patent Owner in the bottom, right-hand corner of each page in Exhibit 2018.

Id. (citing Ex. 2019, 16:10–12;⁸ Ex. 2021 ¶¶ 35, 75). In the ’888 application and the ’655 application, the very next sentence discloses that “[b]ase station CS1 gives an instruction for the number of paths stating that *the number of paths to be set should be equal to or smaller than the number of antennas*, as the control information for link channel allocation instruction, for example, based on the antenna number information from the terminal.” Ex. 2018, 16:13–16 (emphases added); Ex. 2019, 16:13–16 (stating the same). In our view, these disclosures establish that, in some embodiments, the number of paths to be set is equal to the number of antennas and, in other embodiments, the number of paths to be set is smaller than the number of antennas. Stated differently, there is support for at least one embodiment in which the number of paths to be set is equal to the number of antennas.

Second, Patent Owner cites as support the embodiment illustrated in Figures 7 and 8, as well as the corresponding description relating to step S100 in Figure 7 and step S200 in Figure 8. Mot. to Amend 8–9 (citing Ex. 2018, 20:15–17 (“[F]irst, terminal 2000 notifies base station CS1 of the number of antenna elements N in the terminals *or* the maximum number of paths P_MAX (step S100).” (emphasis added)), 22:11–13 (“[T]erminal 2000 notifies base station CS1 of the number of antenna elements N in the terminal. *Alternatively*, the maximum number of paths P_MAX may be notified (step S200).” (emphasis added))). Patent Owner cites to the same disclosures in the ’655 application. *Id.* (citing Ex. 2019, 20:15–17, 22:11–

⁸ All references to the page numbers in the ’655 application refer to the original page numbers in the center of each page in Exhibit 2019 and not the page numbers inserted by Patent Owner in the bottom, right-hand corner of each page in Exhibit 2019.

13). Although not cited by Patent Owner in its Motion to Amend, the same disclosures also are present in the '375 application. Ex. 2021 ¶¶ 103, 118.

Based on these disclosures in the '888 application, the '655 application, and the '375 application, we find that there is sufficient written description support for at least one embodiment where (1) a terminal transmitting antenna number information in a link channel request amounts to transmitting “a value indicating the maximum number of spatial paths formable” in “a request to establish a link channel,” as recited in proposed substitute claim 11; and (2) a base station receiving antenna number information in a link channel request amounts to receiving the claimed “value” in “a request to establish a link channel,” as recited in proposed substitute claims 10 and 12. More specifically, the embodiment illustrated in Figure 3, in which the antenna number information is transmitted to the base station from terminal 1000 as control information in requesting establishment of a link channel (LCH allocation request), provides support for such a limitation. So, too, does the description of the first alternative in the embodiment illustrated in Figure 7.

Petitioner contends that, to the extent proposed substitute claims 10–12 are broad enough in scope such that the claimed “value” encompasses more than using the antenna number information to determine “a value indicating the maximum number of spatial paths [that can be formed/formable],” these claims lack sufficient written description support. Opp. 24–30. Petitioner, however, clarified during the oral argument that, if we agree with Petitioner that Wallace anticipates and renders obvious proposed substitute claims 10–12, it becomes unnecessary for us to reach its written description argument. See Tr. 70:9–11 (stating that, “if you agree

with us on Wallace, it becomes unnecessary to address the written description point”). For the reasons we identify below, we agree with Petitioner that Wallace anticipates and renders obvious proposed substitute claims 10–12. As a result, in light of Petitioner’s concession at the oral hearing, we do not find it necessary to further address Petitioner’s specific written description argument.

3. Level of Skill in the Art

In determining the level of skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quoting *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)). Relying on the testimony of Dr. Sharony, Patent Owner contends that a person of ordinary skill in the art at the time of the invention of the ’851 patent would have possessed the following:

working knowledge of multi-input multi-output (MIMO) wireless communications. The person would have gained this knowledge through a Bachelor of Science degree in Electrical Engineering or an equivalent degree, and three to five years of experience working in the field of wireless communications. Additional education or experience may serve as a substitute for these requirements.

Mot. to Amend 4–5 (citing Ex. 2016 ¶ 31).

In its Opposition, Petitioner does not dispute Dr. Sharony’s assessment of the level of skill in the art. *See generally* Opp. In its Petition, however, we note that Petitioner, relying on the testimony of its declarant, Stephen B. Wicker, Ph.D., contends that a person of ordinary skill in the art

at the time of the '851 patent would have possessed a “Master’s degree in Electrical Engineering and at least 2–4 years of academic or industry experience designing and implementing digital wireless communication systems.” Pet. 13 (citing Ex. 1002 ¶ 54).

Apart from Dr. Sharony’s assessment requiring a Bachelor of Science degree in Electrical Engineering or an equivalent degree and Dr. Wicker’s assessment requiring a Master’s degree in Electrical Engineering, we do not discern a material difference between the assessments advanced by the declarants. In any event, each party’s declarant appears to meet or exceed both parties’ assessments (see Ex. 1002 ¶¶ 3–24, App’x A; Ex. 2016 ¶¶ 11–19), and either assessment of the level of skill in the art is consistent with the '851 patent and the prior art of record. We, therefore, adopt Dr. Sharony’s assessment and apply it to our anticipation and obviousness evaluations below, but we note that our conclusions would remain the same under Dr. Wicker’s assessment.

4. Claim Construction

In an *inter partes* review proceeding filed before November 13, 2018, we interpret claim terms according to the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b).⁹ Under this standard, and absent any special definitions, claim terms generally are given their ordinary and customary meaning, as would

⁹ Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (“This rule is effective on November 13, 2018 and applies to all . . . petitions filed *on or after the effective date*.” (emphasis added)).

be understood by one of ordinary skill in the art, at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Patent Owner contends that “[t]he meanings of any new limitations (e.g., ‘maximum number of spatial paths’ or ‘request to establish a link channel’)—taken as a whole—are discernable from their context and would be readily understood by those of ordinary skill in the art.” Mot. to Amend 12 (citing Ex. 2016 ¶ 16). In its Opposition, Petitioner does not contend that any claim term requires an explicit construction to determine whether the prior art of record anticipates or renders obvious proposed substitute claims 10–12. *See generally* Opp. 1–30. In the course of our discussion of the merits of Petitioner’s opposition, we address the scope of proposed substitute claims 10–12 in applying them to Wallace.

5. Patentability of Proposed Substitute Claims 10–12

Patent Owner “does not bear the burden of persuasion to demonstrate the patentability of [the proposed] substitute claims.” *Lectrosonics*, IPR2018-01129, Paper 15 at 4 (citing *Bosch Auto. Serv. Sols., LLC v. Iancu*, 878 F.3d 1027 (Fed. Cir. 2017); *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017)). “Rather, as a result of the current state of the law and [Office] rules and guidance, the burden of persuasion will ordinarily lie with the petitioner to show that any proposed substitute claims are unpatentable by a preponderance of the evidence.” *Id.*

Petitioner contends that proposed substitute claims 10–12 are unpatentable based on the following grounds set forth in the table below. Opp. 3–24.

