

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

HERA WIRELESS S.A.,
Patent Owner.

IPR2018-01702
Patent 7,873,389 B2

Before THOMAS L. GIANNETTI, ROBERT L. KINDER, and
CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

OGDEN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Denying Patent Owner's Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

In response to a Petition (Paper 2, “Pet.”) by Intel Corporation (“Intel”), the Board instituted an *inter partes* review of claims 1–3 of U.S. Patent No. 7,873,389 B2 (Ex. 1001, “the ’389 patent”). Paper 9 (“Dec.”). During the *inter partes* review, Patent Owner Hera Wireless S.A. (“Hera”) filed a contingent Motion to Amend (Paper 17, “Mot. Amend”). Intel filed an Opposition to the Motion to Amend (Paper 19, “Opp. Amend”). Hera submitted neither a patent owner response,¹ nor a reply to Intel’s Opposition to the Motion to Amend.

We held an oral hearing on January 22, 2020, and the transcript is entered on the record (Paper 25, “Tr.”). At the hearing, Intel addressed only the proposed substitute claims and not the original claims. *See* Tr. 5:16–19. Hera only pointed out that the Motion to Amend was contingent on the original claims being found unpatentable, and did not otherwise offer arguments. *See* Tr. 21:8–17.

This is a Final Written Decision under 35 U.S.C. § 318(a) as to whether the claims challenged in the *inter partes* review are patentable. Intel has shown, by a preponderance of the evidence on the record before us, that claims 1–3 of the ’389 patent are unpatentable. For the reasons discussed below, we also deny Hera’s Motion to Amend.

¹ Hera waived its arguments presented in the Preliminary Response by not filing a patent owner response. *See* Paper 10, 7 (cautioning Hera that “any arguments for patentability not raised in the response may be deemed waived”).

II. BACKGROUND

A. RELATED PROCEEDINGS

The parties identify the following as matters relating to the '389 patent: *Hera Wireless S.A. v. Amazon.com, Inc.*, 1:17-cv-00947 (D. Del.); *Hera Wireless S.A. v. ARRIS Group, Inc.*, 1:17-cv-00948 (D. Del.); *Hera Wireless S.A. v. Belkin International, Inc.*, 1:17-cv-00949 (D. Del.); *Hera Wireless S.A. v. Buffalo Americas, Inc.*, 1:17-cv-00950 (D. Del.); *Hera Wireless S.A. v. Netgear, Inc.*, 1:17-cv-00951 (D. Del.); *Hera Wireless S.A. v. Roku, Inc.*, 1:17-cv-00952 (D. Del.); *Hera Wireless S.A. v. Lenovo Holding Co.*, 1:17-cv-01088 (D. Del.); and *Hera Wireless S.A. v. LG Electronics, Inc.*, 1:17-cv-01089 (D. Del.). Paper 8, 2; Paper 15, 1–2.

The '389 patent was also the subject of *Ruckus Wireless, Inc. v. Hera Wireless S.A.*, IPR2018-01737, Paper 1 (filed Sept. 14, 2018), *institution denied*, Paper 21 (entered Apr. 30, 2019).² Paper 8, 2.

Intel has also filed petitions seeking *inter partes* review of several other of Hera's patents, including the following: IPR2018-01371 (challenging U.S. Patent No. 7,962,103); IPR2018-01372 (challenging U.S. Patent No. 8,412,115); IPR2018-01373 (challenging U.S. Patent No. 8,934,851); IPR2018-01543 (challenging U.S. Patent No. 8,295,400); IPR2018-01657 (challenging U.S. Patent No. 9,270,024); IPR2018-01686 (challenging U.S. Patent No. 8,737,377); IPR2018-01687 (challenging U.S. Patent No. 8,737,377); IPR2018-01700 (challenging U.S. Patent No. 7,369,878); and IPR2018-01701 (challenging U.S. Patent No. 7,454,234).

² Petitioners in that proceeding were Ruckus Wireless, Inc., Belkin International, Inc., Amazon.com, Inc., Netgear, Inc., and Roku, Inc. See IPR2018–01737, Paper 1.

B. REAL PARTIES IN INTEREST

The Petition named only Intel Corporation as the real party in interest. Pet. 1–2. Later, in Updated Mandatory Notices, Intel identified its customers Lenovo Holding Co., Inc. and Lenovo (United States), Inc. as real parties in interest “[o]ut of an abundance of caution, . . . without conceding that they would be determined to be real parties[]in[]interest under the governing legal standard.” Paper 8, 1. Intel also notes that “accused products sold by . . . LG Electronics, Inc. and LG Electronics USA, Inc. might have included integrated circuit products from Intel,” but Hera settled with these entities before Intel filed the Petition. *Id.* Hera does not contest the accuracy or timeliness of Intel’s identification of the real parties in interest.

In addition to itself, Hera identifies Sisvel UK Limited as a real party in interest, because it is the exclusive licensing agent for the ’389 patent. Paper 15, 1.

C. THE ’389 PATENT (EX. 1001)

The ’389 patent relates to a communication method involving “a radio base station” and “a radio terminal.” Ex. 1001, 1:21–22. When the terminal connects to the base station, the base station sends the terminal a signal “indicating a reception operation.” Ex. 1001, 1:21–27. The reception operation is adapted to a transmission operation from the base station to the terminal. *Id.* at code (57), 1:25–26. Based on the base station’s signal, the terminal “selects and performs the optimum reception operation.” *Id.* at code (57).

According to the ’389 patent, prior art mobile communication systems, such as the Personal Handyphone System, used a Path Division

Multiple Access (“PDMA”) scheme. Ex. 1001, 1:36–39. Such schemes were “well known in the art and described in detail.” *Id.* at 1:52–53. In PDMA, a base station connects with several terminals using “spatial multiplexing.” *Id.* at 1:39–42. In other words, for each time slot and frequency, the PDMA scheme divides the signal spatially, to create different paths through the space between the base station and the terminals, to use the transmission bandwidth efficiently. *See id.* at 1:42–44.

PDMA schemes use an adaptive antenna array to allow the base station to transmit signals directionally to each terminal. *Id.* at 1:49–51. A terminal may communicate with a base station’s adaptive array by using selective diversity reception. Ex. 1001, 1:64–66. This involves selecting, from the terminal’s antennas, “one antenna with [a] higher reception level as a reception antenna.” *Id.* at 1:64–2:1. One problem with a terminal using diversity reception to receive a transmission from an adaptive array or spatial multiplexing base station is that interference waves may degrade its reception performance. *Id.* at 4:3–8. This reduces the minimum distance between base stations that can share the same frequency. *Id.* at 4:8–11.

The ’389 patent aims to overcome this problem by causing the terminal to perform a reception operation that is adapted to the base station’s transmission operation. Ex. 1001, 4:22–34. Specifically, the base station sends a signal instructing the terminal to receive a frame in a prescribed manner. When the terminal receives this signal, it adapts its reception operation to the base station’s transmission operation, to receive the frame in an optimal way. *Id.* at 15:64–16:3.

In one embodiment, an adaptive array base station sends a signal to a terminal telling the terminal to stop diversity operation. *Id.* at 15:21–40. In

response, the terminal stops diversity reception and instead selects the single antenna that transmitted the last uplink signal as the antenna that will receive the immediately following frame of the base station's downlink signal. *Id.*

This is illustrated by Figure 1 of the '389 patent, reproduced below:

F I G. 1

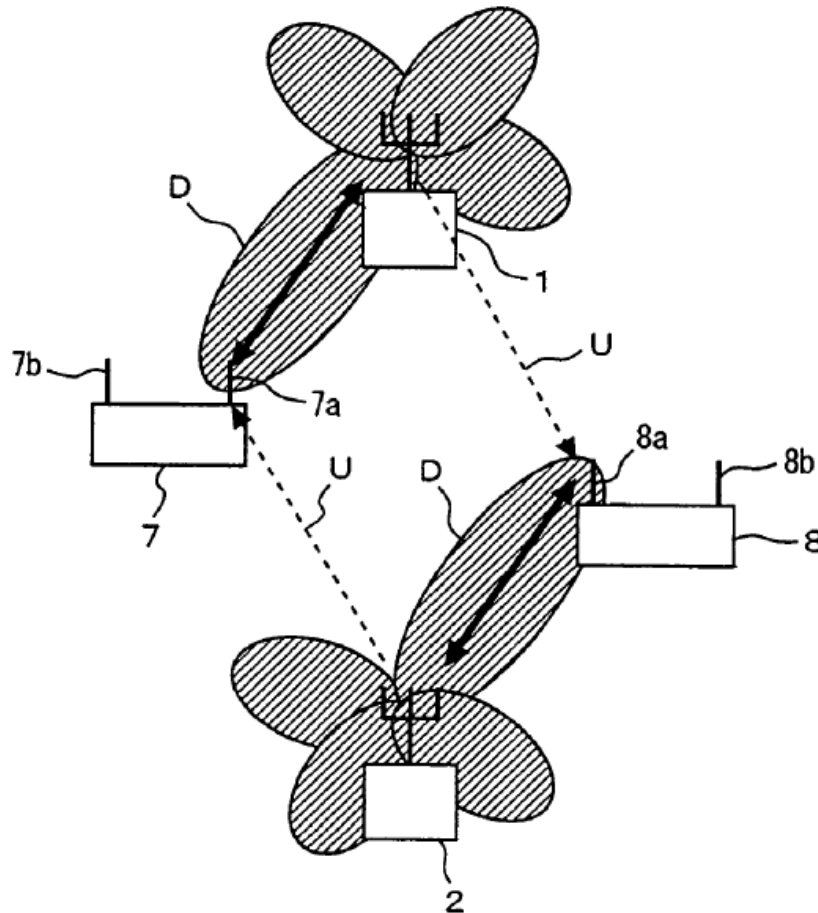


Figure 1 depicts adaptive array base stations 1 and 2, as well as terminals 7 (with antennas 7a and 7b) and 8 (with antennas 8a and 8b), which normally use their two antennas to perform diversity reception. Ex. 1001, 15:3–10. When base stations 1 and 2 each send a signal indicating that diversity reception should stop, terminals 7 and 8 cease performing diversity reception. *Id.* at 15:3–15. Then terminal 7 shifts from diversity reception

using both antennas 7a and 7b to using only antenna 7a. *Id.* at 15:33–40. As a result, base station 1 directs the beam of its signal wave D to antenna 7a, as indicated in Figure 1 by a bold arrow. *Id.* at 15:41–42. This shift to a single antenna minimizes the effect of interference wave U from base station 2. *Id.* at 15:42–44. Terminal 8, likewise, selects antenna 8a to receive communications from base station 2. *See id.* at 15:51–53.

