Trials@uspto.gov
571.272.7822

Paper 43
Entered: March 7, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SPRINT SPECTRUM L.P.,
Petitioner,

v.

GENERAL ACCESS SOLUTIONS, LTD.,
Patent Owner.

Case IPR2017-01889
Patent 7,230,931 B2

Before MELISSA A. HAAPALA, *Acting Vice Chief Administrative Patent Judge,* and KALYAN K. DESHPANDE and DAVID M. KOHUT, *Administrative Patent Judges*.

HAAPALA, *Acting Vice Chief Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

Sprint Spectrum L.P. ("Petitioner") filed a Petition pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–29 of U.S. Patent No. 7,230,931 B2 ("the '931 patent"). Paper 1 ("Pet."). General Access Solutions, Ltd. ("Patent Owner") did not file a Preliminary Response. Applying the standard set forth in 35 U.S.C. § 314(a), we granted Petitioner's request to institute an *inter partes* review of all challenged claims. Papers 5 ("Dec") (instituting on claims 1, 3–10, 12–19, and 21–29); Paper 8 (instituting on remaining challenged claims 2, 11, and 20 and modifying our initial institution decision to include all of the grounds presented in the Petition).

During the trial, Patent Owner timely filed a Response (Paper 25, "PO Resp."), to which Petitioner timely filed a Reply (Paper 29, "Reply"). Patent Owner further submitted a Sur-Reply (Paper 34, "Sur-Reply") to Petitioner's Reply. An oral hearing was held on December 6, 2018, and a copy of the transcript was entered into the record. Paper 41 ("Tr.").

Following the oral hearing and pursuant to our authorization (Paper 37), both parties each submitted claim construction briefs (Papers 38, 39); each party also submitted a reply to the other party's brief (Papers 40, 41).

We have jurisdiction under 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the claims on which we instituted trial. For the reasons that follow, we enter adverse judgement against Patent Owner with respect to independent claims 1, 10, and 19 of the '931 patent and we determine that Petitioner has not shown that dependent claims 2–9, 11–18, and 20–29 are unpatentable.

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I. BACKGROUND

A. The '931 Patent (Ex. 1001)

The '931 patent describes a burst packet transmission media access system using selectively adaptable beam forming in a fixed wireless access network. Ex. 1001, 3:28–31. The fixed wireless network may comprise a plurality of transceiver base stations that transmit forward channel (downlink or downstream) broadband signals to subscriber premises and receive reverse channel (uplink or upstream) broadband signals from subscriber premises. *Id.* at Fig. 1, 11:57–64. Each of the transceiver base stations may cover a cell site that is divided into a plurality of sectors. *Id.* at Fig. 2, 12:25–27. Pre-programmed sets of directed beam patterns are used to cover a cell in an angular fashion, which is referred to as "beam scanning." *Id.* at 28:1–3. The base station establishes a set of beams to cover the cell and based on physical location in the sector, a specific beam is used to communicate with one or more subscribers that lie in that sector. *Id.* at 28:9–12.

Figure 14 of the '931 patent is depicted below:

