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Paper No. 42
Date: February 25, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RUCKUS WIRELESS, INC., BELKIN INTERNATIONAL, INC., NETGEAR, INC., and ROKU, INC.,

Petitioner,

v.

HERA WIRELESS S.A.,

Patent Owner.

IPR2018-01418
Patent 7,962,103 B2

Before THOMAS L. GIANNETTI, ROBERT L. KINDER, and JOHN A. HUDALLA, *Administrative Patent Judges*.

GIANNETTI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Granting Patent Owner's Motion to Amend to Cancel Claims 1–6
Denying Patent Owner's Motion to Amend to Substitute Claims 7 and 8
35 U.S.C. § 318(a)

I. INTRODUCTION

Ruckus Wireless, Inc., Belkin International, Inc., Amazon.com, Inc.,[1] Netgear, Inc., and Roku, Inc. (collectively, "Petitioner" or "Ruckus") filed a Petition requesting *inter partes* review of claims 1–6 of U.S. Patent No. 7,962,103 B2 (Ex. 1001, "the '103 patent"). Paper 1 ("Pet."). Patent Owner, Hera Wireless S.A., filed a Preliminary Response. Paper 8. After considering the arguments presented in Patent Owner's Preliminary Response, 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 as to all of the challenged claims and all grounds raised in the Petition. Paper 17 ("Institution Dec.").

Following institution, Patent Owner did not file a Patent Owner Response. Instead, Patent Owner filed a Motion to Amend. Paper 25 ("Motion"). The Motion to Amend requests the Board "to cancel original claims 1–6 of [the '103 patent] and substitute therefor new claims 7 and 8." *Id.* at 1; *see also id.* at 2 ("[Patent Owner] respectfully requests that the Board grant this motion to amend and cancel claims 1–6 and substitute claims 7 and 8."). Subsequently, Petitioner filed an Opposition to the Motion to Amend (Paper 28, "Opp."), Patent Owner filed a Reply (Paper 31, "Reply"), and Petitioner filed a Sur-reply (Paper 36, "Sur-reply").

[1] A joint motion to terminate the proceeding only as to Amazon.com was granted. Paper 13.

A consolidated oral hearing with related cases IPR2018-01371, IPR2018-01372, and IPR2018-01373, filed by Intel Corporation, along with cases IPR2018-01419, IPR2018-01420, and IPR2018-01421, filed by Ruckus, was held on November 6, 2019, and a transcript of the hearing is included in the record. Paper 41 ("Hearing Tr.").

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision under 35 U.S.C. § 318(a). For the reasons we identify below, we *grant* Patent Owner's Motion to Amend with respect to its request to cancel challenged claims 1–6 of the '103 patent. We, however, *deny* Patent Owner's Motion to Amend with respect to its request to substitute proposed claims 7 and 8 for cancelled independent claims 1 and 4, respectively.

A. Related Matters

The parties indicate that the '103 patent is the subject of numerous district court cases including*:* (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.); (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.). Pet. 2–3; Papers 5, 9.

The '103 patent is also the subject of IPR2018-01371, filed by Intel Corporation. Pet. 3. Concurrently with this Decision, the Board is entering a Final Written Decision in that proceeding. In addition, Petitioner has filed petitions seeking *inter partes* review of patents related to the '103 patent, including: IPR2018-01419 (challenging U.S. Patent No. 8,412,115) and

IPR2018-01420 and IPR2018-01421 (challenging U.S. Patent No. 8,934,851). *Id.*

B. The '103 Patent

The '103 patent is titled "Radio Apparatus, and Method and Program for Controlling Spatial Path." Ex. 1001, (54). The '103 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 1:18–24. The '103 patent describes a modification to a Japanese wireless communication system known as PHS ("Personal Handy phone System"). *Id.* at 1:65–2:25.

According to the '103 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. *Id.* at 4:13–16. The '103 patent, therefore, proposes a solution by providing

> 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 '103 patent describes use in PHS of PDMA ("Path Division Multiple Access") to improve efficiency. *Id.* at 2:19–25. In PDMA, 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.* This allows multiple users to communicate with the base station on the same carrier frequency and time slot. *Id.* at 3:53–59.

The '103 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. This is illustrated by Figure 2 of the '103 patent, reproduced below.

FIG.2

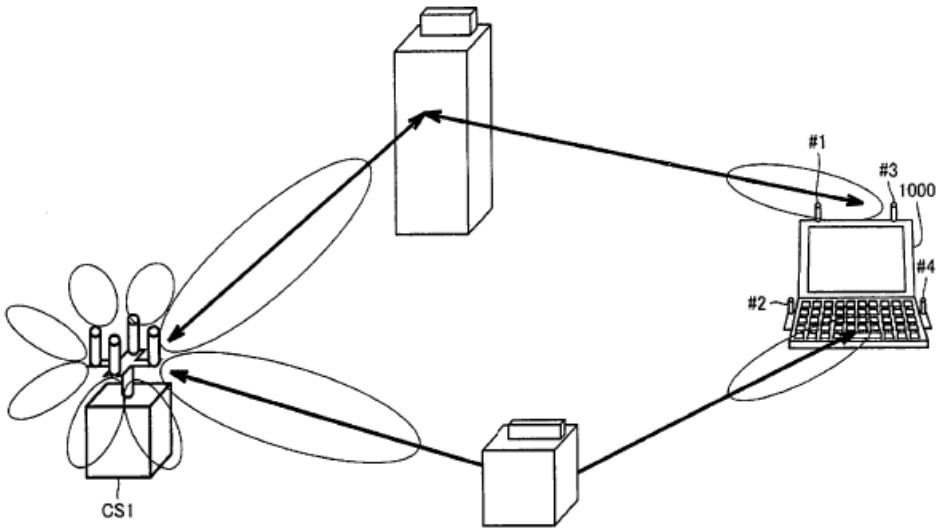


Figure 2 illustrates communication between PDMA terminal 1000 and an array antenna of base station CS1 using multiple spatial paths, where terminal antennas 1 and 3 are used for a first path and terminal antennas 2 and 4 are used for a second path. Ex. 1001, 7:27–30, 9:27–34.

In the embodiment of Figures 2 and 3 (identified as "First Embodiment"), a memory within terminal 1000 stores "antenna number information." *Id.* at 9:46–47. Terminal 1000 transmits the antenna number

information to base station CS1 at a prescribed timing. *Id.* at 9:47–49. 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 9:49–52. "Terminal 1000 sets the number of paths to be formed in accordance with the instruction from base station CS1." *Id.* at 9:52–53.