The '389 patent describes an alternative embodiment in which terminals 7 and 8 switch from diversity reception to using their two antennas for “adaptive array reception.” *Id.* at 15:54–58, 15:64–16:3. According to the '389 patent, adaptive array reception was a “well known technique, and the terminal that selectively performs the diversity reception and the adaptive array reception can easily be realized with software using a plurality of antennas and a digital signal processor.” *Id.* at 15:60–63.

Figure 10 of the '389 patent, reproduced below, shows further detail with respect to the embodiment of switching from diversity reception to single-antenna reception:

FIG. 10

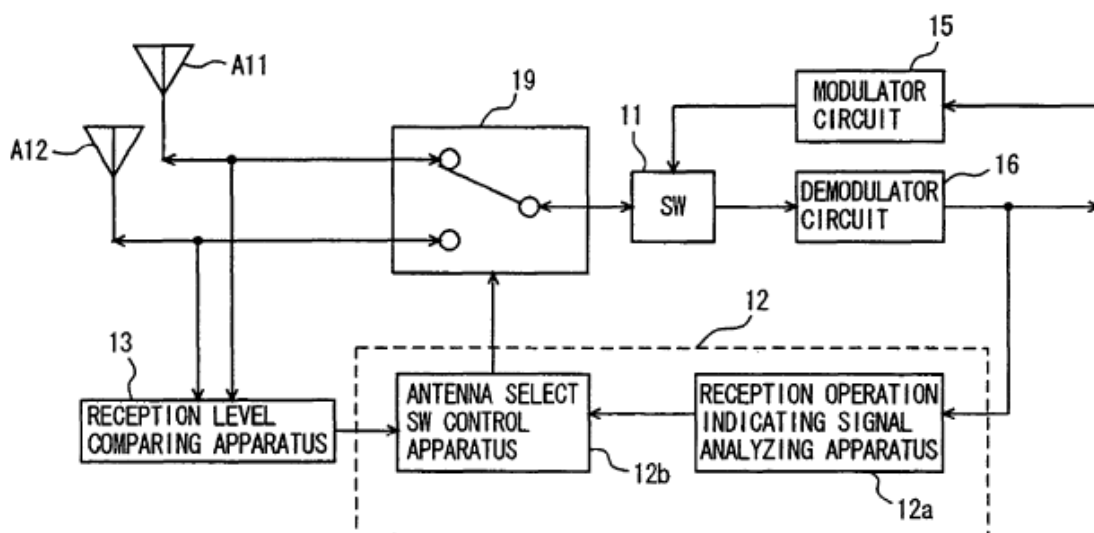


Figure 10 is a functional block diagram of a terminal that is performing diversity reception using two antennas A11 and A12. Ex. 1001, 18:65–67. Switch 19 connects the two antennas to signal-alternating circuit 11. *Id.* at 18:67–19:2. Level comparing apparatus 13 compares the outputs of antennas A11 and A12 and sends its output to switch controlling apparatus 12b, which controls switch 19. *Id.* at 19:6–7, 15–20, 31–36. After receiving a signal indicating that adaptive array processing is unavailable, the apparatus in Figure 10 can “perform[] the reception operation in which the antenna that was used in the immediately preceding transmission is fixed as the reception antenna.” *Id.* at 21:44–47.

D. CHALLENGED CLAIMS AND ASSERTED GROUND OF
UNPATENTABILITY

We summarize Intel’s grounds for the *inter partes* review in the following table:

Claims Challenged	35 U.S.C. §§	Reference(s)
1–3	102, 103 ³	Park ⁴
1–3	102	Ishida ⁵
1–3	102, 103	Uhlik ⁶
1–3	103	PHSv2 ⁷ , Uhlik

³ Because the filing date of the ’438 patent is before March 16, 2013, we apply the versions of 35 U.S.C. §§ 102 and 103 that existed prior to the Leahy–Smith America Invents Act. *See* Pub. L. No. 112-29, § 3(n)(1), 125 Stat. 284, 293 (2011).

⁴ Park et al., WO 99/59263, published Nov. 18, 1999 (Ex. 1003) (“Park”).

⁵ Ishida, US 2001/0014588 A1, published Aug. 16, 2001 (Ex. 1005) (“Ishida”).

⁶ Uhlik et al., US 7,158,493 B1, issued Jan. 2, 2007 (Ex. 1004) (“Uhlik”).

⁷ Personal Handy Phone System, ARIB Standard, Version 2, RCR STD-28 (Dec. 26, 1995) (Ex. 1007 (“PHSv2”).

Pet. 4. Intel raises four grounds of unpatentability with respect to claims 1–3 of the '389 patent: (1) that Park anticipates or renders the claims obvious under 35 U.S.C. §§ 102 or 103(a); (2) that Ishida anticipates the claims under § 102; (3) that Uhlik anticipates or renders the claims obvious under §§ 102 or 103(a); and (4) that the claims are obvious over PHSv2 in view of Uhlik. *See* Pet. 4, 27–76.

Independent claim 1 is as follows:

1. A communication method comprising:
receiving a connection request from a radio terminal
apparatus; and
transmitting a multiple-field frame to the radio terminal
apparatus which has sent the connection request, wherein
(1) a single bit indicating a reception operation adapted to
a transmission operation of a radio base station apparatus
and (2) data are respectively contained in mutually
different fields of the multiple-field frame.

Ex. 1001, 26:27–35. Claim 2 depends from claim 1 and further recites,
wherein the single bit has a first value specifying a first
reception operation or a second value specifying a second
reception operation, the single bit instructing the radio terminal
apparatus to accept the multiple-field frame only in a prescribed
manner determined by the first or second value and adapted to a
corresponding transmission operation of the radio base station
apparatus.

Ex. 1001, 26:36–43. Claim 3 likewise depends from claim 1, and further
requires that both the receiving and transmitting steps use a “plurality of
antennas.” *Id.* at 26:44–48.

Intel relies on the declarations of Stephen B. Wicker, Ph.D, Ex. 1002,
and Karen Anderson, Ex. 1006 (providing testimony to authenticate
Ex. 1007). Hera does not contest Dr. Wicker’s qualification to provide expert
testimony on the subject matter of his declaration. In its Preliminary

Response, Hera relied on the declaration of Jacob Sharony, Ph.D. Ex. 2001; *see also* Ex. 2002 (Dr. Sharony's curriculum vitae). However, Hera did not submit a patent owner response and did not otherwise rely on Dr. Sharony's testimony during the trial stage of this proceeding, including in its Motion to Amend. No cross-examination testimony of any of the declarants appears on the record.

III. GROUNDS OF THE PETITION

Intel challenges claims 1–3 on four separate grounds, three of which assert anticipation under 35 U.S.C. § 102, and three of which assert obviousness under § 103. *See* Pet. 4. To establish anticipation under § 102, a petitioner must identify each and every element in a claim, arranged as recited in the claim, in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). The reference may disclose the limitations “either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). An anticipating prior art reference must also be enabling, and must describe the claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. *See Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1346 (Fed. Cir. 2000); *In re Paulsen*, 30 F.3d 1475, 1479 (Fed. Cir. 1994).

A claim is unpatentable under § 103 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). We typically consider “whether there was an apparent reason to combine the known

elements in the fashion claimed by the patent at issue.” *Id.* at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). A sufficient ground for obviousness in a petition must “articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (citing *KSR*, 550 U.S. at 418); *see also* 35 U.S.C. § 322(a)(3) (2018); 37 C.F.R. §§ 42.22(a)(2), 42.104(b)(4) (2019).

The obviousness inquiry is based on underlying factual considerations, 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) any objective indicia of obviousness or non-obviousness (i.e., secondary considerations) that may be in evidence.⁸ *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Based on the evidence Intel has submitted regarding anticipation and obviousness, we determine that claims 1–3 are unpatentable on each of the four grounds of the Petition, for the reasons discussed below.

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the pertinent art at the time of the invention is one of the factual considerations relevant to obviousness. *See Graham*, 383 U.S. at 17. It is also pertinent to evaluating prior art in the context of anticipation, *see Paulsen*, 30 F.3d at 1480 (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)), and to the construction of patent claims,

⁸ Because neither party has presented evidence of objective indicia of obviousness or non-obviousness, we do not address that consideration in our decision.

see Phillips v. AWH Corp., 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). To assess the level of ordinary skill, we construct a hypothetical “person of ordinary skill in the art,” from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). This legal construct “presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

For Intel, Dr. Wicker opines that a person of ordinary skill in the art “would have been a person with . . . a Master’s degree in electrical engineering, and at least 2–4 years of industry or research experience in the area of wireless communications.” Ex. 1002 ¶ 54; *accord* Pet. 12. Not having submitted a patent owner response, Hera does not contest this formulation on the trial record.⁹

We find that Dr. Wicker’s proposed level of ordinary skill is consistent with the teachings of the ’389 patent and the cited prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (holding that the prior art itself may provide evidence as to the appropriate level of ordinary skill). Therefore, we credit Dr. Wicker’s testimony, and adopt his formulation as the level of ordinary skill for the purpose of this decision.

⁹ During the pre-institution stage of this *inter partes* review, the Board considered the arguments about the level of ordinary skill that Hera made in its Preliminary Response. *See* Dec. 7–8. The panel stated that it “regard[s] any differences in the parties’ formulations as immaterial,” and adopted Intel’s proposed level of ordinary skill. *Id.*

B. CLAIM CONSTRUCTION

Intel filed the Petition before November 13, 2018. *See* Paper 1, 78–79. In deciding petitions filed before this date, the Board interprets claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent in which the claims appear. *See* 37 C.F.R. § 42.100(b) (2018)¹⁰; *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard).

Under the broadest reasonable interpretation standard, claim terms are generally given their ordinary and customary meaning, as one of ordinary skill in the art, at the time of the invention, would have understood them in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A term’s ordinary and customary meaning “is its meaning to the ordinary artisan after reading the entire patent.” *Phillips*, 415 F.3d at 1321. Nevertheless, “it is always necessary to review the specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning,” because “[t]he specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication.” *Vitronics Corp. v. Conceptiontronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996).

In the Institution Decision, the Board did not construe any claim terms, because neither Intel nor Hera identified any terms needing an

¹⁰ This rule has been amended for petitions filed on or after November 13, 2018, which does not apply in this case. *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, 51,359 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018).

explicit construction. *See* Dec. 9–10 (citing Pet. 12–14). Neither party raised the issue of claim construction at trial, either. Therefore, we need not construe claim terms explicitly for the purpose of this decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy’” (quoting *Vivid Techs., Inc. v. Am. Sci & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

C. GROUND 1: PARK UNDER §§ 102, 103

Intel argues that Park anticipates or renders obvious claims 1–3, relying on supporting testimony by Dr. Wicker. *See* Pet. 27–40; Ex. 1002 ¶¶ 152–165. Hera has not responded to Intel’s arguments. We agree with Intel that Park qualifies as prior art under 35 U.S.C. § 102(b). *See* Pet. 14. For the reasons below, we find the evidence persuasive, and we determine that claims 1–3 are unpatentable on this ground.