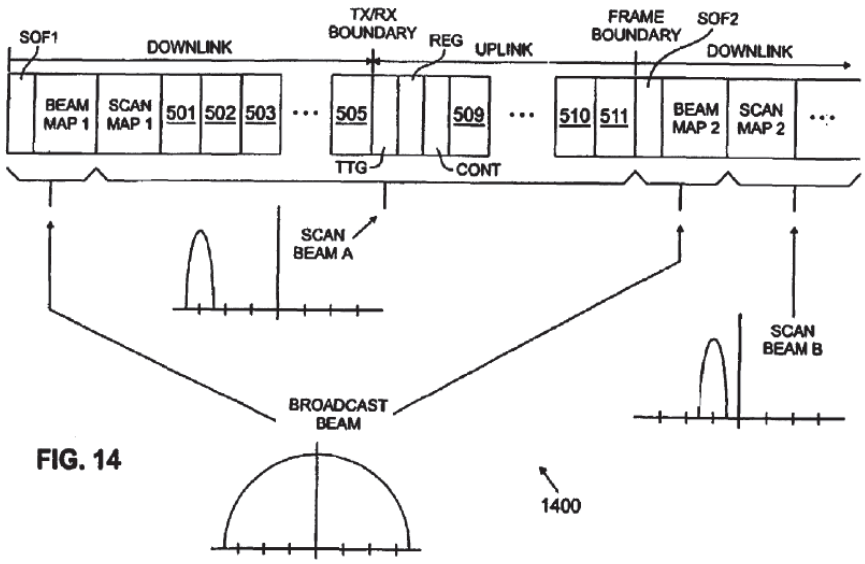

FIG. 14

Figure 14 illustrates the use of broadcast beams and scanning beams in exemplary time division duplex (TDD) signal 1400. *Id.* at 29:3–5. TDD signal 1400 comprises a first TDD frame having a downlink portion comprising a first start-of-frame field (SOF1), a first beam map field (Beam Map 1), and a first scan map field (Scan Map 1). *Id.* at 29:6–10. The first TDD frame is followed by a second TDD frame, which comprises a second start-of-frame field (SOF2), a second beam map field (Beam Map 2), and a second scan map field (Scan Map 2). *Id.* at 29:21–25. A spread spectrum Broadcast Beam is used to transmit start-of-frame fields SOF1, SOF2 and beam map fields Beam Map 1, Beam Map 2 in each TDD frame. *Id.* at 29:26–30. Distinct scan beams (Scan Beam A and Scan Beam B) are used to transmit the scan map fields (Scan Map 1 and Scan Map 2) and the remainder of the uplink and downlink portions of each TDD frame. *Id.* at 29:30–33.

Broadcast Beam Maps 1, 2 provide data indicating which scanning beam (or beams) are used at which time for the frame and also transmits a synchronization field so that all subscribers can maintain synchronization. *Id.* at 29:34–36, 29:47–50. Scanning Beam Maps A, B provides the uplink and downlink map, which state at which time in the frame, using the scanning beam described in the associated Broadcast Beam Map, the downlink modulation groups and specific uplink slots are allocated for the frame using the specific scanning beam. *Id.* at 29:38–43.

B. Illustrative Claims

Claims 1, 10, and 19 are independent claims. Claims 1 and 2 are illustrative of the subject matter at issue:

> 1. For use in a wireless access network comprising a plurality of base stations, each of said plurality of base stations

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capable of bidirectional time division duplex (TDD) communications with wireless access devices disposed at a plurality of subscriber premises in an associated cell site of said wireless access network, a transceiver associated with a first of said plurality of base stations comprising:

transmit path circuitry associated with a beam forming network capable of transmitting directed scanning beam signals each directed to substantially only wireless access devices within a different one of a plurality of sectors of a cell site associated with said first base station, wherein said transmit path circuitry

transmits, at a start of a TDD frame, a broadcast beam signal to wireless access devices within more than one of said sectors, the broadcast beam signal comprising a start of frame field, and

subsequently transmits in a downlink portion of said TDD frame, first downlink data traffic to substantially only wireless access devices within one of said sectors using one of said directed scanning beam signals.

2. The transceiver as set forth in claim 1 wherein said broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals.

C. Instituted Grounds of Unpatentability

Petitioner relies on the following references:

1. U. Vornefeld, et al., *SDMA Techniques for Wireless ATM*, IEEE Communications Magazine (Nov. 1999) ("Vornefeld") (Ex. 1004).
2. U.S. Patent No. 6,470,177 B1, issued Oct. 22, 2002 ("Andersson") (Ex. 1005).
3. U.S. Patent No. 7,366,133 B1, issued Apr. 29, 2008 ("Ahy") (Ex. 1006).[1]

[1] We note the first named inventor of U.S. Patent 7,366,133 is Majidi-Ahy. Ex. 1006, 1. However, as both parties refer to this reference as "Ahy" (*see e.g.,* Pet. 17; PO Resp. 18), we use the same shortened form for consistency and to avoid confusion.

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4. U.S. Patent No. 5,684,491, issued Nov. 4, 1997 ("Newman") (Ex. 1007).

We instituted trial under 35 U.S.C. §§ 102(b) and 103(a) over the following combinations of references:

Reference(s)	Basis	Claims
Vornefeld	35 U.S.C. § 102(b)	1–3, 6, 7, 10–12, 15, 16, 19–21, 24, 25, 28, 29
Vornefeld and Ahy	35 U.S.C. § 103(a)	4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, 27
Vornefeld and Andersson	35 U.S.C. § 103(a)	1–3, 6, 7, 10–12, 15, 16, 19–21, 24, 25, 28, 29
Vornefeld, Andersson, and Ahy	35 U.S.C. § 103(a)	4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, 27
Newman, Ahy, and Andersson	35 U.S.C. § 103(a)	1–29

In support of its contentions, Petitioner submitted a declaration by its witness, Mr. James A. Proctor, Jr. Ex. 1003. In response, Patent Owner submitted a declaration by its witness, Kurt D. Humphrey. Ex. 2001. Both witnesses were cross-examined during the trial, and transcripts of their depositions are in the record. Ex. 1011 (Proctor deposition); Ex. 1012 (Humphrey deposition).