The '103 patent further explains, with relation 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). *Id.* at 9:62–65. 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 9:66–10:4.

II. MOTION TO AMEND

A, Background

We instituted *inter partes* review of the '103 patent on two separate grounds: (1) obviousness of claims 1–6 over Paulraj[2] "in view of the knowledge, skill, and creativity of a [person of ordinary skill in the art]," and (2) obviousness of claims 1–6 over Reudink[3] "in view of the knowledge, skill, and creativity of a [person of ordinary skill in the art]." Institution Dec. 6, 30.

[2] U.S. Patent No. 6,351,499 B1. Ex. 1010.
[3] U.S. Patent No. 7,039,441 B1. Ex. 1009.

As discussed *infra*, Patent Owner now requests cancellation of original claims 1–6 and substitution of new claims 7 and 8 for the cancelled claims. Motion 1. The Motion to Amend is not contingent on our determination as to whether a preponderance of the evidence establishes that challenged claims 1–6 of the '103 patent are unpatentable. We, therefore, *grant* Patent Owner's request to cancel those claims. *Id.* Thus, the only remaining issue before us is whether to grant the Motion to Amend as to proposed substitute claims 7 and 8.

In addition to its Motion and Reply, Patent Owner relies on two declarations from an expert, Dr. Jacob Sharony, to support its proposed amendment. A first declaration of Dr. Sharony was filed with the Motion to Amend. Ex. 2011 ("Sharony I Decl.").[4] A second was filed with Patent Owner's Reply. Ex. 2012 ("Sharony II Decl.").[5] In addition, a transcript of Dr. Sharony's October 10, 2019, deposition was filed as Exhibit 1020 ("Sharony Dep.").

With its Opposition to the Motion to Amend, Petitioner submitted a declaration by an expert, Dr. Kevin Negus. Ex. 1017 ("Negus Decl.").[6]

B. Proposed Substitute Claims

As noted, Patent Owner moves to substitute independent claims 7 and 8 for the cancelled claims, specifically, replacing independent claim 1 by

[4] This declaration is incorrectly labeled "Exhibit 2017."
[5] An earlier declaration by Dr. Sharony was submitted with Patent Owner's Preliminary Response. Ex. 2001.
[6] An earlier declaration by Dr. Negus was submitted with the Petition. Ex. 1002.

proposed substitute claim 7 and independent claim 4 by proposed substitute claim 8. Motion 1, Claims App'x.

Claims 7 recites the following (with underlining indicating language added to and brackets indicating language removed from independent claim 1):

> 7. A radio apparatus capable of communicating with another radio apparatus by forming a plurality of spatial paths therebetween, the radio apparatus comprising:
>
> an adaptive array unit capable of performing adaptive array processing on signals corresponding to a plurality of antennas, respectively;
>
> a storage unit which stores prior to any request to establish a link channel with the another radio apparatus [beforehand] a value indicating [possible multiplicity associated with] the maximum number of spatial paths formable by said adaptive array unit for multiplex communication; and
>
> a control unit which controls a process[ing] of transmitting the value [indicating possible multiplicity] to the another radio apparatus [at a predetermined timing] in a request to establish a link channel.

Motion, Claims App'x.

Claim 8 recites the following (with underlining indicating language added to and brackets indicating language removed from independent claim 4):

> 8. A radio apparatus capable of communicating with another radio apparatus by forming a plurality of spatial paths therebetween, the radio apparatus comprising:
>
> a plurality of antennas constituting an array antenna;
>
> an adaptive array unit capable of performing adaptive array processing on signals corresponding to the plurality of antennas, respectively;

> a storage unit which stores prior to any request to establish a link channel being sent to the another radio apparatus [beforehand] a value indicating [possible multiplicity associated with] the maximum number of spatial paths formable by said adaptive array unit for multiplex communication; and
>
> a control unit which controls a process[ing] of transmitting the value [indicating possible multiplicity] to the another radio apparatus [at a predetermined timing] in a request to establish a link channel.

Id.

C. Statutory and Regulatory Requirements

In this proceeding, 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, before considering the patentability of the proposed substitute claim, as set forth further below. *See Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 and IPR2018-01130, Paper 14 (PTAB Feb. 25, 2019) (precedential) ("*Lectrosonics*").

1. 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 cancels six claims and proposes two replacements—claims 7 and 8. 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).

2. 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 cancelled independent claims 1 and 4 and explains how the proposed substitute claims are patentable over Paulraj and Reudink, the prior art references that served as the basis of the grounds of unpatentability involved in the trial. Motion 12–18. Specifically, Patent Owner has added three categories of allegedly narrowing limitations not present in original claims 1–6:

> (1) the term "beforehand" is replaced by the more-specific clause "prior to any request to establish a link channel [with/being sent to] the another radio apparatus"; (2) the clause "value indicating possible multiplicity associated with the number of spatial paths formable by said adaptive array unit" is replaced by the more specific clause "value indicating the maximum number of spatial paths formable by said adaptive array unit for multiplex communication"; and (3) the clause "at a predetermined timing" is replaced by the more specific clause "in a request to establish a link channel."

Motion 11–12 (alteration in original). Patent Owner contends "[n]one of Petitioner's references teaches or suggests systems having this new combination of limitations." *Id.* at 12.[7] We determine that the amended language in the proposed substitute claims, which will be discussed in more detail *infra*, is responsive to the grounds of unpatentability involved in this trial under 37 C.F.R. § 42.121(a)(2)(i).

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[7] In addition to Paulraj and Reudink, Patent Owner also addresses prior art cited in related cases, e.g., "Wallace," U.S. Patent Application Pub. No. 2002/0193146 A1 (Ex. 1019). Motion 18–22.

3. 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 the substitute claim is "narrower than the original, now-cancelled claims and introduces no new matter." Motion 3. We have reviewed the limitations added in the proposed substitute claims (*see supra*) and determine that they do not enlarge the scope of the original cancelled claims.

4. New Matter/Written Description

A motion to amend "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*, 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) and (2).

Patent Owner provides a chart with citations to earlier-filed disclosures for each respective limitation of the proposed substitute claims. Motion 5–10. The chart purports to show that proposed substitute claims 7 and 8 are supported by U.S. Patent Application No. 12/463,657 (Ex. 2004, "the '657 application"), filed September 22, 2004, which issued as the '103 patent. Patent Owner also provides citations showing that the proposed

substitute claims 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. 2005, "the '655 application"), filed on March 11, 2003, and Exhibit 2007, an English translation of Japanese Patent Application No. JP-2002-081375 (Ex. 2006, "the '375 application"), filed on March 22, 2002. Motion 5–10.