1. *Overview of Park*

Park describes a method of controlling diversity transmission in a “mobile communication system including a base station which transmits forward common and dedicated channel data through at least two antennas with transmission diversity.” Ex. 1003, code (57). “The base station sends a message indicating a [diversity or non-diversity] transmission mode through an antenna to a plurality of mobile stations Then, each mobile station . . . sets its reception mode to [diversity or non-diversity] according to the transmission mode.” *Id.* As the alternative to diversity mode, Park discloses selecting a single antenna for continuous reception; the selection of which antenna to use is based on a channel type. *See id.* at 13:12–15, 22–25.

Park’s Figure 8C, reproduced below, illustrates an example of such a diversity- or non-diversity-indicating message from the base station:

CCCH MESSAGE FORMAT			
MESSAGE TYPE	TSTD MODE CHANGE (OPTIONAL)	TSTD PATTERN (OPTIONAL)	OTHER INFORMATION ELEMENTS

FIG. 8C

Figure 8C is a table showing the format of a message frame that the mobile station sends to the base station. Ex. 1003, 5:24–25. The message frame contains fields, from left to right, for (1) message type, (2) TSTD¹¹ (diversity) mode change information, (3) TSTD (diversity) pattern information, and (4) other information elements. The second field indicates that “the [diversity] mode is changed to a non-[diversity] mode when the [base station] does not want to use the [diversity] mode.” *Id.* at 17:4–6. The third field “provides a [diversity] pattern in which data is switchedly transmitted through the antennas . . . by the [base station].” *Id.* at 17:6–7.

2. *Claim 1*

Intel asserts that Park discloses or suggests each element of claim 1. First, claim 1’s preamble¹² recites a “communication method.” Ex. 1001, 26:27. Intel contends that Park’s disclosure of a base station that sends a message to a plurality of mobile stations satisfies this claim element. Pet. 28 (citing Ex. 1003, code (57), 2:20–23, 5:5–7, 9:21–10:3, 16:24–17:8, Figs. 2, 8C). We find that argument persuasive, and that Park discloses the preamble.

¹¹ *TSTD* stands for “time-switched transmission diversity.” Ex. 1003, 1:9–10, 2:20–21.

¹² We do not decide whether this preamble is limiting, because the parties have not addressed that issue.

Claim 1 also recites “receiving a connection request from a radio terminal apparatus.” Ex. 1001, 26:28–29. According to Intel, Park’s base station performs this step when it receives a connection request from a mobile station. Pet. 29 (citing Ex. 1003, 1:15–16, 9:21–10:3, Fig. 2). In particular, “[mobile station] transmitter 22 sends the [base station] receiver 16 the access message on the . . . random access channel . . . as shown in FIGs. 2 and 8B.” *Id.* at 29–30 (quoting Ex. 1003, 16:4–6). Intel further states that the access message may include a “TCH [traffic channel] assignment request.” *Id.* at 30 (alteration in original) (quoting Ex. 1001, 16:18–23). Dr. Wicker testifies that the TCH assignment request “corresponds to the claimed ‘connection request’ because it requests assignment of a channel that can be received only by the mobile station that made the request.” Ex. 1002 ¶ 156; *accord* Pet. 30. These arguments persuasively establish that Park discloses “receiving a connection request from a radio terminal apparatus.”

Claim 1 additionally requires “transmitting a multiple-field frame to the radio terminal apparatus which has sent the connection request, wherein (1) a single bit indicating a reception operation adapted to a transmission operation of a radio base station apparatus and (2) data are respectively contained in mutually different fields of the multiple-field frame.” Ex. 1001, 26:30–35. According to Intel, Park’s base station performs this step when it transmits the multiple-field frame depicted in Park’s Figure 8C, reproduced above. Pet. 31–37; *see supra* part III.C.1. Intel argues that this message frame includes a single bit field indicating a diversity mode change, and a separate field for data. *Id.* at 33–37.

Intel also argues that the single bit field “indicat[es] a reception operation adapted to a transmission operation of the radio base station apparatus.” Pet. 34. According to Intel, Park’s Figure 7 shows a method in which the mobile station changes from diversity to non-diversity mode. *Id.* at 35–37 (reproducing Ex. 1003, Fig. 7 (annotated)). Because the diversity-mode-change field has only two values, “one indicating that [diversity] is on, and the other indicating [diversity] is off,” Intel argues that “[a] skilled person would immediately recognize that the [diversity] mode change is . . . represented by a single bit.” Pet. 36 (citing Ex. 1002 ¶ 162 (supporting testimony by Dr. Wicker); Ex. 1003, 17:4–6.).

By a preponderance of the evidence, we find that Park teaches each limitation identically as recited in claim 1. In particular, we agree with Dr. Wicker’s uncontested testimony that the diversity-mode-change field contains only a single bit of information—whether diversity mode is on or off—and that a skilled artisan would have understood that the field consists of a single bit. Ex. 1002 ¶ 162.

We also agree with Intel’s alternative argument that Park suggests the “single bit” limitation of claim 1. *See* Pet. 37. In particular, we find persuasive Dr. Wicker’s testimony that a person of ordinary skill in the art would have had reason to store the mode-change information as a single bit, because it is “the most efficient storage and transmission design choice.” *Id.* We find that because the mode-change field only conveys one bit of information—on or off—a person of ordinary skill in the art would have had reason, and the ability, to select a frame size of one bit to convey the single bit of diversity-mode-change information, in order to increase the efficiency

of the transmission. *See KSR*, 550 U.S. at 417 (“If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.”).

Thus, we find that Park anticipates claim 1, and that claim 1 would have been obvious to a person of ordinary skill in the art in light of Park’s disclosure.

3. *Claim 2*

Dependent claim 2 specifies that the “single bit” of claim 1 instructs the terminal “to accept the multiple-field frame only in a prescribed manner” determined by the bit’s first or second value, and that is “adapted to a corresponding transmission operation” of the base station. Ex. 1001, 26:36–43. As we discuss above, Intel has persuasively shown, and we therefore find, that Park’s diversity-mode-change signal is a single bit, or alternatively that the use of a single bit was a predictable variation of Park’s disclosure at the time of invention. *See supra* part III.C.2. Intel argues that this diversity-mode-change signal has “two possible values, each specifying a different reception operation and instructing the terminal to accept the frame only in a prescribed manner.” Pet. 38. Intel cites Dr. Wicker’s testimony that Park prescribes a manner in which the diversity-mode-change signal specifies two different reception operations: diversity-mode operation, and a non-diversity-mode operation. *Id.* at 38–39 (citing Ex. 1002 ¶ 163). We note that in particular, Park discloses single-antenna reception as a non-diversity-mode operation. *See* Ex. 1003, 13:12–15, 22–25.

Thus, we find that Park anticipates claim 2, and we determine that claim 2 would have been obvious to a person of ordinary skill in the art, in light of Park’s disclosure.

4. Claim 3

Claim 3 depends from claim 1 and adds that the receiving and transmitting steps are each performed by a “plurality of antennas.” Ex. 1001, 26:44–48. Intel points to Park’s Figure 3, reproduced below:

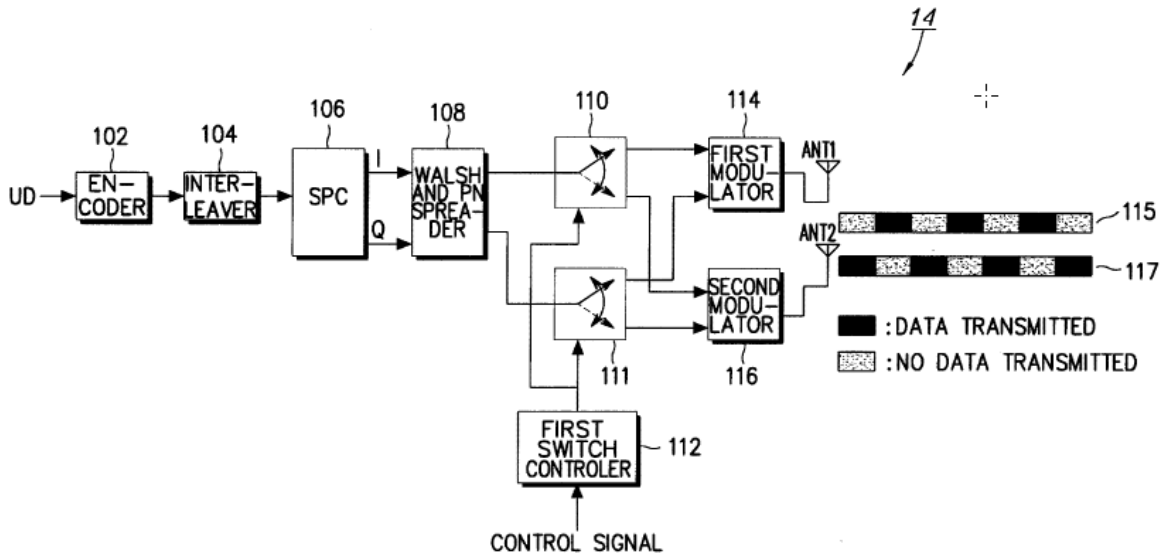


FIG. 3

Pet. 39. Figure 3 is a block diagram showing a diversity transmitter as part of a base station transmitter, “for sending a signal through two antennas.” Ex. 1003, 12:4–5. The transmitter includes switches 110 and 111, which produce a pattern through antennas ANT1 and ANT2 according to a “time switching pattern control signal.” *Id.* at 12:25–13:3. According to Park, “[t]he switching pattern control signal is generated based on a control signal received from the [base station] controller,” and “[t]he control signal is determined by the [base station] transmission mode information indicating whether the [base station] supports a [diversity] mode or not.” *Id.* at 13:5–8.

For the reasons discussed above with regard to claim 1, and because Park discloses the additional limitation of claim 3, we find that Park

anticipates claim 3, and that claim 3 would have been obvious to a person of ordinary skill in the art, in light of Park’s disclosure.

In view of all the above considerations, we conclude that Intel has shown, by a preponderance of the evidence, that claims 1–3 are unpatentable under the first ground of Intel’s Petition.

D. GROUND 2: ISHIDA UNDER § 102

Intel argues that Ishida anticipates claims 1–3, relying on supporting testimony by Dr. Wicker. *See* Pet. 40–52; Ex. 1002 ¶¶ 166–181. Hera has not responded to Intel’s arguments. We agree with Intel that Ishida qualifies as prior art under 35 U.S.C. § 102(e). *See* Pet. 16 (citing Ex. 1009, 90 (conceding, during prosecution of a parent application with the same priority dates, that Ishida is § 102(e) prior art)). Hera presents no evidence to antedate Ishida’s U.S. filing date of February 13, 2001. *See* Ex. 1005, code (22).