Claims Challenged	35 U.S.C. §	Reference(s)
10–12	102(e)	Wallace
10–12	103(a)	Wallace
10–12	103(a)	Wallace, Mayrand ¹⁰
10–12	102(b)	Paulraj
10–12	103(a)	Paulraj
10–12	103(a)	Paulraj, Mukerjee, Mayrand

To support its positions, Petitioner relies on the original Declaration of Dr. Wicker that accompanied the Petition, as well as the Supplemental Declaration of Dr. Wicker filed with its Opposition to the Motion to Amend. Exs. 1003, 1043. We begin our analysis with the principles of law that generally apply to anticipation and obviousness grounds, followed by a brief overview of Wallace, and then we address the parties’ contentions directed to whether Wallace anticipates and renders obvious proposed substitute claims 10–12.

a. Principles of Law

To establish anticipation, “all of the elements and limitations of the claim must be shown in a single prior reference, arranged as in the claim.” *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). When evaluating a single prior art reference in the context of anticipation, the reference must be “considered together with the knowledge of one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (quoting *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)). “[T]he dispositive question regarding anticipation [i]s whether *one*

¹⁰ Luc Mayrand et al., U.S. Patent No. 5,504,939, filed Nov. 3, 1993, issued Apr. 2, 1996 (Ex. 1044, “Mayrand”).

skilled in the art would reasonably understand or infer from the [prior art reference's] teaching' that every claim element was disclosed in that single reference.” *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003) (second and third alterations in original) (quoting *In re Baxter Travenol Labs.*, 952 F.2d 388, 390 (Fed. Cir. 1991)).

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations).¹¹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze Petitioner’s proposed grounds based on anticipation and obviousness with the principles identified above in mind.

b. Wallace Overview

Wallace is titled “Method and Apparatus for Antenna Diversity in a Wireless Communication System.” Ex. 1003, code (54). Wallace discloses a “[m]ethod and apparatus for negotiating a transmission scenario in a mixed mode spectrum wireless communication system.” *Id.* at code (57); *see also id.* ¶ 74 (disclosing a “mixed mode operation of one embodiment” where

¹¹ Patent Owner does not present arguments or evidence regarding secondary considerations during the course of trial.

“the base station negotiates with user terminals to determine antenna diversity status of the terminal”).

Of particular relevance to this case, Wallace discloses the use of wireless MIMO technology, as well as receiving signals and performing adaptive array processing. Ex. 1003 ¶ 31 (“Using Multiple Input-Multiple Output, MIMO, the transmitter can send multiple independent data streams on the same carrier frequency to a user.”), ¶ 95 (“[T]he receiver performs a complementary processing (e.g., spatial matched filter) of the linear transmit processing based on the channel characterization to compute the NC spatial matched filter coefficients needed for each transmission channel (i.e., each eigenmode).”).

Figure 12 of Wallace is reproduced below.

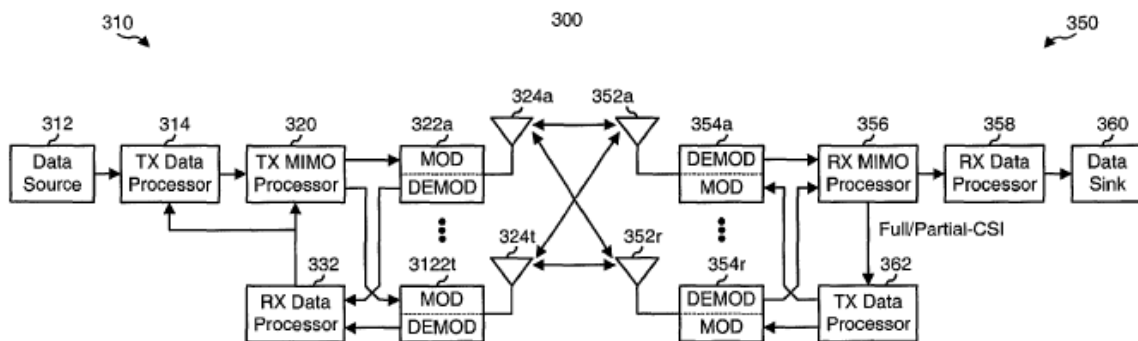


FIG. 12

Figure 12 depicts a “wireless communication system capable of MIMO and diversity transmissions.” Ex. 1003 ¶ 22. Wallace explains that a MIMO system, such as that shown in Figure 12, “can provide improved performance if the additional dimensionalities created by the multiple transmit and receive antennas are utilized.” *Id.* ¶ 94.

The base station of Wallace is illustrated in Figure 18, reproduced below.

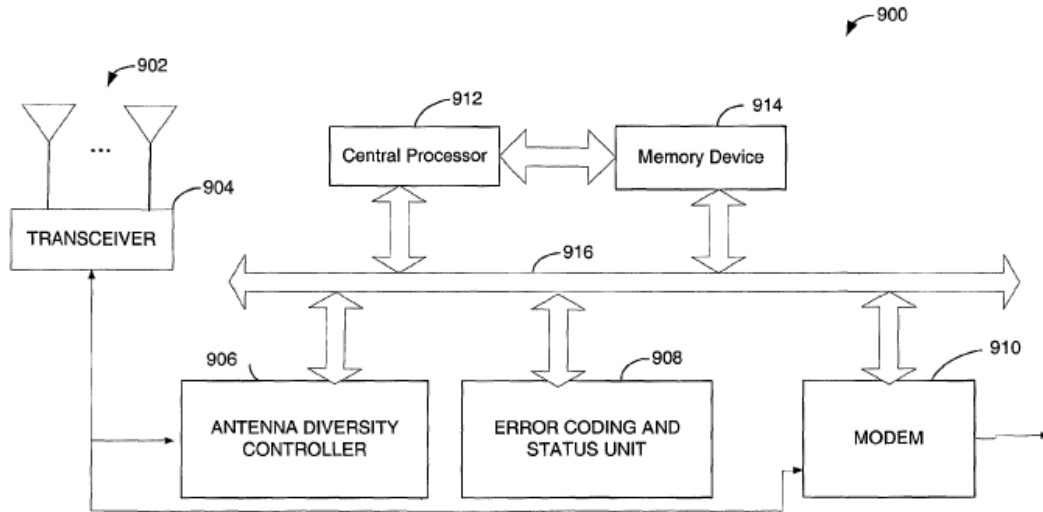


FIG. 18

Figure 18 illustrates base station 900 that includes, among other things, transceiver 904 coupled to multiple antennas 902 (including multiple transmit and receive antennas), central processor 912, and memory device 914. Ex. 1003 ¶ 122.

The mobile station of Wallace is illustrated in Figure 20, reproduced below.