For reasons that will be discussed *infra*, of particular relevance to this discussion is whether the original disclosure of the '657 application, and the earlier-filed disclosures of the '655 application and the '375 applications, provide sufficient written description support for the added claim limitation of storing "a value indicating the maximum number of spatial paths formable" in "a request to establish a link channel," as recited in proposed substitute claims 7 and 8. *See* discussion of claim 7 and 8, *supra*. Specifically, in responding to Petitioner's prior art challenge to proposed substitute claims 7 and 8, Patent Owner argues that the "value indicating the maximum number of spatial paths formable" is not met by sending the number of antennas. *See, e.g.*, Hearing Tr. 108:4–8 ("If the mobile station is saying I am going to count up the number of antennas . . . it is not sending the number of spatial paths. It is sending the number of antennas.").

As support for this limitation added in the proposed substitute claims, Patent Owner' chart refers to Figure 7 of the '657 application and the accompanying description in the text. Motion 6, 9. That figure (designated "Second Embodiment") in the '657 application is a flowchart that shows "flow in [the] adaptive control of the number of paths set" in two different

variations. Ex. 2004, 20:6–10.[8] In the first variation, the terminal notifies the base station of "the number of antenna elements N in the terminal." *Id.* at 20:15–17. Thus, referring to this disclosure for written description support of proposed substitute claims 7 and 8, Patent Owner states: "Terminal 2000 notifies base station CS1 of the number of antenna elements N in the terminal." Motion 6, 9 (citing Ex. 2004, 20:15–17).

Furthermore, as discussed *supra* in summarizing the '103 patent, describing the First Embodiment of Figures 2 and 3, the '657 application explains: "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)." Ex. 2004, 16:10–12. Patent Owner quotes this portion of the specification in support of its proposed amendment. Motion 7 (quoting Ex. 2004, 16:10–12), 9 (same). In the very next sentence, the '675 application explains that in this embodiment, "[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. 2004, 16:13–16 (emphasis added). Patent Owner cites this and similar discussions from the '655 application and the '375 application. *See, e.g.*, Motion 7 (citing Ex. 2005, 16:10–12; Ex. 2007 ¶ 75), 9 (citing Ex, 2005, 16:10–12, Ex. 2007 ¶ 35).

[8] Citations to Exhibits 2004 and 2005 refer to page and line numbers. Page numbers are those appearing in the original documents.

Petitioner's opposition challenges Patent Owner's showing of written description support for this proposed amendment. Opp. 2–7. Petitioner contends that, "to the extent that Hera is arguing that the claimed 'value indicating a maximum number of spatial paths' that is transmitted/received in a 'request to establish a link channel' is something other than the terminal's number of antennas, it fails to show § 112(a) written description support for the claim limitation." *Id.* at 6–7. At the oral hearing, however, counsel stated that, if we were to agree with Petitioner's position that the proposed claim is unpatentable over Wallace, "it becomes unnecessary to address the written description point." Hearing Tr. 70:9–11

Based on the disclosures in the '657 application, the '655 application, and the '375 application, we find that there is sufficient written description support for this limitation. The '103 patent and its previously-filed supporting applications describe at least one embodiment where a terminal transmits antenna number information in a link channel request. Specifically, in the First Embodiment discussed *supra* in relation to Figure 3, 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). Ex. 1001, 9:62–65. We further find that this amounts to transmitting a "value indicating the maximum number of spatial paths formable" in "a request to establish a link channel," as recited in the proposed substitute claims. *See* discussion *infra*. So, too, does the description of the first variation of the Figure 7 Second Embodiment, described *supra*. This showing discharges Patent Owner's burden on this issue.

However, because we also conclude, *infra*, that proposed substitute claims 7 and 8 would have been obvious in light of Wallace, and in view of counsel's concession at the oral hearing, we do not find it necessary to further address Petitioner's specific written description arguments. *See* Hearing Tr. 70:9–11 ("[I]f you agree with us on Wallace, it becomes unnecessary to address the written description point").

D. Patentability of Proposed Substitute Claim 7

1. Introduction

Petitioner challenges proposed substitute claim 7 as obvious over Wallace (*see supra*) in view of the knowledge of a person of ordinary skill in the art. Opp. 7. Patent Owner "does not bear the burden of persuasion to demonstrate the patentability of [the proposed] substitute claims." *Lectrosonics*, Paper 15 at 4 (citing *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017); *Bosch Auto. Serv. Sols. LLC v. Iancu*, 878 F.3d 1027 (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." *Lectrosonics*, Paper 15 at 4.

We begin our analysis with the principles of law and other related matters that generally apply to an obviousness ground, followed by a brief overview of Wallace.

2. Principles of Law

A claim is unpatentable as obvious under 35 U.S.C. § 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).[9] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze Petitioner's unpatentability arguments based on obviousness with the principles identified above in mind.

3. Person of Ordinary Skill

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 '103 patent would have possessed "a working knowledge of multi-input multi-output (MIMO) wireless communications. That 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." Motion 4 (citing Sharony I Decl. ¶ 28).

Petitioner's Opposition does not dispute Dr. Sharony's assessment of the level of skill in the art. The Petition, however, provides the following description:

> As of March 2002, the education level and work experience of a person having ordinary skill in the art . . . relevant to the

[9] Patent Owner did not present arguments or evidence regarding secondary considerations during the course of trial.

> '103 Patent was a Bachelor of Science in Electrical Engineering, or an equivalent field, as well as three to four years of experience in the field of wireless communications, or a Master's degree in Electrical Engineering, or an equivalent field, as well as two years of experience in the field of wireless communications.

Pet. 18–19 (citing Ex. 1002 ¶ 29). The parties' formulations differ mainly in the amount of experience in wireless communications for a Bachelor's degree level engineer: three to four years (Petitioner) or three to five years (Patent Owner).

We regard any differences in the two formulations as insignificant. For the purpose of this Final Written Decision, we adopt Patent Owner's proposal as consistent with the prior art before us. However, we would reach the same result with regard to this decision under either formulation.

4. Claim Construction

In this *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) (2018).[10] Under that standard, and absent any special definitions, claim terms generally are given their ordinary and customary meaning, as would have been 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).

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[10] A recent amendment to this rule does not apply here because the Petition was filed before November 13, 2018. *See* 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)).