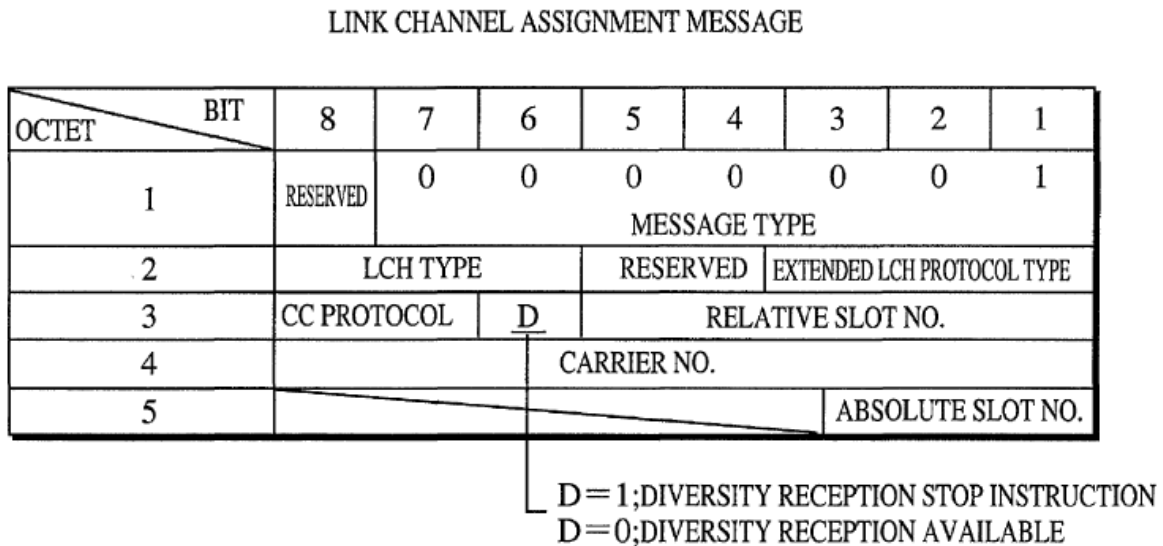
For the reasons provided below, we find Intel’s evidence persuasive, and we find that claims 1–3 are unpatentable on this ground.

1. *Overview of Ishida*

Ishida discloses a base station. Ex. 1005, code (57). When a mobile station sends the base station a request for traffic channel assignment information, the base station responds to the mobile station with a diversity reception stop instruction. *Id.* The mobile station’s message to the base station is called a “link channel establishment request,” while the base station’s responding message to the mobile station is called a “link channel assignment request.” *See id.* ¶ 44.

Ishida's Figure 5, reproduced below, shows an example link channel assignment request:

FIG.5



Ex. 1005 ¶¶ 31, 68. Figure 5 shows the format of a five-octet-long link channel (Lch) assignment message, which a base station sends to a terminal. *Id.* ¶ 68. The sixth bit of the third octet is called the “D flag.” *Id.* When D is 1, “the D flag indicates a diversity reception stop instruction against the mobile station,” and when D is 0, the flag “indicates that a diversity reception is possible, namely, that either a diversity reception or a reception using one antenna is possible.” *Id.*

2. Claim 1

Intel argues that Ishida discloses each limitation of claim 1. First, Intel contends that claim 1’s “communication method” (Ex. 1001, 26:27) corresponds to Ishida’s disclosure of a base station that receives a link channel establishment request from a mobile station and responds by

transmitting a link channel assignment message. Pet. 42 (citing Ex. 1005 ¶¶ 62, 64, 66; Ex. 1002 ¶ 167). We find this persuasive.

Intel argues that claim 1's requirement for "receiving a connection request from a radio terminal apparatus" (Ex. 1001, 26:28–29) corresponds to the link channel establishment request that the mobile station sends to the base station. Pet. 42–43 (citing Ex. 1005 ¶¶ 62–66, 78, Figs. 4, 7; Ex. 1002 ¶ 170). The evidence supports Intel's argument, and we therefore find that Ishida meets this limitation based on Ishida's disclosure.

Claim 1 also requires "transmitting a multiple-field frame to the radio terminal apparatus which has sent the connection request, wherein (1) a single bit indicating a reception operation adapted to a transmission operation of a radio base station apparatus and (2) data are respectively contained in mutually different fields of the multiple-field frame." Ex. 1001, 26:30–35. According to Intel, this limitation corresponds to Ishida's link channel assignment message shown in Figure 5, reproduced above. Pet. 44–49. As Intel points out, this message includes a single-bit D flag that "indicates a diversity reception stop instruction" when set to 1, and "indicates that a diversity reception is possible" when set to 0. Pet. 47–48 (quoting Ex. 1005 ¶ 68) (citing Ex. 1002 ¶ 176). Relying on Dr. Wicker's testimony, Intel argues that Ishida's D flag "is a single bit indicating a reception operation adapted to a transmission operation of the base station." *Id.* (citing Ex. 1002 ¶ 176). Intel also asserts that Ishida's link channel assignment message includes data in fields separate from the D flag. *Id.* at 48–49 (citing Ex. 1005 ¶¶ 54, 68, Figs. 4, 5, 7; Ex. 1002 ¶¶ 177–178).

Intel has persuasively shown, and we therefore find, that each limitation of claim 1 may be found in a single embodiment in Ishida.

Therefore, we agree with Intel and find that Ishida anticipates claim 1. In particular, we agree with Intel that Ishida's D flag is "a single bit indicating a reception operation adapted to a transmission operation of a radio base station apparatus" (Ex. 1001, 26:32–34). The bit indicates a reception operation: for example, reception with one antenna, rather than diversity reception. *See* Ex. 1005 ¶¶ 69, 80.

3. *Claim 2*

Intel argues that Ishida's D flag satisfies the requirement of claim 2 for a single bit specifying two reception operations, that instructs the terminal to accept the multiple-field frame in a prescribed manner that is determined by a first or second value of the bit, and that is adapted to a transmission operation of the base station. Pet. 49–50 (citing Ex. 1002 ¶¶ 179–180 (Dr. Wicker's supporting testimony)).

Intel's argument is persuasive, and we therefore find that Ishida anticipates claim 2. In particular, when D=0, Ishida's D flag initially specifies diversity reception. By sending a message frame with D=1, the base station instructs the terminal to stop diversity reception and shift to a second reception operation (e.g., single-antenna reception). *See* Ex. 1005 ¶ 68. We therefore find that the D flag instructs the apparatus to accept the multiple-field frame only in a prescribed manner, based on the D flag value (e.g., using single-antenna reception when D=1, or allowing diversity reception when D=0). *See id.*; Ex. 1002 ¶¶ 179–180.

4. *Claim 3*

With respect to the limitation in claim 3 requiring the transmission "by a plurality of antennas" (Ex. 1001, 26:46), Intel points to Ishida's Figure

1, and Ishida's disclosure that the base station communicates with mobile stations "using a plurality of antennas." Pet. 51 (quoting Ex. 1005 ¶ 36). Intel's argument is persuasive, and we therefore find that Ishida anticipates claim 3.

In view of all the above considerations, Intel has shown, by a preponderance of the evidence, that claims 1–3 are unpatentable under the second ground of Intel's Petition.

E. GROUND 3: UHLIK UNDER §§ 102 OR 103

Intel argues that Uhlik anticipates or renders obvious claims 1–3, relying on supporting testimony by Dr. Wicker. *See* Pet. 52–61; Ex. 1002 ¶¶ 182–194. Hera has not responded to Intel's arguments. We agree with Intel that Uhlik qualifies as prior art under 35 U.S.C. § 102(e). *See* Pet. 18 (noting that Uhlik's filing date is before Ishida, which is conceded § 102(e) prior art). Hera presents no evidence to antedate Uhlik's U.S. filing date of Sept. 29, 2000. *See* Ex. 1004, code (22).

For the reasons provided below, we find the evidence persuasive, and we therefore determine that claims 1–3 are unpatentable on this ground.

1. *Overview of Uhlik*

Uhlik discloses a "wireless network using spatial division multiple access (SDMA) technology in combination with multiple access systems." Ex. 1004, 2:54–58. The disclosed system includes a multi-antenna base station that receives a "request burst from a user terminal" and transmits "a message burst from the base station to the user terminal from which the request was received." *Id.* at code (57). The message burst includes "a description of the channels available on the radio communications system."

Id. Uhlik describes the base station's response as a "Configuration Message burst." *Id.* at 9:58–63. An example appears in Uhlik's Figure 7:

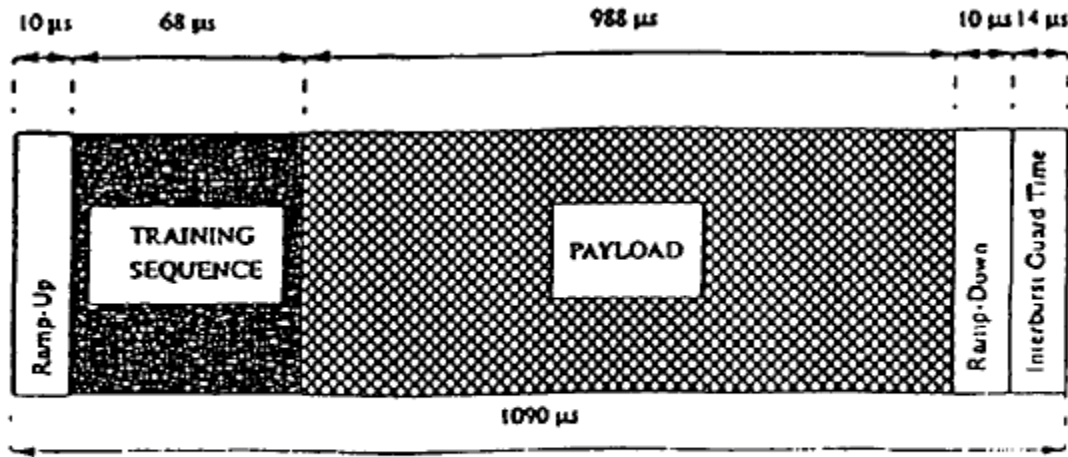


FIG. 7

Figure 7 shows the timing and content of an example Configuration Message burst. Ex. 1004, 2:35–37. Boxes represent bits for ramp-up, training, the payload, ramp-down and then an inter-burst guard time. *Id.* at 14:42–50. The payload of the Configuration Message includes fields such as a single-bit "hopping" instruction field. *Id.* at 15:3–18. A hopping bit value of 1 indicates that "the relationship between physical and logical carriers hops each frame." *Id.* at 15:39–40.

2. Claim 1

Intel asserts that Uhlik discloses or teaches each element of claim 1. In its preamble, claim recites a "communication method." Ex. 1001, 26:27. Intel contends that Uhlik discloses base stations that communicate with remote terminals over a wireless network, and, therefore, meets this claim limitation. Pet. 52 (citing Ex. 1004, 2:47–62, 5:64–6:1, Fig. 1; Ex. 1002

¶ 183). We find this persuasive and therefore agree that Uhlik discloses the preamble.