D. Related Proceedings

Petitioner and Patent Owner identify the following district court litigation involving the '931 patent: *General Access Sol., Ltd. V. Sprint Spectrum L.P.*, Case No. 2:16-cv-465-RWS (E.D. Tx.). Pet. 2; Paper 3, 1.

E. Real Parties in Interest

Petitioner identifies the following additional real parties in interest: Virgin Mobile USA, L.P.; Boost Mobile, LLC; Clearwire Corporation;

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Clearwire Communications LLC; and Clear Wireless LLC. Pet. 1. Petitioner further identifies Sprint Corporation as a real party in interest only for purposes of this proceeding and only to the extent Patent Owner contends the separate legal entity should be named a real party in interest in this proceeding. *Id.* Patent Owner does not identify any additional real parties in interest. *See* Paper 3, 1.

II. ADVERSE JUDGEMENT

Both in its Response and at the oral hearing, Patent Owner conceded the unpatentability of independent claims 1, 10, and 19. PO Resp. 2 n.2 ("Patent Owner does not herein dispute the patentability of the independent claims 1, 10, and 19 of the '931 patent."); Tr. 56:19–57:9 ("[Vornefeld] knocks out our independent claims. We concede that."). A concession of unpatentability is construed as a request for entry of adverse judgement. 37 C.F.R. § 42.73(b)(3). The request is granted.

III. ANALYSIS

A. Legal Principles

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). Although the elements must be arranged or combined in the same way as in the claim, "the reference need not satisfy an *ipsissimis verbis* test," i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009).

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are "such that the subject matter as a whole would have been obvious at the time the invention was made to a

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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) objective evidence of non-obviousness, i.e., secondary considerations such as commercial success, long felt but unsolved needs, and failure of others.[2] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). The obviousness inquiry further requires an analysis of "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness")).

B. Level of Ordinary Skill in the Art

Petitioner asserts a person of ordinary skill in the art at the time of the filing date of the '931 patent would have had at least a Bachelor of Science in Computer Science, Computer Engineering, Electrical Engineering, or an equivalent field, and at least two years of academic or industry experience in any type of wireless networking field. Pet. 9–10. Patent Owner asserts a person or ordinary skill would have been a telecommunications engineer or technologist working in the wireless networking sector and have a least a bachelor's degree in engineering and relevant work experience, including at

[2] The record does not include arguments or evidence regarding objective indicia of non-obviousness.

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least two years of academic, practical, or industry experience in the wireless networking and/or telecommunications field. PO Resp. 6.

Our decision does not turn on the minor differences between the definitions. Both Petitioner and Patent Owner advocate a similar level of experience and both agree that a person of ordinary skill would have a bachelor's degree in engineering. We accept the level of skill advocated by Petitioner as the identified undergraduate academic degrees are consistent with the prior art of record.

C. Claim Construction

In an *inter partes* review, based on a petition filed before November 13, 2018, claims of an unexpired patent are interpreted using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2017);[3] *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). Under that standard, "words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history." *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016).

1. "a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals"

This limitation is recited by dependent claims 2, 11, and 20. After review of the parties' briefing and based on arguments made at the oral hearing, we determined the meaning of the recited "beam map" is at issue in

[3] 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) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018).

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this proceeding. Because neither party had set forth an explicit construction for this term, during the oral hearing we authorized each party to file an additional brief setting forth the party's proposed construction and also authorized each party to file a response brief to the other party's proposed construction. Paper 37. Both parties submitted the additional briefs and response briefs. *See* Papers 39, 40 (Petitioner's briefs); Papers 38, 41 (Patent Owner's briefs).

Petitioner asserts we should construe "a first beam map" as "scheduling information for one or more beams." Paper 39, 1. In support of its construction, Petitioner asserts the beam map is part of the broadcast beam shown in Figure 14 and the description of a beam map in the corresponding portion of the specification references scheduling information associated with the beam map. *Id.* at 2 (citing Ex. 1001, 29:34–36). Petitioner asserts the scheduling information that forms a beam map comprises information about one or more beams that are transmitted in the frame and that the beam maps "provide data indicating which beam (or beams) are used at which time." *Id.* at 3 (citing Ex. 1001, 29:34–36).