Referring to the terms in the original claims that are carried over in claims 7 and 8, Patent Owner asserts it "does not rely on those or any other specific claim constructions to demonstrate patentability of the proposed substitute claim over the prior art. Rather, Patent Owner demonstrates patentability based on the new limitations of the proposed substitute claims." Motion 10. Thus, 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." *Id.*

Petitioner does not contend that any claim term requires an explicit construction to determine whether the proposed substitute claims would have been obvious in light of the prior art of record. In the course of our discussion of the merits of Petitioner's opposition, however, we do address the scope of proposed substitute claims 7 and 8 in applying them to Wallace.

5. Wallace Overview

Wallace is titled "Method and Apparatus for Antenna Diversity in a Wireless Communication System." Ex. 1019, (54). Wallace discloses a "[m]ethod and apparatus for negotiating a transmission scenario in a mixed mode spectrum wireless communication system." *Id.* at (57); *see also id.* ¶ 74 (disclosing a "mixed mode operation for one embodiment" where "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. *Id.* ¶¶ 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.

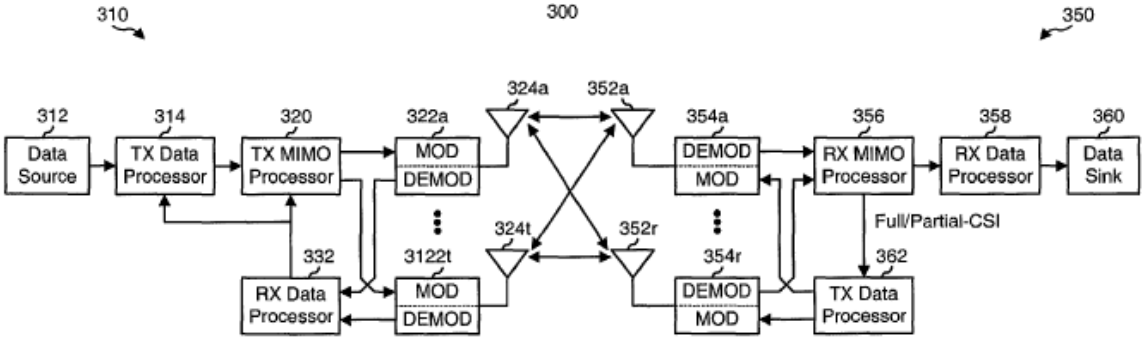


FIG. 12

Figure 12 depicts a "wireless communication system capable of MIMO and diversity transmissions." Ex. 1019 ¶ 22. Wallace explains that "[s]ystem 300 may be operated to transmit data via a number of transmission channels." *Id.* ¶ 93.

Wallace relates the number of transmission channels (NC) to the number of transmit (NT) and receive (NR) antennas: "A MIMO channel may be decomposed into NC independent channels, with NC≦min {NT, NR}." *Id.* Wallace explains further that "[e]ach of the NC independent channels is also referred to as a spatial subchannel of the MIMO channel. For a MIMO system, there may be only one frequency subchannel and each spatial subchannel may be referred to as a 'transmission channel.'" *Id.*

Wallace explains also 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.

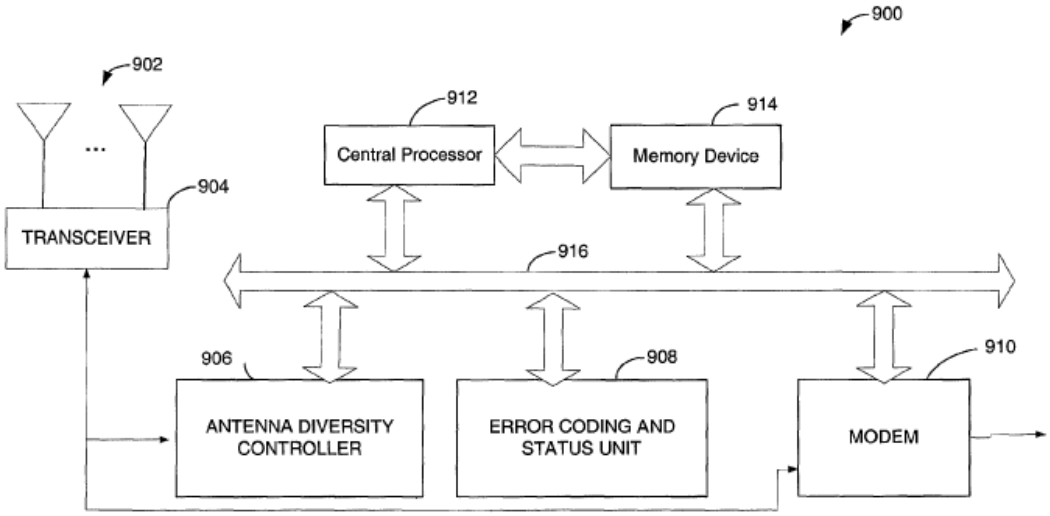


FIG. 18

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. 1019 ¶ 122.

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

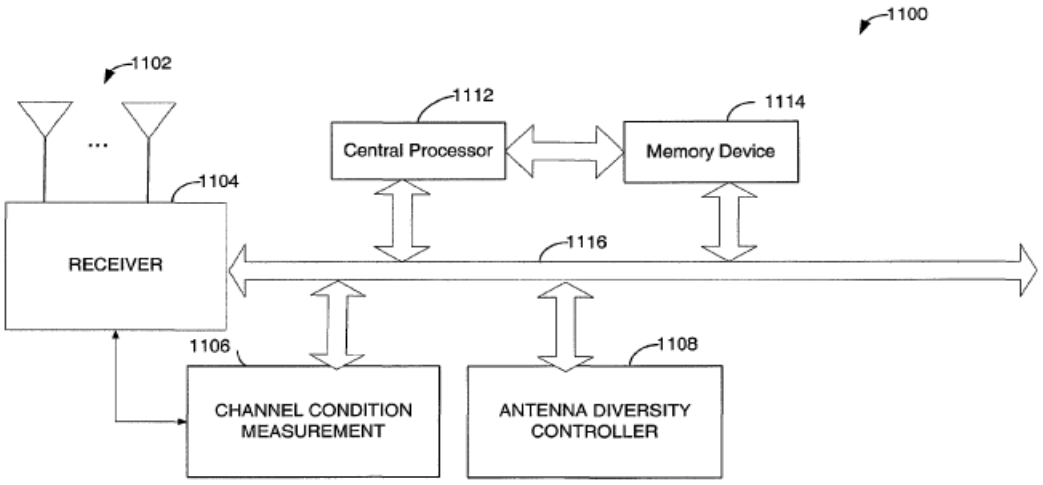


FIG. 20

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. 1019 ¶ 139.