Regarding the recitation in claim 1 of “receiving a connection request from a radio terminal apparatus” (Ex. 1001, 26:28–29), Intel asserts that Uhlik’s disclosure that the base station receives a “Configuration Request” from a remote terminal satisfies this claim limitation. Pet. 53–54 (citing Ex. 1004, 1:61–65, 2:38–40, 9:58–63, 10:44–47, Fig. 8; Ex. 1002 ¶ 185). We agree.

Regarding Claim 1’s recitation of “transmitting a multiple-field frame to the radio terminal apparatus which has sent the connection request, wherein (1) a single bit indicating a reception operation adapted to a transmission operation of a radio base station apparatus and (2) data are respectively contained in mutually different fields of the multiple-field frame” (Ex. 1001, 26:30–35), Intel argues that this corresponds to Uhlik’s Configuration message, which the base station sends in response to the Configuration Request. Pet. 55 (citing Ex. 1004, 2:28–40, 9:58–63, 10:50–54, Fig. 8; Ex. 1002 ¶ 187).

Intel argues that the Configuration Message includes a single hopping bit indicating a reception operation adapted to a transmission operation, and data in a separate field. *Id.* 58–59 (citing 1004, 11:58–63, 14:62–15:18, 15:39–40; Ex. 1002 ¶¶ 190–192). Intel notes that, according to Uhlik, “if the ‘hopping’ bit . . . is ‘equal to 1, the relationship between physical and logical carriers hops each frame.’” Pet. 58 (citing Ex. 1004, 15:39–40; Ex. 1002 ¶ 190). Intel states that when the hopping bit is set, the base station also transmits the “parameters of the frequency hopping scheme” to the receiving terminal as part of the Configuration Message burst. *Id.* (quoting Ex. 1004,

11:58–63). The receiving terminal needs those parameters so that it can “be tuned to the correct carrier frequency to properly receive transmissions from the base station transmitter.” *Id.* (citing Ex. 1002 ¶¶ 190–191 (Dr. Wicker’s supporting testimony)).

We find persuasive Dr. Wicker’s un rebutted testimony that “setting the hopping bit to one signaled to the terminal that the forthcoming communications would be subject to frequency hopping.” Ex. 1002 ¶ 190. Thus, we find that the evidence of record shows that the hopping bit “indicat[es] a reception operation adapted to a transmission operation of a radio base station” (Ex. 1001, 26:32–34), which in this case is the reception of a hopping transmission. Thus, we find that Ishida anticipates claim 1, and we conclude that claim 1 would have been obvious in view of Ishida.

3. *Claim 2*

Intel argues that Uhlik’s hopping bit satisfies claim 2’s requirement for a single bit specifying two reception operations, that instructs the terminal to accept the multiple-field frame in a prescribed manner that is determined by a first or second value of the bit, and that is adapted to a transmission operation of the base station. Pet. 59–60 (citing Ex. 1002 ¶ 193 (Dr. Wicker’s supporting testimony)).

Intel’s argument is persuasive. As Intel explains, if the hopping bit is set, “the relationship between physical and logical carriers hops each frame,” whereas if the bit is not set, “the relationship between physical and logical carriers remains static.” *Id.* at 60 (quoting Ex. 1004, 15:39–40). We agree with Dr. Wicker that the hopping bit defines two operations: “frequency hopping or no frequency hopping.” Ex. 1002 ¶ 193. We also agree with Intel

that “a terminal must only accept each frame in the manner prescribed by the ‘hopping’ bit.” *Id.* (citing Ex. 1002 ¶ 193).

Thus, we find that Uhlik anticipates claim 2, and we determine that claim 2 would have been obvious to a person of ordinary skill in the art, in light of Uhlik’s disclosure.

4. *Claim 3*

Figure 1 of Uhlik depicts a base station having multiple antennas. *See* Ex. 1004, 3:2–7, 3:26–31, Fig. 1. Intel argues that this satisfies requirement in claim 3 that the receiving and transmitting steps be performed using a plurality of antennas. Pet. 60–61. We find this argument persuasive. Thus, we find that Uhlik anticipates claim 3, and we conclude that claim 3 would have been obvious in view of Uhlik.

In view of all the above considerations, we determine that Intel has shown, by a preponderance of the evidence, that claims 1–3 are unpatentable under the third ground of Intel’s Petition.

F. GROUND 4: PHSv2 AND UHLIK UNDER § 103

Intel argues that claims 1–3 are obvious over PHSv2 in view of Uhlik, relying on supporting opinion testimony by Dr. Wicker. *See* Pet. 61–76; Ex. 1002 ¶¶ 195–209. Hera has not responded to Intel’s arguments. We agree with Intel that PHSv2 qualifies as prior art under 35 U.S.C. § 102(b). *See* Pet. 20. For the reasons provided below, we find Intel’s evidence persuasive, and we therefore conclude that claims 1–3 are unpatentable on this ground.

1. *Overview of PHSv2*

PHSv2 is a wireless communication standard that discloses a system for communication between personal stations (i.e., terminals) and cell stations (i.e., base stations). Ex. 1007, 1, 5.¹³ PHSv2 describes in detail the frame formats and functions of the data communicated between personal and cell stations. *Id.* at 71, 127. The frame formats include signals that instruct terminals how to communicate with base stations. *Id.*

For example, after the terminal sends a “link channel establishment request” from the terminal, the base station uses a “link channel assignment message” to set up the call. Ex. 1007, 127; *see also id.* at 24, Fig. 2.4 (showing the signal structure between a terminal and a base station).

PHSv2’s Table 4.3.11, reproduced below, shows the structure of a link channel assignment message:

¹³ We use the original page numbers of the reference, rather than Intel’s exhibit page numbers.

Table 4.3.11 Link channel assignment message

Message type : Link channel assignment
Direction : CS → PS (downlink)
Function channel : SCCH

Octet \ Bit	8	7	6	5	4	3	2	1
1	Re-served	0	0	0	0	0	0	1
2	LCH type			Reserved		Extension LCH protocol type		
3	CC protocol type		Re-served	Relative slot number				
4	Carrier number n_i							
5							Absolute slot number	

Ex. 1007, 127. Figure 4.3.11 shows fields that are part of the link channel assignment message, including message type, LCH type, extension LCH protocol type, CC protocol type, relative slot number, carrier number, and absolute slot number. *See id.*, 127–130; Ex. 1002 ¶¶ 200–202 (Dr. Wicker’s explanation of the table). The figure also indicates that some of the bits are “reserved.” *See* Ex. 1002 ¶ 202.

2. Claim 1

Intel argues that PHSv2 discloses all the limitations of claim 1, except for the single bit indicating a reception operation adapted to a transmission operation of the base station. Pet. 61. Intel argues that Uhlik teaches this limitation, and that it would have been obvious to use one of PHSv2’s reserved bits for that purpose according to Uhlik’s teachings. *Id.* at 62–76.

In particular, Intel argues that PHSv2 discloses a “communication method” as recited in the preamble (Ex. 1001, 26:27) through its disclosure

of a bidirectional Signaling Control Channel (“SCCH”) that “transmits information needed for call connection between the cell station [i.e., base station] and the personal station [i.e., terminal], and it transmits independent information to each cell.” Pet. 67 (quoting Ex. 1007, 23). We find this argument persuasive, and determine that PHSv2 meets the preamble of claim 1.

Intel also argues that PHSv2 discloses “receiving a connection request from a radio terminal apparatus” (Ex. 1001, 26:28–29) by disclosing a link channel establishment request that the terminal sends to the base station. Pet. 68 (citing Ex. 1007, 20, 24, Fig. 2.4; Ex. 1002 ¶ 198). The evidence supports Intel’s contention.

Intel relies on the combination of PHSv2 and Uhlik for the limitation “transmitting a multiple-field frame to the radio terminal apparatus which has sent the connection request, wherein (1) a single bit indicating a reception operation adapted to a transmission operation of a radio base station apparatus and (2) data are respectively contained in mutually different fields of the multiple-field frame,” Ex. 1001, 26:30–35. *See* Pet. 68–74. According to Intel, PHSv2 discloses that, in response to a connection request, the cell station transmits a link channel assignment message as part of an SCCH multiple-field frame to a personal station. Pet. 68–69 (citing Ex. 1007, 20, 56, 85; Ex. 1002 ¶¶ 200–201). Intel contends that “the multiple field frame containing the PHSv2 link channel assignment message included numerous other fields containing data.” Pet. 73–74 (citing Ex. 1007, 56, 85; Ex. 1002 ¶ 205).

Intel asserts that a person of ordinary skill in the art would have had reason to include Uhlik’s hopping bit (discussed above in part III.E.1) as

part of PHSv2's link channel assignment message, in order to instruct the personal station regarding the appropriate reception operation. *Id.* at 71–73 (citing Ex. 1004, 10:50–54, 11:40–12:11, 14:65–15:18, Fig. 8, Table 8; Ex. 1007, 2, 22, 75; Ex. 1002 ¶¶ 203–204).

Further, we find that for the reasons Intel has presented, a person of ordinary skill in the art would have known to perform frequency hopping in PHS systems, and that adding Uhlik's frequency hopping to PHSv2 would have helped to reduce interference among users. Pet. 63–64 (citing Ex. 1007, 2, 31, 35; Ex. 1002 ¶¶ 71, 141–142; Ex. 1014 (U.S. Patent No. 6,442,146); Ex. 1015 (Int'l Patent Application Pub. No. WO 01/56204 A1)). According to Intel, “[u]sing frequency hopping to avoid interference in PHSv2 systems was merely the application of a known technique to a known objective or issue, with predictable results.” *Id.* at 64 (citing *KSR*, 550 U.S. at 416). Intel further asserts that an ordinarily skilled artisan would have used Uhlik's single-bit frequency-hopping instruction so that it could maintain backward compatibility with legacy PHS terminals lacking the frequency-hopping functionality, and that such an artisan would have used one of the reserved bits in PHSv2's link channel assignment message for this purpose. *Id.* at 65 (citing Ex. 1004, 15:5–40, Fig. 8; Ex. 1007, 85; Ex. 1002 ¶¶ 143–144). We find this evidence to be persuasive.

By a preponderance of the evidence of record, including Dr. Wicker's opinion testimony, we determine that a person of ordinary skill in the art would have had reason to combine Uhlik's teachings with PHSv2's disclosure, and that the resulting combination meets all the limitations of claim 1.

3. *Claim 2*

Intel contends that Uhlik’s hopping bit, used as one of PHSv2’s reserve bits, satisfies the claim 2 requirement for a single bit that instructs the terminal to accept the multiple-field frame in a prescribed manner that is determined by a first or second value of the bit, and that is adapted to a transmission operation of the base station. Pet. 74 (citing Ex. 1002 ¶ 206).