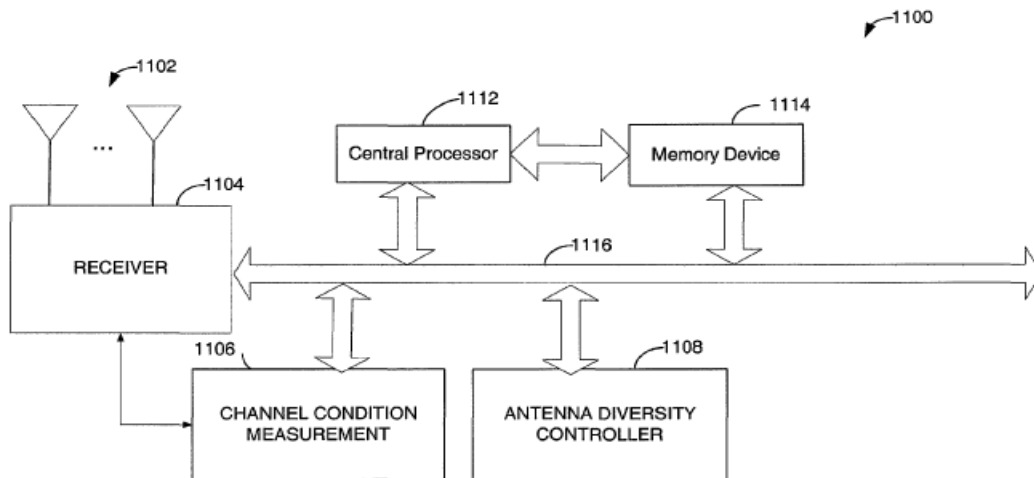


FIG. 20

Figure 20 illustrates mobile station 1100, which includes, among other things, receive antenna array 1102 coupled to receiver 1104 (which may be a transceiver), memory device 1114, and central processor 1112. Ex. 1003 ¶ 139. Wallace discloses that, “[i]n one embodiment, a look up table is provided in the memory device 1114, wherein entries associate a transmission scenario with multiple channel quality measures. Alternate embodiments may use other measures of channel quality, sufficient to provide information for determining a transmission scenario.” *Id.* ¶ 140.

Wallace explains that the process of negotiating a forward link between a mobile user and a base station “starts with a query to the mobile user to determine diversity capability information,” including, for example, information regarding the “number of receive antennas used at the mobile station.” Ex. 1003 ¶ 104. The base station may also request additional information concerning, for example, the “channel quality of [a] given link.” *Id.* In response to this information, the base station determines the appropriate configuration for the forward link. *Id.*

Wallace further discloses that, “[t]ypically, antenna diversity negotiations are performed at initiation of a communication, however, alternate embodiments may allow adjustment during a communication, wherein the quality of the communication link channel degrades over time and environmental condition.” Ex. 1003 ¶ 127. In addition, Wallace discloses that its approach can be used in time division multiple access (“TDMA”) systems. *Id.* ¶¶ 33–35, 69.

c. Proposed Substitute Claim 11

Petitioner presents arguments and evidence that proposed substitute claim 11 is anticipated by Wallace, obvious over the teachings of Wallace

alone, and obvious over the combined teachings of Wallace and Mayrand. Opp. 3–15. Our analysis below only focuses on Petitioner’s arguments and evidence with respect to whether proposed substitute claim 11 is anticipated by Wallace and obvious over the teachings of Wallace alone.

i. *“A radio apparatus capable of communicating with another radio apparatus, comprising”*

Petitioner contends that, to the extent the preamble is limiting, Wallace discloses the preamble of proposed substitute claim 11 for the same reasons it discloses the preamble of cancelled independent claim 4. Opp. 3 (citing Pet. 34–35). That is, Petitioner argues that Wallace discloses the preamble of proposed substitute claim 11 because it describes, for example, a base station and a mobile station that communicate “over a plurality of spatial paths using MIMO technology.” Pet. 34–35 (citing Ex. 1003 ¶ 31).

ii. *“a communication unit configured to communicate using a plurality of antennas”*

Petitioner contends that Wallace discloses the “communication unit” of proposed substitute claim 11 for the same reasons it discloses the “communication unit” of cancelled independent claim 4. Opp. 3 (citing Pet. 36–37). That is, Petitioner argues that Wallace discloses this limitation because it describes a transmitter system (i.e., base station) and a receiver system (i.e., mobile station) that communicate using one or more antennas. Pet. 36–37. For example, Petitioner explains that Wallace exemplifies “a base station ‘having multiple antennas’ coupled to a ‘transceiver 904’ for transmitting and receiving information (i.e., communicating).” *Id.* at 37 (emphasis omitted) (quoting Ex. 1003 ¶ 122). Petitioner likewise asserts that Wallace discloses “a mobile station 1100 that ‘includes a receive

antenna array 1102 coupled to a receiver 1104,' which could also be a transceiver.” *Id.* (quoting Ex. 1003 ¶ 139).

iii. “a storage unit configured to store prior to any request to establish a link channel from the another radio apparatus a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication”

Petitioner first contends that Wallace discloses “a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication,” as recited in proposed substitute claim 11. Opp. 4. To support its argument, Petitioner argues that Wallace describes using spatial paths for multiplex communication because it discloses “a MIMO communication channel between two wireless devices having multiple antennas (e.g., a mobile station and a base station) that includes ‘NC independent channels,’ where each is a separate ‘spatial subchannel.’” *Id.* (quoting Ex. 1003 ¶ 93) (citing Ex. 1043 ¶¶ 24–26). According to Petitioner, Wallace’s creation of subchannels allows the transmitter of a mobile station to “‘send multiple independent data streams on a same carrier frequency’ using ‘spatial multiplexing, i.e., parallel channels.’” *Id.* (quoting Ex. 1003 ¶¶ 66, 106) (citing Ex. 1043 ¶ 26).

Petitioner also contends that Wallace discloses values that correspond to “the maximum number of spatial paths formable,” as recited in proposed substitute claim 11. Opp. 4. Petitioner argues that, for MIMO channels, Wallace discloses the number of transmit antennas (“NT”) or the number of receive antennas (“NR”), whichever is lower, provides an upper bound on the number of spatial subchannels (“NC”) formable. *Id.* at 4–5 (citing Ex. 1003 ¶¶ 66 (stating “ $N = \min(N_t, N_r)$ ”), 93 (stating “NC” is less than or equal to “{NT, NR}”)). Relying on the testimony of Dr. Wicker, Petitioner

argues that, when using “the mobile station as an example, its number of transmit antennas represents the maximum number of spatial paths the [mobile] station can form when transmitting to a base station.” *Id.* at 5 (citing Ex. 1043 ¶ 27). Similarly, Petitioner argues that “the mobile station’s number of receive antennas represents the maximum number of spatial paths that the [mobile] station can receive from the base station.” *Id.* Petitioner asserts that the ’851 patent confirms that antenna number information may be indicative of the maximum number spatial paths a device can form by stating “the number of paths to be set should be equal to or smaller than the number of antennas.” *Id.* (quoting Ex. 1001, 9:65–10:3) (citing Ex. 1001, 9:7–12).