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. 1019 ¶ 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. 1019 ¶ 127. In addition, Wallace

discloses that its approach can be used in time division multiple access ("TDMA") systems. *Id.* ¶¶ 33–35, 69.

6. Analysis of Proposed Substitute Claim 7

Petitioner presents arguments and evidence that proposed substitute claim 7 would have been obvious over the teachings of Wallace. Opp. 7–24. Petitioner provides an element-by-element analysis of Wallace in relation to claim 7. *Id.* at 10–24. We credit Petitioner's analysis and find Petitioner has demonstrated by a preponderance of the evidence that the subject matter of claim 7 would have been obvious to a person of ordinary skill based on Wallace. Our reasoning follows.

a. "A radio apparatus capable of communicating with another radio apparatus by forming a plurality of spatial paths therebetween, . . . comprising"

Petitioner contends that, to the extent this preamble of proposed substitute claim 7 is limiting, Wallace discloses the preamble. Opp. 10–11. We find that Wallace discloses the preamble of proposed substitute claim 7 because it describes a wireless communication system with a "base station" and "terminals." Ex. 1019 ¶¶ 43–44; Fig. 1. The base station in Wallace communicates with the terminals. *Id.* ¶ 71. Thus, the terminal of Wallace is "a radio apparatus," and the base station is "another radio apparatus." Opp. 11; Negus Decl. ¶ 89. Furthermore, the base station communicates with the mobile station over a plurality of spatial paths using MIMO technology. Ex. 1019 ¶ 97; Negus Decl. ¶ 92–93.

Patent Owner does not challenge this assertion by Petitioner.

b. "an adaptive array unit capable of performing adaptive array processing on signals corresponding to a plurality of antennas, respectively"

Petitioner contends that Wallace discloses the "adaptive array unit" of proposed substitute claim 7. Opp. 11–14. We find that Wallace meets this limitation. Negus Decl. ¶¶ 96–107. We note that the '103 patent states that "adaptive array processing is a well-known technique." Ex. 1001, 2:38–39.

Wallace discloses MIMO communication system 300, shown in Figure 12 (reproduced *supra*), where data source 312 provides data to transmit data processor 314 and transmit MIMO processor 320. Ex. 1019, Fig. 12, ¶¶ 97–98, 100. System 300 also has a number of receive antennas 352 and demodulators 354 that receive transmitted signals and provide demodulated signals to receive MIMO processor 356. *Id.* ¶ 102. We find that a person of ordinary skill would have understood that this combination of transmit and receive data processors, transmit and receive MIMO processors, multiple modulators and demodulators, and multiple transmit and receive antennas is an adaptive array unit that is capable of performing adaptive array processing on signals corresponding to multiple antennas. Negus Decl. ¶¶ 100–106.

Patent Owner does not challenge this assertion by Petitioner.

c. "a storage unit which stores prior to any request to establish a link channel with the another radio apparatus a value indicating the maximum number of spatial paths formable by said adaptive array unit for multiplex communication"

This limitation of proposed substitute claim 7 lies at the core of Petitioner's opposition to the Motion to Amend and Patent Owner's response. We now discuss, in turn, several aspects of this limitation.

i. "a value indicating the maximum number of spatial paths formable by said adaptive array unit . . ."

Petitioner contends that Wallace meets this limitation. Opp. 15–17. Petitioner asserts that a person of ordinary skill would have understood from the '103 patent that the maximum number of spatial paths that can be formed by a terminal for multiplex communication "can equate to the 'number of antennas' available to the terminal for a communication link." *Id.* at 15. Petitioner contends, further, that Wallace's disclosure of the number of receive antennas and the number of transmit antennas for a mobile station is "a value indicating the maximum number of spatial paths formable by said communication unit for multiplex communication." *Id.* at 17 (citing Negus Decl. ¶ 128). We agree with Petitioner for the reasons that follow.

As discussed *supra*, 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. 1019 ¶ 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.*

As noted *supra*, for MIMO communications, Wallace relates the number of transmission channels (NC) to the number of transmit (NT) and receive (NR) antennas: "A MIMO channel may be decomposed into NC independent channels, with NC≦min {NT, NR}." Ex. 1019 ¶ 93. Wallace thus discloses to a person of ordinary skill that the maximum number of "spatial subchannels" for MIMO communication formable by a particular

transmitter or receiver is the maximum number of transmit or receive antennas for that transmitter or receiver. Negus Decl. ¶¶ 124–126.

Patent Owner contends that this information on number of antennas does not meet the claim limitation. Reply 4–11. Patent Owner argues: "Wallace does not contain any teaching of the use of subarrays. The 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.* at 4 (internal citation omitted). According to Patent Owner: "While Wallace does disclose the possibility of transmitting the number of antennas 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 number of antennas." *Id.* at 4 (emphasis added). At the oral hearing, Patent Owner's position was presented another way:

> THE BOARD: So would it be fair to characterize patent owner's position as that antenna number information is *necessary, but not sufficient* to define the number of spatial paths formable?
>
> PATENT OWNER'S COUNSEL: Yes, I think that is fair, Your Honor.

Hearing Tr. 112:18–23 (emphasis added).

We do not agree with Patent Owner's argument that the antenna number information in Wallace is not "a value indicating the maximum number of spatial paths formable." As Petitioner points out, the proposed substitute claims do not "recite or require" subarrays. Sur-reply 6–7; *see also In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) (explaining that limitations not appearing in the claims cannot be relied upon for

patentability). Patent Owner could have added such a limitation as part of its amendment, but chose not to do so. Instead, all the proposed claims call for is "a value indicating the maximum number of spatial paths formable." Motion, Claims App'x.

Although it is true that the antennas in a communication system may be grouped in sub-arrays, there is no dispute that this is not a requirement for communications to take place. Thus, at least in such situations where there are no sub-arrays, or where each "subarray" has only one antenna, the number of antennas would be indicative of the maximum number of paths and would meet the claim limitation. Sur-reply 8–9; Sharony II Decl. ¶ 36 ("The two numbers coincide when each subarray contains exactly one antenna and all antennas work and are used in the subarrays."). For example, Dr. Negus testified "Wallace explicitly discloses a MIMO communication system embodiment with the number of transmit antennas being equal to the number of transmit RF and signal processing chains and with the number of receiver antennas being equal to the number of receive RF and signal processing chains for either or both of a base station and a terminal device." Negus Decl. ¶ 127.