Intel’s argument is persuasive. We therefore find that a person of ordinary skill in the art would have had reason to use the combination of PHSv2 and Uhlik as discussed above with respect to claim 1. In addition, as we discuss above in part III.E.3, we find that when the hopping bit is set, “the relationship between physical and logical carriers hops each frame,” whereas if the bit is not set, “the relationship between physical and logical carriers remains static.” *Id.* at 60 (quoting Ex. 1004, 15:39–40). The hopping bit therefore instructs the terminal to accept the multiple-field frame in a prescribed manner that is determined by a first and second value of the bit. Based on the evidence of record, we determine that claim 2 would have been obvious in view of the combination of Uhlik and PHSv2.

4. *Claim 3*

Intel identifies Uhlik’s disclosure of a base station with multiple antennas as satisfying claim 3’s requirement that the base station perform both the receiving and transmitting steps using a plurality of antennas. Pet. 75–76. Intel further argues that “[b]y August 2001, the earliest possible priority date for the ’389 patent, it was well-known in the art that a base station conforming to PHSv2 could communicate with terminals using a plurality of antennas in a multi-antenna array.” *Id.* at 75.

Intel's argument is persuasive. We also credit Dr. Wicker's testimony that in combining PHSv2 and Uhlik, the use of multiple antennas would have "allowed for spatial multiplexing, which was known in the prior art to increase transmission rates by allowing the transmission of parallel data streams using the same frequency." Ex. 1002 ¶ 209 (citing Ex. 1004, 3:2–7, 3:26–31; Ex. 1005 ¶ 5). We therefore find that the combination of Uhlik and PHSv2 meets the limitations of claim 3, and we conclude that the combination would have been obvious to a person of ordinary skill in the art.

For the reasons discussed above, Intel has shown, by a preponderance of the evidence, that claims 1–3 are unpatentable under the fourth ground of Intel's Petition.

G. CONCLUSION

In summary, Intel has articulated specific and persuasive reasoning, based on evidence of record, to support a finding of anticipation, and the legal conclusion of obviousness. We determine that a preponderance of the evidence shows that Park, Ishida, and Uhlik anticipate claims 1–3. We also determine that a preponderance of the evidence shows that a person of ordinary skill in the art in the relevant timeframe would have had reason to apply the teachings in either (1) Park alone, (2) Uhlik alone, or (3) a combination of PHSv2 and Uhlik, with a reasonable expectation of success. Accordingly, claims 1–3 would have been obvious based on each of these grounds. Therefore, we determine that claims 1–3 of the '389 patent are unpatentable.

IV. HERA'S MOTION TO AMEND

Because we determine that all of the challenged claims are unpatentable, we consider Hera's Motion to Amend. *See* Mot. Amend 1 (asserting that the Motion is "contingent upon a finding of unpatentability with respect to the original challenged claims"). Hera's Motion proposes claim 4 as a substitute for challenged claim 1, claim 5 as a substitute for challenged claim 2, and claim 6 as a substitute for challenged claim 3. *See id.* We reproduce the proposed substitute claims below:

4. A communication method comprising:
receiving a connection request from a radio terminal apparatus; and
transmitting a multiple-field frame to the radio terminal apparatus which has sent the connection request,
wherein (1) a single bit indicating a reception operation adapted to a transmission operation of a radio base station apparatus and (2) data are respectively contained in mutually different fields of the multiple-field frame,
wherein the transmission operation is a transmission to the radio terminal apparatus with directivity.
5. A communication method according to claim 1,
wherein the single bit has a first value specifying a first reception operation or a second value specifying a second reception operation, the single bit instructing the radio terminal apparatus to accept the multiple-field frame only in a prescribed manner determined by the first or second value and adapted to a corresponding transmission operation of the radio base station apparatus,
wherein the transmission operation includes transmitting a signal indicating an adaptive array reception operation to the radio terminal apparatus.
6. A communication method according to claim 1,
wherein the receiving step includes receiving the connection request by a plurality of antennas, and the transmitting step

includes transmitting the multiple-field frame by the plurality of antennas,

wherein the radio terminal apparatus is caused to perform the adaptive array reception operation to improve the reception of the radio terminal apparatus.

Mot. Amend, App'x (reference numbers removed, claim numbers added, and additions to the original claims underlined).

In an *inter partes* review, a patent owner does not have a right to amend patent claims, but must propose amendments as a part of a motion to amend. 35 U.S.C. § 316(d). The Board must assess the patentability of proposed substitute claims “without placing the burden of persuasion on the patent owner.” *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017) (en banc); see *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 3–4 (PTAB Feb. 25, 2019) (precedential). After *Aqua Products*, the Federal Circuit also issued *Bosch Automotive Service Solutions, LLC v. Matal*, 878 F.3d 1027 (Fed. Cir. 2017), *amended by* Order on Petition for Panel Rehearing, *Bosch Automotive Service Solutions, LLC v. Iancu*, No. 2015-1928 (Fed. Cir. Mar. 15, 2018).

According to *Aqua Products*, *Bosch*, and *Lectrosonics*, a patent owner does not bear the burden of persuasion to show that the proposed substitute claims are patentable. Rather, ordinarily, “the petitioner bears the burden of proving that the proposed amended claims are unpatentable by a preponderance of the evidence.” *Bosch*, 878 F.3d at 1040 (as amended on rehearing); *Lectrosonics*, Paper 15 at 3–4. To determine whether a petitioner has proven the substitute claims are unpatentable, the Board focuses on “arguments and theories raised by the petitioner in its petition or opposition to the motion to amend.” *Nike, Inc. v. Adidas AG*, 955 F.3d 45, 51 (Fed. Cir. 2020). The Board itself also may justify any finding of unpatentability by

referring to evidence of record in the proceeding. *Lectrosonics*, Paper 15 at 4 (citing *Aqua Products*, 872 F.3d at 1311 (O’Malley, J.)).

Notwithstanding the foregoing, a patent owner’s proposed substitute claims must meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. *Lectrosonics*, Paper 15 at 4–8. Accordingly, Hera must demonstrate the following: (1) the amendment proposes a reasonable number of substitute claims; (2) the original disclosure (and any earlier priority document) supports the proposed claims; (3) the amendment responds to a ground of unpatentability involved in the trial; and (4) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter. *See* 35 U.S.C. § 316(d); 37 C.F.R. § 42.121.

Hera contends the proposed amendments do not enlarge the scope of the claims, and that they are responsive to at least one ground of unpatentability involved in the trial. Mot. Amend 3, 5–6. We agree with these contentions, which Intel does not dispute. *See generally* Opp. Amend. Because Hera proposes only one substitute claim for each original claim, we also determine that Hera has proposed a “reasonable number of substitute claims” under 35 U.S.C. § 316(d)(1)(B). *See* 37 C.F.R. § 42.121(a)(3) (“The presumption is that only one substitute claim would be needed to replace each challenged claim.”).

We summarize Intel’s grounds for Intel’s Opposition to Hera’s Motion to Amend in the following table:

Claims Challenged	35 U.S.C. §§	Reference(s)
4	102	Ishida
4	102, 103	Uhlik
5, 6	103	Uhlik, Sebastian ¹⁴

Relying on Dr. Wicker’s second declaration (Ex. 1022),¹⁵ Intel contends that proposed substitute claim 4 is unpatentable because Ishida anticipates the claim under 35 U.S.C. § 102, that claim 4 is also unpatentable under §§ 102 and 103 for anticipation or obviousness over Uhlik, and that claims 5 and 6 are unpatentable under § 103 as obvious over Uhlik in view of Sebastian. Opp. Amend 10–23. Intel also argues that we should deny Hera’s Motion to Amend because Hera has not shown sufficient support in the original disclosure. *Id.* at 2–10. We address each of these issues in turn.

A. ISHIDA UNDER § 102 (PROPOSED CLAIM 4)

Intel argues that Ishida anticipates proposed substitute claim 4. *See* Opp. Amend 11–12. Because proposed claim 4 is identical to claim 1 except for an additional limitation, Intel relies partly on its analysis challenging claim 1 based on anticipation by Ishida. *See id.* at 11; Ex. 1022 ¶¶ 32–35. Because we address these anticipation arguments above, we do not discuss them further in the context of the Motion to Amend. *See supra* part III.D.2 (finding Intel’s argument persuasive that Ishida anticipates claim 1).

¹⁴ Sebastian et al., US 6,757,265 B1, issued June 29, 2004 (Ex. 1023, “Sebastian”).

¹⁵ Hera did not reply to Intel’s Opposition to the Motion to Amend, and did not submit declaratory testimony to rebut Dr. Wicker’s testimony.

Claim 4’s additional limitation is “wherein the transmission operation is a transmission to the radio terminal apparatus with directivity.”

Mot. Amend 8. Intel argues that Ishida teaches “a base station that transmits using an adaptive array technique to form a ‘directional’ transmission to a terminal.” Opp. Amend. 11 (citing Ex. 1005 ¶¶ 6–7, 13, 36, 41). Citing Dr. Wicker, Intel argues that this “is a transmission ‘with directivity’” as claim 4 requires. *Id.* (citing Ex. 1022 ¶¶ 37–39).

We find Intel’s argument persuasive. In particular, we credit Dr. Wicker’s un rebutted testimony that both Ishida and the ’389 patent disclose a similar PDMA scheme, using an antenna array to form transmissions with a directional pattern, and that in both cases, this directional pattern is a transmission “with directivity” as claim 4 recites. *See* Ex. 1022 ¶¶ 37–38 (citing Ex. 1001, 1:36–51; Ex. 1005 ¶¶ 6–7, 41). Thus, we find that Intel has shown by a preponderance of the evidence that all limitations of claim 4 are present identically in Ishida, and that Ishida anticipates proposed substitute claim 4.

B. UHLIK UNDER §§ 102 OR 103 (PROPOSED CLAIM 4)

Intel argues that Uhlik either anticipates or renders obvious proposed substitute claim 4. *See* Opp. Amend 13–15. Because proposed claim 4 is identical to claim 1 except for an additional limitation, Intel relies partly on its analysis with respect to claim 1 in its Petition. *See id.* at 13; Ex. 1022 ¶¶ 40–43. We address the arguments for claim 1 above. *See supra* part III.E.2 (finding Intel’s argument persuasive that Uhlik anticipates and renders obvious claim 1).

Regarding claim 4's additional limitation, "wherein the transmission operation is a transmission to the radio terminal apparatus with directivity" (Mot. Amend 8), Intel argues that Uhlik discloses "a base station that transmits using a 'spatial division multiple access' (SDMA) technique by sending 'spatially directed beam[s]' to different terminals." Opp. Amend 13 (alteration in original) (citing Ex. 1004, 3:16–25, Fig. 2).