Turning to “storing” the value indicating the maximum number of spatial paths formable “prior to any request to establish a link channel,” as recited in proposed substitute claim 11, Petitioner contends that Wallace describes this limitation because it discloses “an algorithm for a mobile station to send its number of transmit and receive antennas to a base station based on ‘a software module executed by a processor.’” Opp. 5 (quoting Ex. 1003 ¶ 145) (citing Ex. 1003 ¶¶ 104, 107, 125). Petitioner further argues that Wallace discloses a storage medium, such as memory, “coupled to the processor” so that the processor can “read information from” the medium. *Id.* (quoting Ex. 1003 ¶ 145). More specifically, Petitioner asserts that Figure 20 of Wallace illustrates double arrows pointing to and from memory device 1114, which convey that it stores information and shares information with other components within mobile station 1100, including central processor 1112. *Id.* at 5–6 (citing Ex. 1043 ¶ 28). Petitioner then represents that a person of ordinary skill in the art would have understood that central

processor 1112 within mobile station 1100 must read the number of transmit and receive antennas from memory device 1114 in order to send the antenna number information, including in any link channel request. *Id.* at 6 (citing Ex. 1002 ¶¶ 252–259).

Alternatively, Petitioner contends that “it would have been obvious for Wallace’s memory device 1114 to have been configured to store the number of transmit and receive antennas before sending that information” because it was known in the field “to use memory to store parameters before sending them over a communication link.” Opp. 6 (citing Pet. 41).

Petitioner argues that it would have been obvious to configure Wallace’s memory device 1114 in this way for the following two reasons: (1) “[u]sing Wallace’s memory device 1114 for that purpose would have applied a known method (storing values to be transmitted in memory) to achieve a predictable result (transmission of the values)”; and (2) “given the finite set of possibilities for storing the values in Wallace’s mobile station, using memory device 1114 for that purpose was an obvious design choice.” *Id.* (citing *KSR*, 550 U.S. at 416, 421).

Lastly, Petitioner contends that Wallace discloses that the mobile station stores the number of transmit and receive antennas prior to any request to establish a link channel so it can send those values to the base station, which, in turn, uses those values to select a transmission scenario. Opp. 6. Petitioner argues that, consistent with Patent Owner’s position that a “request to establish a link channel” is one “that occurs at the very beginning of any communication,” Wallace discloses that a mobile station initiates a communication with a base station by sending a request. *Id.* at 7 (quoting Mot. to Amend 4) (citing Ex. 1003 ¶ 123 (“Initiation refers to the start of a

communication, including, but not limited to . . . a request for a communication from a mobile user.”)). Petitioner also argues that Wallace discloses that a message sent by the mobile station (e.g., the communication request) may include the antenna number information as part of antenna diversity status information. *Id.* (citing Ex. 1003 ¶ 125 (“The antenna diversity status . . . may be sent as a message to the base station 900 . . . [and] may include the number of transmit antennas, the number of receive antennas.”); Ex. 1043 ¶ 30). According to Petitioner, Wallace’s disclosure of sending antenna number information in a communication request allows the base station to select a transmission scenario for the mobile station. *Id.* (citing Ex. 1003 ¶¶ 123, 125; Ex. 1043 ¶ 30).

iv. “a control unit configured to control a process of transmitting the value to said another radio apparatus in a request to establish a link channel”

Petitioner contends that Wallace discloses this limitation because it describes transmitting the number of transmit and receive antennas at the mobile station (i.e., values indicating the maximum number of spatial paths formable) to the base station in a message sent at “initiation of each communication,” which Wallace explains is “the start of a communication, including, but not limited to . . . a request for communication from a mobile user” (i.e., in a request to establish a link channel). Opp. 11 (quoting Ex. 1003 ¶ 123) (citing Ex. 1003 ¶¶ 77, 127).

Alternatively, Petitioner contends that Wallace teaches or suggests this limitation because it discloses a “mixed mode” system where MIMO and non-MIMO mobile stations communicate with a base station. Opp. 11 (quoting Ex. 1003, code (57)) (citing Ex. 1003 ¶¶ 68, 125, 129). Petitioner argues that, each time a mobile station initiates a communication with a

request, Wallace discloses that the base station “determines a transmission scenario,” which is the “type of configuration and processing” for the communication link. *Id.* at 11–12 (quoting Ex. 1003 ¶¶ 123, 124).

Petitioner further argues that Wallace discloses that the base station needs “antenna diversity status” information, such as the number of transmit and receive antennas at the mobile station that initiated the communication request, in order to configure the communication link. *Id.* at 12 (quoting Ex. 1003 ¶¶ 77, 125). According to Petitioner, if Wallace’s mobile station indicates that it has multiple transmit and receive antennas, it may communicate with the base station using a MIMO scheme with the number of spatial paths limited by the number of antennas. *Id.* (citing Ex. 1003 ¶¶ 46, 63, 64–66, Fig. 3). Petitioner then reiterates that Wallace’s mobile station sends its antenna number information to the base station. *Id.* (citing Ex. 1003 ¶ 123).

Based on the aforementioned disclosures in Wallace, Petitioner contends that a person of ordinary skill in the art would have understood that “a mobile station . . . send[s] antenna number information in a link channel request to the base station.” Opp. 12 (citing Ex. 1043 ¶¶ 45–47). Petitioner argues that Wallace discloses that selecting a transmission scenario following the initiation of a communication by a mobile station requires the base station to determine MIMO capabilities of the mobile station. *Id.* (citing Ex. 1003 ¶¶ 104–109, 123–125). Petitioner further argues that Wallace discloses that, at initiation, the base station is required to know the number of transmit and receive antennas at the mobile station. *Id.* (citing Ex. 1003 ¶ 77; Ex. 1043 ¶ 45). Petitioner, once again, reiterates Wallace discloses that the mobile station sends the base station a request to initiate

communication and a message that contains the antenna number information. *Id.* (citing Ex. 1003 ¶¶ 123, 125). Petitioner then asserts that, “[t]o ensure the base station had the antenna number information needed at initiation to configure the link, a [person of ordinary skill in the art] would have included the mobile station’s antenna number information in its initial communication request.” *Id.* (citing Ex. 1043 ¶ 46).

d. Proposed Substitute Claims 10 and 12

Petitioner presents arguments and evidence that proposed substitute claims 10 and 12 are anticipated by Wallace, obvious over the teachings of Wallace alone, and obvious over the combined teachings of Wallace and Mayrand. Opp. 15–16. Our analysis below only focuses on Petitioner’s arguments and evidence with respect to whether proposed substitute claims 10 and 12 are anticipated by Wallace and obvious over the teachings of Wallace alone.

i. “A radio apparatus capable of communicating with another radio apparatus, comprising”

The preambles of proposed substitute claims 10 and 12 are identical to that of proposed substitute claim 11 and, to the extent these preambles are limiting, Petitioner relies on the same disclosures of Wallace discussed above to account for this claim element. Opp. 15 (citing Pet. 48); *see also id.* at 16 (arguing the same).