Patent Owner's expert Dr. Sharony testified to this effect at his deposition, addressing proposed claim 7 of the '103 patent:

> Q. If I sell an 802.11 access point that has a plurality of antennas, but those antennas are not arranged in sub-arrays, can I still meet the limitation of claim 7 of the '103 patent?
>
> . . .
>
> A. You do because each antenna, again, it's a special case, could be the sub-array.

Ex. 1020, 35:21–36:4; *see id.* at 36:5–25 ("so if you put one antenna per sub-array, so the number of sub-arrays, the number of antennas, so you would

basically meet the claim limitation"). Thus, we do not agree with Patent Owner's argument distinguishing Wallace based on "antenna arrays," as it is not supported by the language of the proposed substitute claims.

At the oral hearing, Patent Owner shifted the focus of its argument on Wallace to the Second Embodiment of Figure 7 of the '103 patent. *See, e.g.*, Hearing Tr. 109:6–110:2. Thus, to support its argument that the scope of the proposed substitute claims excludes Wallace's transmitting the number of antennas as part of diversity negotiations, Patent Owner relies on the Figure 7 variation, discussed briefly *supra*, involving P_MAX. Hearing Tr. 109:23–110:2. Figure 7 of the '103 patent is reproduced below.

FIG.7

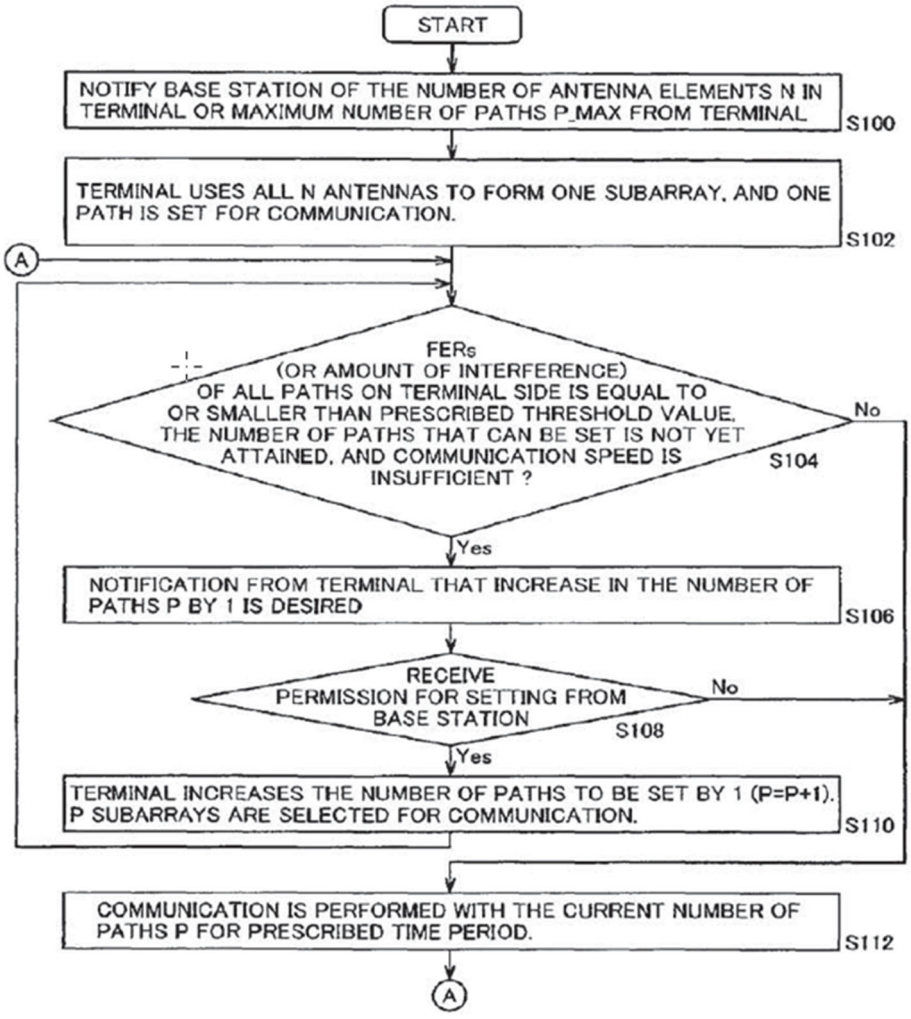


Figure 7 is a flowchart showing the steps in the adaptive control of the number of paths set in PDMA terminal. As noted previously in our written description analysis, Figure 7 is described in the '103 patent as a "Second Embodiment." Ex. 1001, 12:17–23. As discussed, the initial step (S100) of the process of Figure 7 involves two alternatives: a first terminal either notifies base station CS1 of the "number of antenna elements N in the terminal *or* the maximum number of paths P_MAX." *Id.* at 12:30–32 (emphasis added). According to Patent Owner at the oral hearing:

> Figure 7 allows for two alternatives. . . . One alternative is to send the number of antennas. Another alternative, *which is the one that we are now claiming*, is the one where you send the maximum number of paths PMAX formable.

Hearing Tr. 109:24–110:2 (emphasis added). Thus, Patent Owner argues that the proposed substitute claims should be limited to the variation of Figure 7 where the base station is given "the maximum number of paths P_MAX." *Id.* at 109:23–110:2; 111:20–23; 115:19–116:2.

For several reasons we do not agree with this argument. We first look at the language of the claims. *Phillips v. AWH Corp.,* 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). The claim language imposes no requirement that the value be the actual number of paths, only that it be "a value indicating the maximum number of spatial paths *formable* by said communication unit." Motion, Claims App'x (emphasis added). There is no dispute that it is "well known" in MIMO spatial multiplexing that the number of antennas may set the upper limit for the number of paths, *e.g.*, when there are no antenna arrays. *See, e.g.*, Hearing Tr. 138:3–5 ("[W]e don't dispute that the maximum number of spatial paths formable in any instance is going to be no more than the number of antennas."). There is also no dispute that the number of antennas is "a relevant factor." *Id.* at 119:9–10.

Nor does the '103 patent specification support this argument by Patent Owner. The argument ignores the First Embodiment of the '103 patent, discussed *supra* in relation to Figures 2 and 3. Ex. 1001, 8:30–11:3. As explained *supra*, in that embodiment, 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). *Id.* at 9:62–65. Base station CS1 gives an instruction for the number of paths, the

'103 patent 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 9:66–10:4. And, in addition, the Second Embodiment illustrated in Figure 7 discloses the alternative initial step of notifying the base station of the number of antennas. *See* discussion *supra*.