Below is a reproduction of Figure 2 of Uhlik:

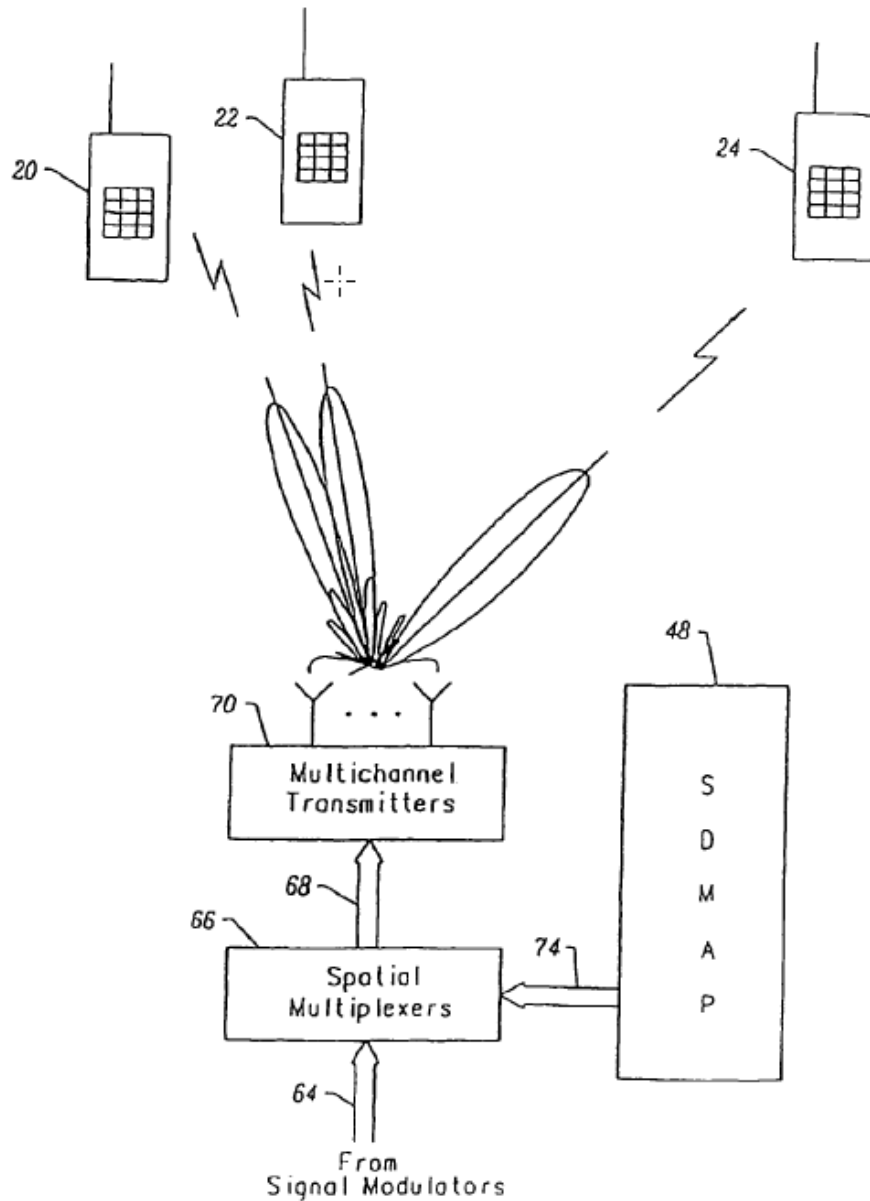


FIG. 2

Uhlik's Figure 2 "illustrat[es] transmission patterns of a multi-channel spatial diversity transmitter." Ex. 1004, 2:21–22. Multichannel transmitters 70 use an antenna array that forms beams directed at user terminal handsets 20, 22, and 24. *See id.* at 2:47–3:25. Uhlik notes that the prior art describes "[s]uitable technologies for achieving such a *spatially directed beam*." *Id.* at

3:21–23 (emphasis added) (citing Ottersten et al., US 5,828,658, issued Oct. 27, 1998; Roy, III et al., US 5,642,353, issued June 24, 1997).

Citing Dr. Wicker, Intel argues that these spatially directed beams constitute a transmission operation “with directivity” according to claim 4, and that this “beamforming” technique is used in conjunction with frequency hopping. Opp. Amend 14 (citing Ex. 1022 ¶¶ 44–45). We agree. As Dr. Wicker persuasively explains, “[w]hile sending signals using beamforming (i.e., SDMA¹⁶), Uhlik disclosed that the base station transmits using either frequency hopping or a fixed frequency.” Ex. 1022 ¶ 45. Thus, in Uhlik, during either reception operation by the terminal (frequency hopping or fixed frequency), the base station’s transmission to the terminal is “with directivity.”

Thus, we find that Intel has shown by a preponderance of the evidence that Uhlik anticipates proposed substitute claim 4, and we further determine that claim 4 would have been obvious to a person of ordinary skill in the art over Uhlik.

C. UHLIK AND SEBASTIAN UNDER § 103 (PROPOSED CLAIMS 5, 6)

1. *Overview of Sebastian*

We agree with Intel that Sebastian is prior art to the ’389 patent under 35 U.S.C. § 102(e). Opp. Amend 16. Sebastian claims priority to a U.S. application filed on April 7, 2000,¹⁷ which is before August 6, 2001, the

¹⁶ According to Dr. Wicker, SDMA and PDMA (described in the ’389 patent), are equivalent terms for a type of beamforming technology. *See* Ex. 1022 ¶ 48.

¹⁷ Sebastian also claims priority, as a continuation-in-part, to an earlier U.S. application filed July 30, 1999. *See* Ex. 1023, code (60).

filing date of the Japanese application to which the '389 patent claims earliest priority. *Compare* Ex. 1023, code (60), *with* Ex. 1001, code (30). Sebastian issued on June 29, 2004, after the filing date of the '389 patent. Ex. 1023, code (45). Hera has not submitted evidence to antedate Sebastian's April 7, 2000 priority claim.

Sebastian describes a system for "implementing spatial multiplexing in conjunction with one or more multiple access protocols during the broadcast of information in a wireless network." Ex. 1023, code (57). These multiple access protocols include SDMA. *See id.* at 2:33–37, 4:39–46. Sebastian's spatial multiplexing technology "exploits multiple antennas at both the base station(s) and at the subscriber units to increase the bit rate in a wireless radio link." *Id.* at 4:29–32.

The base station splits a stream of symbols into independent substreams, which it sends over its antenna array using a protocol such as SDMA. *See id.* at 4:37–46. The terminal apparatus likewise includes "an array of receive antennas," which captures the multiple radio signals, and then uses "a signal processing technique . . . to separate the signals, recover the original substreams and finally merge the symbols back together." *Id.* at 4:56–59.

Sebastian's Figure 6 illustrates this process:

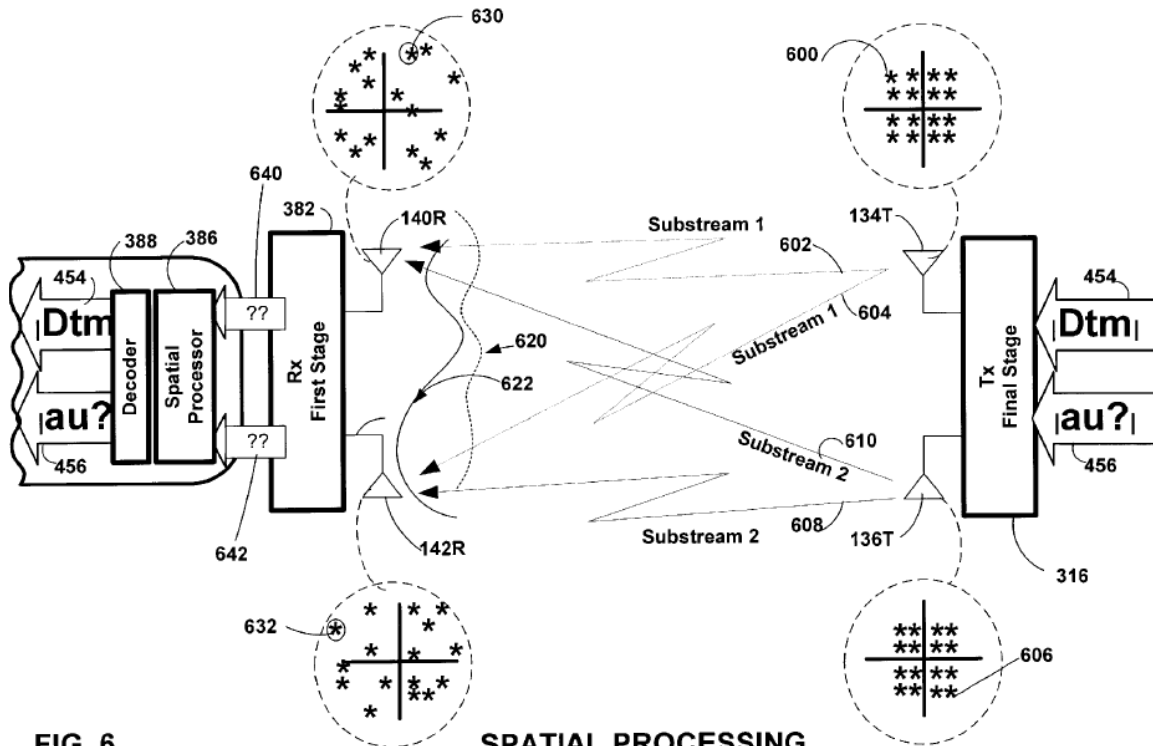


Figure 6 depicts a base station (right) and subscriber unit receiver (left). Ex. 1023, 21:43–45. The base station's transmitter has two antennas 134T and 136T, and the terminal's receiver has two antennas 140R and 142R. *Id.* at 21:43–47. The base station transmits two data substreams 454 (“Dtm” or “Substream 1”) and 456 (“au?” or “Substream 2”) over four different signals: Substream 1 includes signals 602 and 604, while Substream 2 includes signals 608 and 610. *Id.* at 22:3–13. Other signals could be present as a result of scattering off of buildings and other objects. *Id.* at 22:6–8.

Sebastian also describes a control system in which the base station can send a signal to the terminal, switching the terminal's spatial multiplexing on or off, so that the terminal may operate in either a spatial multiplexing mode, or a “traditional” mode that does not use spatial multiplexing. *See id.* at 2:6–12, 12:27–35, 33:35–39.