ii. “a communication unit configured to communicate using [an antenna/a plurality of antennas]”

This limitation is the same as the corresponding limitation in proposed substitute claim 11 addressed above, except that proposed substitute claim 10 recites “using an antenna,” whereas proposed substitute claims 11 and 12 each recite “using a plurality of antennas.” Petitioner relies on the same

disclosures of Wallace discussed above with regard to proposed substitute claim 11 to explain how Wallace accounts for the same or similar limitation of proposed substitute claims 10 and 12. Opp. 15 (citing Pet. 48); *see also id.* at 16 (arguing the same).

iii. “a reception unit configured to receive, from said another radio apparatus, a value indicating the maximum number of spatial paths that can be formed by said another radio apparatus for multiplex communication in a request to establish a link channel”

Proposed substitute claims 10 and 12 each recite this limitation. Mot. to Amend, Claims App’x. Beginning with a “value indicating the maximum number of spatial paths that can be formed by said another radio apparatus,” Petitioner relies on the same disclosures of Wallace discussed above with regard to proposed substitute claim 11 to explain how Wallace accounts for a mobile station transmitting and a base station receiving this claimed “value.” Opp. 15; *see also id.* at 16 (arguing the same). Turning to “a reception unit configured to receive, from said another radio apparatus,” the claimed “value . . . in a request to establish a link channel,” Petitioner, once again, relies on the same disclosures of Wallace discussed above with regard to proposed substitute claim 11 to explain how Wallace accounts for a mobile station transmitting and a base station receiving the claimed “value . . . in a request to establish a link channel.” *Id.* at 15; *see also id.* at 16 (arguing the same).

*e. Patent Owner’s Arguments and Petitioner’s Counter Arguments
(Proposed Substitute Claim 11)*

In its Reply to the Motion to Amend, Patent Owner presents a number of arguments as to why Wallace does not anticipate or render obvious all the limitations of proposed substitute claim 11. PO Reply 1–7. In its Sur-reply,

Petitioner presents a number of counter arguments. Sur-reply 1–6. We address those arguments in turn.

i. Wallace discloses or reasonably suggests “a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication”

In its Reply, Patent Owner contends that there are several reasons as to why Wallace does not disclose “a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication,” as recited in proposed substitute claim 11. PO Reply 2. First, Patent Owner argues that “Wallace does not contain any teachings of the use of subarrays.” *Id.* (citing Ex. 2016 ¶ 109; Ex. 2025 ¶¶ 50, 51, 53, 56). According to Patent Owner, “[t]he presence of subarrays will necessarily result in the maximum number of spatial paths formable by a particular unit being different (and less) than the total number of antennas, as the antennas within each subarray function as a single antenna for purposes of establishing spatial paths.” *Id.* Patent Owner further argues that, although Wallace discloses transmitting antenna number information as part of diversity negotiations, “the number of spatial paths is a different parameter that does not have to be, and usually is not, the same as the [antenna number information].” *Id.* (citing Ex. 2016 ¶ 109; Ex. 2025 ¶ 53); *see also id.* at 5 (arguing that, because “the number of spatial paths is dynamically configurable, so is the ‘maximum number of spatial paths,’ and that number cannot be described for all times by an absolute, fixed number like the actual number of antennas” (citing Ex. 2025 ¶ 57)).

Second, Patent Owner contends Wallace is directed to “diversity scenarios,” which, according to Patent Owner, are different than the “spatial multiplexing” purportedly required by proposed substitute claim 11. PO

Reply 2–3 (citing Ex. 2016 ¶ 110; Ex. 2025 ¶¶ 17–20, 53, 54). Patent Owner argues that the antenna information transmitted from the remote terminal to the base station only is used to determine a transmission scenario (i.e., the type of configuration for a link, such as Single Input-Single Output, Single Input-Multiple Output, Multiple Input-Single Output, or MIMO). *Id.* at 3 (citing Ex. 1003 ¶¶ 7, 32, 124, Fig. 3). Patent Owner asserts that the antenna number information at either the remote terminal or the base station “is not relevant to the configuration selected,” nor is the antenna number information “used for any other purpose in Wallace.” *Id.* (citing Ex. 2016 ¶ 111).

Third, Patent Owner contends that Wallace does not disclose “the relationship between the number of antennas and the maximum number of spatial paths.” PO Reply 3. Patent Owner argues that, because “Wallace does not contain any teachings of spatial paths at all,” a person of ordinary skill in the art would not have been motivated to adapt Wallace’s disclosure of configuration modes to achieve the invention of proposed substitute claim 11. *Id.* (citing Ex. 2016 ¶ 112).

In its Sur-reply, Petitioner counters that Patent Owner improperly constrains the limitation of “a value indicating the maximum number of spatial paths formable” to require a “dynamically configurable” number of sub-arrays. Sur-reply 2. According to Petitioner, a “dynamically configurable” number of sub-arrays is not recited in proposed substitute claim 11, much less required by this claim. *Id.* Petitioner asserts that “a value indicating the maximum number of spatial paths formable” “logically extends to *any* value indicating a maximum.” *Id.*

Petitioner further argues that the specification of the '851 patent does not support Patent Owner's constrained reading of "a value indicating the maximum number of spatial paths formable." Sur-reply 2. Petitioner argues that the specification discloses one example in which "antenna number information" is transmitted in a link channel request. *Id.* (quoting Ex. 1001, 9:61–64). According to Petitioner, the specification explains that "antenna number information" could be either the "number of antennas" or the "number of antennas capable of normal transmission/reception." *Id.* at 2–3 (quoting Ex. 1001, 8:32–50, 10:54–58). Petitioner argues that the specification clearly states that the "number of [spatial] paths to be set should be equal to or smaller than the number of antennas." *Id.* at 3 (alteration in original) (quoting Ex. 1001, 9:65–10:3) (citing Ex. 1001, 9:7–12). In other words, Petitioner argues that "the number of [spatial] paths can never exceed the number of antennas, which sets the maximum." *Id.* Based on the aforementioned disclosures in the specification, Petitioner asserts that the claimed "value" is broad enough in scope to cover antenna number information. *Id.*

As an initial matter, we agree with Petitioner that "a value indicating the maximum number of spatial paths formable" does not require a "dynamically configurable" number of sub-arrays, but rather is broad enough in scope to encompass *any* value indicating a maximum number of spatial paths, such as antenna number information that sets the maximum of spatial paths. See Sur-reply 2. Stated differently, Patent Owner's argument with regard to this limitation is not commensurate in scope with proposed substitute claim 11 because this claim does not recite a "dynamically configurable" number of sub-arrays. See *In re Self*, 671 F.2d 1344, 1348

(CCPA 1982) (explaining that limitations not appearing in the claims cannot be relied upon for patentability).