Patent Owner's attempt to limit its claims by relying on the Figure 7 "P_MAX" variation is unconvincing. Although the claims must be read in view of the specification, "limitations from the specification are not to be read into the claims." *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1326 (Fed. Cir. 2002) (citations omitted). "[T]he claims of the patent will not be read restrictively, unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction." *Liebel-Flarsheim Co. v. Medrad, Inc*., 358 F.3d 898, 906 (Fed. Cir. 2004) (citing *Teleflex*, 299 F.3d at 1327). As noted *supra*, the '103 patent discloses sending antenna number information to the base station as an upper bound for the number of paths. Moreover, as discussed *supra*, Patent Owner relies on that very disclosure as providing written description support for the proposed substitute claims. *See* Motion 7.

In light of the foregoing, we credit Petitioner's evidence on this limitation, supported by the testimony of Dr. Negus, and find that the limitation is met by Wallace. Based on the foregoing, we find a person of ordinary skill would have understood from Wallace that the maximum number of spatial paths formable by a terminal for multiplex communication

can equal the number of antennas available to the terminal for a communication link. Negus Decl. ¶¶ 112–116, 124–128.

In response to Patent Owner's P_MAX argument, Petitioner asserts that P_MAX is a value that is derived after communication is established. Thus, according to Petitioner, in the '103 patent, a frame error rate counter (FER) calculates how many frames reach their destination terminal without an error. Hearing Tr. 72:6–13; Ex. 1001, 11:14–18. Petitioner explains that this stored information, in turn, is used to determine the value P_MAX. Hearing Tr. 72:14–73:3; Ex. 1001, 11:37–42. Thus, Petitioner argues that in order to establish communication, the first step would be to transmit the antenna information, and not P_MAX. Hearing Tr. 74:8–23.

While we see merit in Petitioner's argument, we do not find it necessary to determine whether P_MAX is transmitted initially or derived after communication has started. We find (and Patent Owner does not dispute) that in one variation of this Second Embodiment, communication is initiated by transmitting the number of antennas to the base station. Hearing Tr. 109:17–110:2. For reasons discussed *supra*, we are not persuaded by Patent Owner's attempt to limit its claims to exclude that variation of the Second Embodiment or the description in the '103 patent of the First Embodiment.

ii. ". . . for multiplex communication"

Petitioner contends that Wallace meets this limitation of proposed substitute claim 7. Opp. 14–15; Negus Decl. ¶¶ 110, 119. Petitioner contends a person of ordinary skill would have understood "'multiplex communication' to mean at least a MIMO scheme where a terminal communicates with a base station using 'a plurality of spatial paths.'"

Opp. 14 (citing Negus Decl. ¶ 110). Petitioner further contends a person of ordinary skill also would have understood the term "spatial path" to convey "at least the concepts of multiple 'spatially multiplexed streams' or 'multiple distinct data streams.'" *Id.* at 15 (citing Negus Decl. ¶ 111).

Patent Owner does not challenge this assertion. We are persuaded by Petitioner's argument and find that a person of ordinary skill would have understood the term "spatial paths" and "multiple independent data streams on a same frequency to a given user" in Wallace to convey "at least the concepts of multiple 'spatially multiplexed streams' or 'multiple distinct data streams.'" Opp. 15; Ex. 1019 ¶ 66; Negus Decl. ¶¶ 33, 111, 119.

iii. "a storage unit which stores prior to any request to establish a link channel with the another radio apparatus . . . "

Petitioner contends, "Wallace discloses 'antenna diversity status information' that is stored in a memory device or in an antenna diversity controller within the remote station, and this antenna diversity status information 'may be sent as a message to the base station' and 'may include the number of transmit antennas [and] the number of receive antennas." Opp. 19. We find that a person of ordinary skill would have understood this storage unit element of claim 7 is taught by Wallace.

Wallace discloses that antenna diversity information is stored in a memory device of an antenna diversity controller. Ex. 1019 ¶ 125; Negus Decl. ¶ 136. Wallace also teaches that this diversity information "may include a variety of information" including the number of send or receive antennas, and that this information "may be sent as a message to the base station." *Id.* We find that a person of ordinary skill would have understood that to send such a message at the time of a request for communication from

a mobile user, the information (including the number of antennas) must have been stored in a memory prior to the time a link channel is established. Negus Decl. ¶¶ 138–139.

d. "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 the claimed control unit. Opp. 20–24; Negus Decl. ¶¶ 142–161. According to Petitioner, in Wallace:

> This control unit which controls a process of transmitting to the another radio apparatus the value, such as the number of receive and transmit antennas of a terminal sent as "antenna diversity status information." The control unit sends this value in a request to establish a link channel, such as when the terminal sends "antenna diversity status information" at "the initiation of a communication" at least in the form of "a request for a communication from a mobile user."

Opp. 25 (citing Negus Decl. ¶ 161). According to Dr. Negus, "a [person of ordinary skill] would understand at least the 'central processor' or the 'antenna diversity controller' would be examples of a 'controller' that controls other elements of a radio apparatus and their operation thereof as disclosed within the 'remote station' or 'terminal' of Wallace." Negus Decl. ¶ 146 (emphases omitted). We are persuaded by Petitioner's showing and find that Wallace discloses the claimed control unit.

Petitioner contends that Wallace meets the "in a request to establish a link channel" limitation by disclosing "that the terminal/mobile station sends its number of transmit antennas/number of receive antennas as a message to the base station at the initiation of a communication at least in the form of a request for a communication from a mobile user that may be provided when

the receiver registers with the base station." Opp. 21–22 (internal quotation marks omitted) (citing Negus Decl. ¶¶ 157–158).

Patent Owner disputes this analysis. Reply 10–11. According to Patent Owner, "Wallace discloses that the actual number of antennas is transmitted from the terminal to a base station during registration of the terminal with the base station, whereas the '103 patent teaches that the maximum number of spatial paths that can be formed is transmitted in a request to establish a link channel." *Id.* at 10 (emphases omitted). To support its argument, Patent Owner relies on the PHS standard (Ex. 1016), which Patent Owner claims establishes that the value indicating the number of spatial paths in PHS is not transmitted in a request to establish a link channel, as the claim requires, but comes after. *Id.*

We do not agree with this argument. Instead, we find that Wallace teaches a control unit transmitting "a value [the number of antennas] indicating the maximum number of spatial paths formable" in the initial request of the mobile station to the base station. Negus Decl. ¶¶ 152–161. Wallace describes "[t]ypically" performing "antenna diversity status negotiations" "at initiation of a communication." Ex. 1019 ¶ 127. According to Wallace, "[i]nitiation refers to the start of a communication, including . . . a request for a communication from a mobile user." *Id.* ¶ 123. We find that a person of ordinary skill would have understood that this mobile station's initial request to the base station is analogous to the request for a link channel in the '103 patent. *See* Opp. 21 (citing Negus Decl. ¶ 152); Negus Decl. ¶¶ 157–161.