2. *Proposed Claim 5*

Proposed substitute claim 5 is identical to claim 2 (including its dependency from claim 1), except that it adds a limitation “wherein the transmission operation includes transmitting a signal indicating an adaptive array reception operation to the radio terminal apparatus.” Mot. Amend 9. Intel argues that claim 5 would have been obvious over a combination of Uhlik’s method with Sebastian’s adaptive array reception operation. Opp. Amend 17–21. Intel relies partly on its analysis with respect to claim 2. *See id.* at 15; Ex. 1022 ¶ 46. We address Intel’s arguments regarding claim 2 above, and do not repeat that discussion here. *See supra* part III.E.3 (finding persuasive Intel’s argument that Uhlik anticipates and renders obvious claim 2).

First, as a matter of claim construction, Intel argues that claim 5’s additional limitation “is broad enough to cover transmitting a second signal to a terminal (besides the single-bit signal) to indicate that the terminal should perform an adaptive array reception operation.” Opp. Amend 17; *see also id.* at 6 (citing Ex. 1022 ¶ 22) (making the same argument in the context of whether the proposed claim introduces new matter). We agree that the broadest reasonable interpretation of claim 5 encompasses two distinct signals. Claim 1, from which proposed claim 5 depends, includes (1) a “multiple-field frame,” which includes the single-bit signal, and (2) a “transmission operation” which is adapted to the single-bit signal in the multiple-frame field. *See* Ex. 1001, 26:30–34. According to the plain language of the proposed claim, the “signal indicating an adaptive array reception operation” is part of the transmission operation, and may be transmitted separately from the multiple-field frame.

Next, Intel argues that Sebastian discloses an adaptive array reception operation within the scope of proposed claim 5. Opp. Amend 17. According to Intel, Sebastian discloses a system with base stations that operate in two different modes: (1) “traditional,” in which there is one spatial stream between the base station and terminal, and (2) “spatially enabled,” in which each terminal receives multiple spatial streams. *Id.* (citing Ex. 1023, 5:67–6:5). This “spatially enabled” mode, which uses multiple antennas at both the base station and the terminal, is depicted in Sebastian’s Figure 6, reproduced and discussed above. *See supra* part IV.C.1.

Intel argues that, according to Sebastian, the “spatially enabled” mode increases communication speed because it allows the base station to “transmit[] multiple substreams ‘in parallel’ rather than just a single data stream.” Opp. Amend 19–20 (citing Ex. 1023 5:6–8; Ex. 1022 ¶ 55). Moreover, Intel argues that Sebastian taught using this “spatially enabled” operation in conjunction with SDMA. *See id.* at 20 (citing Ex. 1023, 4:34–46, 30:23–29). SDMA is the multiple-access technique that Uhlik already uses for its base station’s adaptive antenna array. *See id.* at 19 (citing Ex. 1004, 2:54–60; Ex. 1023, 4:39–46, 6:32–41, 30:23–31; Ex. 1022 ¶¶ 47–50). According to Intel, using Sebastian’s “spatially enabled” mode (including multiple antennas at the terminal) in Uhlik’s system would have provided the benefit of improving communication speed. *See id.* at 20.

Intel also argues that, “[a]s part of the combination, a skilled person would have implemented Sebastian’s ‘control signal’ in Uhlik’s system.” Opp. Amend 20. According to Intel, Sebastian’s base station sends a “control signal” to the terminal to indicate whether the terminal should use its “traditional” or “spatially enabled” mode. *Id.* at 18–19 (citing Ex. 1023, 2:6–

12, 12:27–35, 26:49–53, 34:1–5); *see also id.* at 21–22 (citing Ex. 1023, Fig. 13B, 4:30–65, 31:26–57; Ex. 1022 ¶ 68). This control signal “indicat[es] the mode of the transmitted signal, e.g. traditional/spatial, and in the latter case, the number of substreams to be generated from the composite signals received.” *Id.* at 19 (alteration in original) (quoting Ex. 1023, 33:35–39).

According to Intel, Sebastian teaches that there are reasons to switch between “traditional” and “spatially enabled” modes, based on factors including “QoS [quality of service], bit rate requirement[s], feasibility, etc.” *Id.* at 21 (quoting Ex. 1023, 13:4–10) (citing Ex. 1022 ¶ 54). Intel also cites Dr. Wicker as stating that “Sebastian’s control signal allows the base station to indicate use of spatial multiplexing to a terminal when conditions, such as data rate requirements and channel conditions, favor doing so.” *Id.* (citing Ex. 1022 ¶ 57). Thus, Intel argues, “A skilled person would have augmented Uhlik’s teachings by using a transmission operation such as frequency hopping to send a control signal indicating an adaptive array reception operation, as disclosed in Sebastian.” *Id.* at 19.

We find Intel’s arguments, and supporting testimony of Dr. Wicker, to be persuasive, and Hera has submitted no responding arguments or testimony. In particular, we find, for the reasons that Intel has argued, that adding Sebastian’s spatial multiplexing to Uhlik’s system, including the single-bit frequency-hopping signal, predictably would have resulted in increased speed, without adversely increasing power or overhead. *See* Ex. 1022 ¶¶ 56–57. We also find that Intel has also shown, by a preponderance of the evidence, that combining Sebastian’s teachings with those of Uhlik would have been within the ordinary level of skill in the art at the time of the claimed invention. Therefore, we conclude that proposed

substitute claim 5 is unpatentable because it would have been obvious over the combination of Uhlik and Sebastian.

3. *Proposed Claim 6*

Proposed substitute claim 6 is identical to claim 3 (including its dependency from claim 1), except that it adds a limitation “wherein the radio terminal apparatus is caused to perform the adaptive array reception operation to improve the reception of the radio terminal apparatus.”

Mot. Amend 9. Intel argues that claim 6 would have been obvious over a combination of Uhlik’s method with Sebastian’s adaptive array reception operation. Opp. Amend 21–23. Intel relies partly on its analysis with respect to claim 3. *See id.* at 15; Ex. 1022 ¶ 46. We address these arguments above. *See supra* part III.E.4 (finding persuasive Intel’s argument that Uhlik anticipates and renders obvious claim 3).

Like claim 5, proposed substitute claim 6 recites an “adaptive array reception operation.” Mot. Amend. 9. As we discuss in the previous section, Intel has persuaded us that Sebastian discloses such an operation, and that it would have been within the ordinary skill in the art to incorporate that operation into Uhlik’s SDMA method. *See supra* part IV.C.2; *see also* Opp. Amend 21–22 (citing Ex. 1023, Fig. 13B, 4:30–65, 31:26–57; Ex. 1022 ¶ 68) (reiterating the same arguments with respect to proposed claim 6).

In addition, Intel argues, and we agree, that Sebastian teaches “that the terminal’s use of spatial multiplexing adaptive array reception improves the reception of the terminal,” as proposed claim 6 requires, by improving link speed. Opp. Amend 22 (citing Ex. 1023, 4:66–5:22; Ex. 1022 ¶ 69). Thus, we agree with Intel that “a skilled person would have combined Sebastian and Uhlik [by] design[ing] the terminal to perform spatial multiplexing

reception when that operation was indicated by a base station.” *Id.* at 23 (citing Ex. 1022 ¶ 70). Intel argues that “Uhlik’s system would not have realized the benefit of increased communication speed that results from spatial multiplexing unless the terminal actually implemented that technique when instructed.” *Id.* (citing Ex. 1022 ¶ 70).

We find Intel’s arguments persuasive by a preponderance of the evidence. For these reasons, and the reasons discussed above with respect to proposed substitute claim 5, we conclude that proposed substitute claim 6 is unpatentable because it would have been obvious over the combination of Uhlik and Sebastian.

D. NEW MATTER AND EFFECTIVE FILING DATE

A motion to amend may not present substitute claims that introduce new subject matter. 35 U.S.C. § 316(d)(3); 37 C.F.R. § 42.121(a)(2)(ii). New matter is any addition to the claims that lacks sufficient support in the subject patent’s original disclosure. *See TurboCare Div. of Demag Delaval Turbomach. Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001) (“When [an] applicant adds a claim . . . , the new claim[] must find support in the original specification.”). The Board requires that a motion to amend set forth written-description support in the originally filed disclosure of the subject patent for each proposed substitute claim, and also set forth support in an earlier-filed disclosure for each claim for which the Hera seeks the benefit of the earlier-filed disclosure’s filing date. *See* 37 C.F.R. §§ 42.121(b)(1), 42.121(b)(2).

In its Motion to Amend, Hera identifies citations in the original disclosure that it asserts provide support for the proposed amendment of

each claim. Mot. Amend 4. Hera also claims that each element finds support in the Japanese application to which the '389 application claims priority. *Id.* at 3 (citing Ex. 1008, 361 (declaration and power of attorney claiming priority to JP 2001-237798 (published Aug. 6, 2001))). However, Hera does not provide a translation of the Japanese priority document, or provide citations showing support for the proposed amended claims. *See* 37 C.F.R. §§ 42.63(b), 42.121(a)(b)(2).

Intel argues that because Hera omitted a limitation-by-limitation explanation of support in the Japanese application, this alone justifies denying the motion. Opp. Amend 2. Intel also argues that the original and foreign priority applications “do not provide written description support for claim 5 because they do not demonstrate that the named inventor actually possessed the full scope of the claimed subject matter when the applications were filed.” *Id.* at 4 (citing *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1353–54 (Fed. Cir. 2010); *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997)). Because we determine that the proposed substitute claims are unpatentable based on the prior art, we need not address these arguments.

E. CONCLUSION

Because Intel establishes by a preponderance of the evidence that all proposed substitute claims are unpatentable for either anticipation or obviousness over the cited prior art, we deny Hera’s Motion to Amend the claims.

V. ORDER

In consideration of the foregoing, it is

ORDERED that Intel has shown that claims 1–3 of the '389 patent are unpatentable;

FURTHER ORDERED that Hera's Motion to Amend is denied; and

FURTHER ORDERED that 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.

The table below summarizes our conclusions as to the challenged claims:

Claims	35 U.S.C. §	References	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–3	102	Park	1–3	
1–3	103	Park	1–3	
1–3	102	Ishida	1–3	
1–3	102	Uhlik	1–3	
1–3	103	Uhlik	1–3	
1–3	103	PHSv2, Uhlik	1–3	
Overall Outcome			1–3	

The table below summarizes our conclusions as to Hera's Contingent Motion to Amend the claims:¹⁸

¹⁸ Should Hera wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Hera's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Hera chooses to file a reissue application or a

Motion to Amend Outcome	Claims
Original Claims Canceled by Amendment	
Substitute Claims Proposed in the Amendment	4–6
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	4–6
Substitute Claims: Not Reached	

request for reexamination of the challenged patent, we remind Hera of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

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For PETITIONER:

Tyler Bowen
Bryan Banks
PERKINS COIE LLP
bowen-ptab@perkinscoie.com
banks-ptab@perkinscoie.com

For PATENT OWNER:

Timothy Devlin
Leonard Monfredo
Patrick Delaney
DEVLIN LAW FIRM LLC
td-ptab@devlinlawfirm.com
imonfredo@devlinlawfirm.com
pdelaney@devlinlawfirm.com