Our reading of this limitation to encompass antenna number information that sets the maximum number of spatial paths finds support in at least one embodiment disclosed in the specification of the '851 patent. As Petitioner correctly notes, the specification clearly states in describing Figure 3 that the “number of [spatial] paths to be set should be equal to or smaller than the number of antennas.” Sur-reply 3 (alteration in original) (quoting Ex. 1001, 9:65–10:3). In other words, in at least one instance, the specification discloses that the number of spatial paths to be set should be equal to the number of antennas. In at least one other instance, the specification discloses that the number of spatial paths to be set should be smaller than the number of antennas.

Consistent with this embodiment disclosed in the specification of the '851 patent, Wallace discloses that, for MIMO channels, the number of spatial subchannels (“NC”) that can be formed is less than or equal to the number of transmit antennas (“NT”) or the number of receive antennas (“NR”), whichever is lower. Ex. 1003 ¶ 93 (stating “ $NC \leq \min \{NT, NR\}$ ”—i.e., “NC” is less than or equal to “ $\min \{NT, NR\}$ ”). Relying on this disclosure in Wallace, Petitioner’s declarant, Dr. Wicker, testifies that “the maximum number of formable spatial paths or subchannels is limited by the number of transmit antennas or number of receive antennas used in the communication link (whichever is smaller).” Ex. 1043 ¶ 27 (citing Ex. 1003 ¶¶ 31, 66, 93). We credit Dr. Wicker’s testimony in this regard because it is consistent with the disclosures in Wallace identified above. See Ex. 1003 ¶¶ 31, 66, 93.

We do not agree with Patent Owner’s argument that Wallace fails to disclose the claimed “value” because Wallace is directed to “diversity scenarios,” whereas proposed substitute claim 11 purportedly requires “spatial multiplexing.” See PO Reply 2–3. We understand Patent Owner to argue that Wallace is non-analogous prior art to the invention covered by proposed substitute claim 11.

For purposes of Petitioner’s asserted ground based on anticipation by Wallace, “the question whether a reference is analogous art is irrelevant to whether that reference anticipates.” *In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997) (citing *Self*, 671 F.2d at 1350). Accordingly, Patent Owner’s argument in this regard is inapposite for purposes of our anticipation analysis.

In any event, contrary to Patent Owner’s argument, even though Wallace generally relates to “negotiating a transmission scenario in a mixed mode spectrum wireless communication system” (Ex. 1003, code (57)), Wallace explains that the MIMO links discussed in the context of its multiple embodiments encompass two basic types, one of which is “spatial multiplexing, i.e., parallel channels” (*id.* ¶ 106). Petitioner also adequately explains how Wallace describes spatial multiplexing. See Opp. 4 (citing Ex. 1043 ¶¶ 24–26) (explaining that Wallace describes using spatial paths for multiplex communication because Wallace teaches “a MIMO communication channel between two wireless devices having multiple antennas (e.g., a mobile station and a base station) that includes ‘NC independent channels,’ where each is a separate ‘spatial subchannel’” (quoting Ex. 1003 ¶ 93)). Moreover, Petitioner points out that, in a related proceeding, Dr. Sharony testifies that Wallace “mentions a MIMO

configuration using spatial multiplexing.” Sur-reply 5 (quoting *Intel Corp. v. Hera Wireless S.A.*, IPR2018-01372, Ex. 2025 ¶ 53 (PTAB filed Sept. 13, 2019) (Second Declaration of Dr. Jacob Sharony)).

For purposes of Petitioner’s asserted ground based on obviousness over the teachings of Wallace alone, it is well-settled that “[t]he use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned.” *In re Heck*, 699 F.2d 1331, 1333 (Fed. Cir. 1983) (quoting *In re Lemelson*, 397 F.2d 1006, 1009 (CCPA 1968)); see also *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985) (“A reference must be considered for everything that it *teaches* by way of technology and is not limited to the particular *invention* it is describing and attempting to protect.”).

Accordingly, for purposes of our obviousness analysis, we consider Wallace for everything it teaches and do not limit our consideration of Wallace to its disclosures of “diversity scenarios.” We also find that Wallace is analogous prior art to the invention covered by proposed substitute claim 11 because Wallace includes teachings regarding spatial multiplexing, which are at least reasonably pertinent to the particular problem with which the inventor of the ’851 patent is involved. See *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (stating that “[t]wo separate tests define the scope of analogous prior art,” one of which is “whether the reference is still reasonably pertinent to the particular problem with which the inventor is involved” (citations omitted)).

Lastly, we do not agree with Patent Owner’s argument that Wallace does not disclose “the relationship between the number of antennas and the maximum number of spatial paths” because it “does not contain any

teachings of spatial paths at all.” PO Reply 3. Patent Owner’s argument in this regard is undermined by the testimony of Dr. Sharony. Indeed, Dr. Sharony testifies that “Wallace discloses an absolute maximum number of spatial paths that is equal to the actual number of antennas.” Ex. 2025 ¶ 57 (emphasis omitted).

Based on the record developed during trial, we find that Wallace discloses or reasonably suggests antenna number information that sets the maximum number of spatial paths that a terminal can form. Accordingly, Wallace accounts for “a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication,” as recited in proposed substitute claim 11.

ii. Wallace discloses or reasonably suggests “a storage unit configured to store prior to any request to establish a link channel . . . a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication”

In its Reply, Patent Owner contends that, although “Wallace stores a fixed value of the actual number of antennas before transmitting the value to a base station,” “[t]his fixed, actual number of antennas in the terminal does not represent the maximum number of spatial paths that can be formed for multiplex communication at the given time of an initial request to establish a link channel.” PO Reply 4 (emphasis omitted) (citing Ex. 2025 ¶¶ 50, 56). Relying on the communication sequence in PHS illustrated in Figure 19 of the ’851 patent, Patent Owner argues that “the new request when done in the context of the invention carries the maximum number of spatial paths formable based on the condition or quality of the channel.” *Id.* at 4–5 (citing Ex. 2025 ¶ 98). Therefore, according to Patent Owner, “the maximum number of spatial paths formable is the number of configured sub-arrays

(according to channel conditions), which is not readily equatable to the number of antennas.” *Id.* at 5 (emphasis omitted) (Ex. 2025 ¶¶ 98–102). Patent Owner then asserts that “knowing the maximum number of antennas without more does not allow a clear determination of the maximum number of spatial paths.” *Id.* (emphases omitted).

In its Sur-reply, Petitioner counters by noting that Patent Owner’s argument is, once again, predicated on the notion that Wallace fails to disclose “a value indicating the maximum number of spatial paths formable,” as recited in proposed substitute claim 11. Sur-reply 5 (citing PO Reply 4–5). Petitioner reiterates that Patent Owner’s argument relies on a constrained reading of this limitation that “would improperly exclude the ’851 patent’s preferred embodiment, which uses antenna number to signal the maximum number of spatial paths a terminal can form.” *Id.* Petitioner reiterates that “Wallace does the same thing.” *Id.* (citing Ex. 1003 ¶¶ 66, 93). Petitioner also disagrees with Patent Owner’s assertion that “knowing the maximum number of antennas without more does not allow a clear determination of the maximum number of spatial paths” because, according to Petitioner, “[t]he ’851 patent could hardly be clearer that antenna number [sets] a maximum.” *Id.* (quoting PO Reply 5 (emphases omitted)) (citing Ex. 1001, 9:65–10:3).