Furthermore, in Wallace, a mobile station may also transmit antenna diversity status information, including the number of transmit and receive

antennas, when it registers with the base station. *Id.* ¶ 141. The base station in Wallace "selects a transmission scenario based on the resources of the base station and the receiver." *Id.* Patent Owner contends that this transmission in Wallace of antenna number information by the terminal during registration does not meet this limitation. Reply 10. Patent Owner contends that the timing of this transmission does not correspond to sending a request to establish a link channel because those times "are usually different." *Id.* For the reasons given, we do not agree with this argument. We find that Wallace meets this limitation because Wallace explicitly teaches to a person of ordinary skill providing antenna number information at the "initiation of a communication," e.g., "when the receiver registers with the base station." Sur-reply 10 (citing Ex. 1019 ¶¶ 127, 141); Negus Decl. ¶¶ 157–160.

Therefore, we determine that Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claim 7 would have been obvious to a person of ordinary skill based on Wallace.

7. Analysis of Proposed Substitute Claim 8

Proposed substitute claim 8 is nearly identical to proposed claim 7. Opp. 15. Petitioner's element-by-element analysis of claim 8 relies on its analysis of claim 7 for all limitations but one. *Id.* at 25. For that limitation, which recites "a plurality of antennas constituting an array antenna," Petitioner states "Wallace discloses multiple element antenna arrays including a mobile station with 'a receive antenna array.'" *Id.* (citing Ex. 2019 ¶¶ 5, 139; Negus Decl. ¶¶ 99, 174–175).

Patent Owner responds that claim 8 is patentable "[f]or the same reasons discussed above as to substitute claim 7." Reply 11. We accept

Petitioner's analysis of the additional limitation of claim 8 relating to multiple antennas, and find that there are no other differences in the claims that would affect our previous analysis of proposed claim 7. We, therefore, adopt our previous analysis and findings for proposed substitute claim 8.

We have considered Petitioner's additional remarks and find for the reasons given Petitioner has demonstrated by a preponderance of the evidence that each element of claim 8 either is taught by Wallace, or alternatively, reasonably suggested by Wallace to a person of ordinary skill. Therefore, we determine that the claim would have been obvious to a person of ordinary skill based on Wallace.

8. Patent Owner's Additional Arguments

Patent Owner contends the "primary distinctions" are "Wallace does not teach: (a) transmitting the maximum number of spatial paths formable for multiplex communication; and (b) doing so in the initial request to establish a link channel." Reply 1. These primary arguments are addressed *supra*.

Patent Owner presents additional arguments on Wallace. *Id.* at 4–11. We have considered these arguments in reaching our conclusions on patentability of the substitute claims, but do not find them persuasive for the following reasons.

For example, Patent Owner suggests that Wallace is "inherently different" from the '103 patent because Wallace focuses "on selecting a transmission scenario for spatial diversity communication rather than on management of multiple spatial paths for spatial multiplexing communication." Reply 11 n.3. We do not agree. For reasons discussed *supra*, we find that Wallace is from the same field of endeavor as the

'103 patent (wireless communication systems) and is at least "reasonably pertinent" to the claimed invention. Sur-reply 5 (citing *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004)).

Patent Owner contends Wallace teaches that the antenna number information transmitted from the remote terminal to the base station "is used only to determine a transmission scenario, i.e., the 'type of configuration' . . . for a communication link." Reply 5. In addition, Patent Owner argues "Wallace does not contain any teaching of the relationship between the specific number of antennas and the maximum number of spatial paths. In fact, Wallace does not contain any teaching of spatial paths at all." *Id.* at 5–6. We do not find these arguments convincing. We find that Wallace teaches MIMO communication links where the number of antennas is used to determine the maximum number of independent channels (i.e., the maximum number of spatial paths) formable for multiplex communication. Ex. 1019 ¶ 93; Negus Decl. ¶¶ 43–45, 124–128. Specifically, Wallace discloses that for MIMO channels, 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. *See* discussion of Wallace, *supra*; Ex. 1019 ¶ 66 ("N=min(Nt,Nr)"), ¶ 93 ("NC" is less than or equal to "{NT, NR}"). Moreover, we agree with Petitioner that Wallace describes forming spatial paths. Negus Decl. ¶ 93.

Thus, we find that to a person of ordinary skill, Wallace teaches a relationship between antennas and spatial paths: the maximum number of spatial paths formable by a terminal depends on the number of antennas at the terminal. Negus Decl, ¶¶ 43–45, 124–128; Ex. 1019 ¶¶ 66, 93. Further, we find that a person of ordinary skill would have understood Wallace uses

this information to determine "the maximum number of spatial paths formable." *Id.*

Patent Owner further argues that "Wallace stores a fixed value of its actual number of antennas before transmitting the value to a base station in order to select a transmission scenario for spatial diversity communications. This fixed number of the 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." Reply 7. We do not find this argument convincing as it is contrary to the language of the proposed substitute claims. The claims do not call for a "dynamically changing parameter" or transmitting the actual number of paths formed, only "a value indicating the maximum number of spatial paths *formable*." Patent Owner does not dispute that the number of paths cannot exceed the number of antennas. *See supra*.

9. 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 7 and 8 would have been obvious over Wallace at the time of the invention to a person of ordinary skill.

III. CONCLUSIONS

Patent Owner's request to cancel challenged claims 1–6 of the '103 patent is *granted*. Patent Owner has demonstrated that proposed substitute claims 7 and 8 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 7 and 8 are unpatentable under 35 U.S.C. § 103(a). Patent Owner's Motion to Amend as to substitute claims 7 and 8 is, therefore, *denied*.

A summary of our conclusions is set forth in the table reproduced below.

Motion to Amend Outcome	Claims
Original Claims Cancelled by Amendment	1–6
Substitute Claim Proposed in the Motion to Amend	7, 8
Substitute Claim: Motion to Amend Denied	7, 8

IV. ORDER

In consideration of the foregoing, it is

ORDERED that claims 1–6 of the '103 patent are *cancelled*;

FURTHER ORDERED that, because Petitioner has demonstrated that proposed substitute claims 7 and 8 are unpatentable, Patent Owner's Motion to Amend as to claims 7 and 8 is *denied*;

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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