At the outset, for purposes of Petitioner’s asserted ground based on anticipation by Wallace, we agree with Petitioner that Wallace discloses “a storage unit configured to store prior to any request to establish a link channel . . . a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication,” as recited in proposed substitute claim 11. As explained above, Wallace

provides antenna number information that, in at least one embodiment, sets the maximum number of spatial paths that a terminal can form. *See* Ex. 1003 ¶¶ 31, 66, 93. Moreover, Figure 20 of Wallace illustrates double arrows pointing to and from memory device 1114, which Petitioner argues—and we agree—conveys that memory device 1114 stores information and shares information with other components within mobile station 1100, including central processor 1112. Ex. 1003 ¶ 140 (“Instructions may be stored in a memory storage device, such as memory device 1114.”), Fig. 20; Ex. 1043 ¶ 28 (“The double-headed arrows shown in Figure 20 between Wallace’s memory device [1114] and central processor [1112] show exchange of information between those devices.”). Based on these disclosures in Wallace and Dr. Wicker’s supporting testimony, we agree with Petitioner that a person of ordinary skill in the art would have reasonably understood that Wallace’s central processor 1112 reads instructions, such as the number of transmit and receive antennas, from memory device 1114 prior to transmitting the antenna number information in a link channel request. *See* Opp. 6.

Alternatively, for purposes of Petitioner’s asserted ground based on obviousness over the teachings of Wallace alone, Petitioner argues—and we agree—that a person of ordinary skill in the art would have understood how to configure Wallace’s memory device 1114 to store antenna number information prior to transmitting that information in a link channel request. *See* Opp. 6. Petitioner provides two reasons as to why a person of ordinary skill of the art would have been motivated to configure Wallace’s memory device 1114 in this way, both of which are not disputed by Patent Owner: (1) “[u]sing Wallace’s memory device 1114 for that purpose would have

applied a known method (storing values to be transmitted in memory) to achieve a predictable result (transmission of the values)”; and (2) “given the finite set of possibilities for storing the values in Wallace’s mobile station, using memory device 1114 for that purpose was an obvious design choice.” *Id.* (citing *KSR*, 550 U.S. at 416, 421).

Patent Owner’s argument that Wallace does not disclose the claimed “storage unit” is predicated on the notion that Wallace fails to disclose or reasonably suggest “a value indicating the maximum number of spatial paths formable,” as recited in proposed substitute claim 11. *See* PO Reply 4–5. For the same reasons discussed previously, we do not agree with Patent Owner’s arguments. *See supra* Section II.A.5.e.i.

In addition, Patent Owner’s reliance on the communication sequence in PHS illustrated in Figure 19 of the ’851 patent to support its argument is puzzling. *See* PO Reply 4–5. In its Motion to Amend, Patent Owner does not direct us to Figure 19 or its corresponding description as disclosures in the ’888 application (i.e., the original disclosure of the ’851 patent) that provide sufficient written description support for the proposed substitute claims. *See* Mot. to Amend 5–11. In any event, Figure 19 of the ’851 patent and its corresponding description are directed to establishing a traffic channel in the prior art. Ex. 1001, 1:55–2:19, Fig. 19 (labeled as “Prior Art”). Upon reviewing this prior art disclosure, which not surprisingly is located in the “Background Art” section of the ’851 patent and not in the “Disclosure of the Invention” section, we note that the prior art disclosure is silent as to including a maximum number of spatial paths in a link channel request and says nothing about limiting the claimed “value” to a

“dynamically configurable” number of sub-arrays in accordance with channel conditions. *See id.*

Based on the record developed during trial, we find that Wallace’s memory device 1114 stores, or a person of ordinary skill in the art would have understood how to configure memory device 1114 to store, antenna number information that sets the maximum number of spatial paths that a terminal can form. Accordingly, Wallace accounts for “a storage unit configured to store prior to any request to establish a link channel . . . a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication,” as recited in proposed substitute claim 11.

iii. Wallace discloses or reasonably suggests “a control unit configured to control a process of transmitting the value to said another radio apparatus in a request to establish a link channel”

In its Reply, Patent Owner contends that Wallace is distinguishable from the proposed substitute claims because Wallace does not teach including the “value indicating the maximum number of spatial paths formable . . . in a request to establish a link channel.” PO Reply 3–4. According to Patent Owner, the proposed substitute claims require the request to come from the mobile/requesting station, but in Wallace, the base station queries the mobile end for information. *Id.* at 3. Patent Owner further argues that Wallace discloses transmitting the actual number of antennas from the terminal to a base station during registration, whereas the proposed substitute claims require transmitting the maximum number of spatial paths that can be formed in a request to establish a link channel. *Id.* at 6 (citing Ex. 2025 ¶ 58). According to Patent Owner, “the times of

registration and sending the request to establish a link channel . . . are different messages sent at different times.” *Id.* To support its argument, Patent Owner directs us to Figure 4.4.3.8.6 of the PHS standard, which purportedly distinguishes between sending a location registration request message on control channel FACCH only after sending a request message to establish a link channel on control channel SCCH. *Id.* (citing Ex. 2024, 401).¹²

In its Sur-reply, Petitioner counters that the PHS standard is irrelevant to the disclosures of Wallace. Sur-reply 6. Petitioner then directs us to arguments and evidence previously presented in its Opposition to the Motion to Amend and asserts that Wallace discloses the claimed “link channel request.” *Id.* (citing Opp. 6–7, 11–15).

We begin our analysis by noting that Patent Owner characterizes the newly amended language of “in a request to establish a link channel” as more focused and specific than the original language of a “predetermined timing.” Mot. to Amend 4. Patent Owner states that this amendment “[f]ocus[es] exclusively and specifically on the request that occurs at the very beginning of any communication.” *Id.* With Patent Owner’s characterization of “in a request to establish a link channel” in mind, we turn to Petitioner’s arguments and evidence.

For purposes of both Petitioner’s asserted ground based on anticipation by Wallace and its asserted ground based on obviousness over

¹² All references to the page numbers in the PHS standard refer to the original page numbers in the center of each page in Exhibit 2024 and not the page numbers inserted by Patent Owner in the bottom, right-hand corner of each page in Exhibit 2024.

the teachings of Wallace alone, Petitioner argues—and we agree—that Wallace discloses that a mobile station initiates a communication with a base station by sending a communication request. *See* Opp. 7. More specifically, when discussing initiation of a communication link, Wallace states that “[i]nitiation refers to the start of a communication, including, but not limited to . . . a request for a communication from a mobile user.” Ex. 1003 ¶ 123. Wallace further discloses transmitting “antenna diversity status information,” which includes, among other things, “the number of transmit antennas” and “the number of receive antennas,” as a message to a base station. *Id.* ¶ 125. Elsewhere, Wallace discloses that the base station “requires antenna diversity status information on initiation.” *Id.* ¶ 77. Relying on these disclosures in Wallace, Dr. Wicker testifies that “Wallace’s mobile station initiate[s] communication by sending a message that include[s] antenna number information to the base station,” which, in turn, “allow[s] the base station to determine the transmission scenario at initiation and provide[] the . . . ‘antenna diversity status information’ required by the base station at that time.” Ex. 1043 ¶ 30 (citing Ex. 1003 ¶ 77). We credit Dr. Wicker’s testimony in this regard because it is consistent with the disclosures of Wallace that we identify above. *See* Ex. 1003 ¶¶ 77, 123, 125. Accordingly, we disagree with Patent Owner that Wallace does not disclose transmitting the “value indicating the maximum number of spatial paths formable . . . in a request to establish a link channel.”

We also do not agree with Patent Owner’s argument that Wallace’s disclosure is limited to a mobile station transmitting antenna number information to a base station during registration. *See* PO Reply 6. As Petitioner points out, neither Patent Owner nor Dr. Sharony provides a

citation to any teaching in Wallace in support of this argument. Sur-reply 6 (citing PO Reply 6; Ex. 2025 ¶ 58). Moreover, as we explain above, and contrary to Patent Owner's argument, Wallace actually discloses that the mobile station transmits antenna number information in a message to initiate communication with the base station in the same manner required by proposed substitute claim 11. See Ex. 1003 ¶¶ 77, 123, 125; Ex. 1043 ¶ 30.

We also do not agree that the PHS standard relied on by Patent Owner bears on the reading of Wallace for two reasons. See PO Reply 6. First, Patent Owner does not explain how the PHS standard applies to the disclosures in Wallace. Second, Figure 4.4.3.8.6 of the PHS standard is reproduced in a section titled "Location registration" and under the sub-heading titled "Location registration acknowledge (MM)." Ex. 2024, 400–01. The section and sub-heading discuss registering and acknowledging a particular user, respectively. *Id.* Patent Owner does not explain persuasively why, notwithstanding the disclosures of Wallace discussed above, one of ordinary skill in the art would have understood the transmission of the number of antennas to occur after the request to establish a link channel, and neither Patent Owner nor Dr. Sharony supports their assertions with citations to teachings from Wallace. See PO Reply 6; Ex. 2025 ¶¶ 52, 58.

Based on the record developed during trial, we find that Wallace discloses or reasonably suggests a terminal that initiates communication with a base station by sending a communication request that includes, among other things, antenna number information. Accordingly, Wallace accounts for "a control unit configured to control a process of transmitting the value

to said another radio apparatus in a request to establish a link channel,” as recited in proposed substitute claim 11.

f. Patent Owner’s Arguments (Proposed Substitute Claims 10 and 12)

Patent Owner relies on the same arguments discussed above in the context of proposed substitute claim 11 to rebut Petitioner’s arguments and evidence as to how Wallace accounts for all the limitations of proposed substitute claims 10 and 12. PO Reply 7 (citing Ex. 2025 ¶¶ 49–54, 60–66). For the same reasons identified above with respect to proposed substitute claim 11, we do not agree with Patent Owner’s arguments.

g. Summary

In summary, based on the full record developed during trial, we conclude that Petitioner has demonstrated by a preponderance of the evidence that the subject matter of proposed substitute claims 10–12 is both anticipated by Wallace, and would have been obvious over the teachings of Wallace alone.

h. Remaining Proposed Grounds

Our conclusion that Petitioner has demonstrated by a preponderance of the evidence that the subject matter of proposed substitute claims 10–12 is both anticipated by Wallace, and would have been obvious over the teachings of Wallace alone, renders it unnecessary for us to reach the remaining grounds of unpatentability proposed by Petitioner in its Opposition to the Motion to Amend. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming a ground based on anticipation); *Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (explaining that an administrative agency is at liberty to reach a decision based on a dispositive issue because doing so

“can not only save the parties, the [agency], and [the reviewing] court unnecessary cost and effort,” but can “greatly ease the burden on [an agency] faced with a . . . proceeding involving numerous complex issues and required by statute to reach its conclusion within rigid time limits”).

B. Patent Owner’s Motion to Seal

During the preliminary stage of this proceeding, Patent Owner filed unredacted (Paper 17) and redacted (Paper 16) versions of its Preliminary Response to correct a filing error, along with unredacted (Paper 19) and redacted (Paper 18) versions of Patent Owner’s Motion to Seal in which it requested to seal portions of the Preliminary Response, portions of the Declaration of Timothy Devlin that is Exhibit 2014, and Exhibits 2002–2004 and 2006–2010 in their entirety. Pursuant to 37 C.F.R. § 42.14, the unredacted versions of the Preliminary Response, the Motion to Seal, and Exhibit 2014, along with Exhibits 2002–2004 and 2006–2010, were provisionally sealed on receipt of Patent Owner’s Motion to Seal and remained sealed pending the outcome of our decision on that Motion.

In the Decision on Institution and in this Final Written Decision, we did not rely on the unredacted versions of the Preliminary Response, the Motion to Seal, and Exhibit 2014, nor did we rely on Exhibits 2002–2004 and 2006–2010, in rendering a decision. Because each of these documents and exhibits identified above have no bearing on our conclusions to grant Patent Owner’s Motion to Amend to cancel challenged claims 1–9 of the ’851 patent and to deny Patent Owner’s Motion to Amend to substitute claims 10–12, we exercise our discretion to expunge these documents and exhibits under 37 C.F.R. §§ 42.7(a) and 42.56, and we dismiss Patent Owner’s Motion to Seal as moot.

III. CONCLUSIONS

Patent Owner's request to cancel challenged claims 1–9 of the '851 patent is granted. Patent Owner has demonstrated that proposed substitute claims 10–12 meet all the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121. However, based on the arguments and evidence presented during trial, Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claims 10–12 are both anticipated under 35 U.S.C. § 102(e) by Wallace and unpatentable under 35 U.S.C. § 103(a) over the teachings of Wallace alone. A summary of our conclusions is set forth in the table reproduced below.

Motion to Amend Outcome	Claims
Original Claims Cancelled by Amendment	1–9
Substitute Claims Proposed in the Motion to Amend	10–12
Substitute Claims: Motion to Amend Denied	10–12

IV. ORDER

In consideration of the foregoing, it is
ORDERED that claims 1–9 of the '815 patent are *cancelled*;
FURTHER ORDERED that Petitioner has demonstrated that
proposed substitute claims 10–12 of the '851 patent are unpatentable;
FURTHER ORDERED that, pursuant to 37 C.F.R. §§ 42.7(a) and
42.56, we expunge the following documents and exhibits from the record:
(1) the unredacted versions of the Preliminary Response (Paper 17), the
Motion to Seal (Paper 19), and Exhibit 2014; and (2) Exhibits 2002–2004
and 2006–2010;

FURTHER ORDERED that we *dismiss* Patent Owner's Motion to Seal as moot; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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