Patent Owner initially proposes we construe "a first beam map" as "scanning beam information contained in the broadcast beam signal that enables wireless access devices to detect a particular directed scanning beam signal." Paper 38, 1. In its Opposition, Patent Owner states it does not disagree with Petitioner's proposed construction and that it is suitable for the claimed "beam map." Paper 41, 1. Patent Owner further asserts that the "first beam map" at issue in claims 2, 11, and 20 is significantly narrower, and requires that the beam map enable devices to detect a particular scanning beam. *Id.*

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Petitioner does not dispute that claims 2, 11, and 20 require the elements of Patent Owner's proposed construction because those elements are already found in the claims. Paper 40, 1. Petitioner asserts the problem with Patent Owner's initial construction is that it is redundant and renders the remaining terms of the claims superfluous. *Id.*

The '931 patent describes two different types of beam maps: broadcast beam maps and scanning beam maps. Ex. 1001, 29:26–43. A broadcast beam is used to transmit the broadcast beam map (Beam Map 1 and Beam Map 2) and distinct scan beams are used to transmit the scan map fields (Scan Beam A, Scan Beam B). *Id.* at Fig. 14, 29:26–33. Both parties assert that the "first beam map" recited in claims 2, 11, and 20 refers to the broadcast beam map. *See* Paper 38, 2 (Patent Owner's assertion that the first beam map "clearly means the Broadcast Beam Map portion of the definition of a generic "beam map."); Paper 39, 2 (Petitioner's assertion that the beam map "is a part of the broadcast beam (see Fig. 14), and the description of a beam map in the corresponding portion of the specification also references the scheduling information associated with the beam map."). Because claims 2, 11, and 20 all set forth the "first beam map" is a component of the "broadcast beam signal," we agree with the parties that the "first beam map" refers to a broadcast beam map.

We are persuaded that Petitioner's proposed construction of a "first beam map" is consistent with the plain meaning of a broadcast beam map in the context of the disclosure of the '931 patent. The '931 patent describes transmission of map information for beam scheduling via a spread spectrum broadcast beam. *See* Ex. 1001, 28:56; 29:34–35. Patent Owner agrees that Petitioner's proposed construction for "a first beam map" is a suitable

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definition. Paper 41, 1. Accordingly, we construe "first beam map" as "scheduling information for one or more beams."

As noted by both parties, claims 2, 11, and 20 further require that the "first beam map" contain "scanning beam information usable by said wireless access device to detect said directed scanning beam." *See* Papers 40, 2; 41, 1. Petitioner argues the scanning beam information

> may include information that 'identifies a downlink time slot during which one of said directed scanning beam signals transmits said downlink data traffic,' (claim 3), information that 'identifies at least one modulation format associated with one of said directed scanning beam signals' (claim 4), or information that 'identifies at least one forward error correction code level associated with one of said directed scanning beam signals' (claim 5).

Paper 40, 2–3. Petitioner asserts that Patent Owner's arguments limit "beam map" to a specific embodiment (such as the "Frame Beam map and Super-Frame Beam Map embodiment) and this provides reason to reject Patent Owner's construction. *Id.* at 3; *see also* Reply 9–11 (similarly asserting that Patent Owner's arguments that a first beam map necessary includes information about what scanning beam will be used improperly confine the claim to a specific embodiment). Petitioner argues that the '931 patent includes description of another embodiment in which the scanning beam information identifies a downlink time slot in the downlink portion during which the at least one directed scanning beam transmits the downlink traffic. Reply 11 (citing Ex. 1001, 9:40–44).

Patent Owner asserts that scanning beam detection information is different from scanning beam uplink/downlink/modulation information. *Id.* Patent Owner cites to several examples in the disclosure that provide data to enable a device to detect a particular scanning beam signal. Paper 38, 3

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(citing Ex. 1001, 29:34–36, 29:51–55, 29:66–30:2). Patent Owner argues that information about which scanning beam will be used to cover the sector and when it will be used is necessary for a signal to serve as a beam map. PO Resp. 21, 24 (citing Ex. 2001 ¶ 44). Patent Owner argues that timeslot reservations do not constitute beam map information including the specific beam(s) and their precise start times in the frames which are useable by the wireless access devices to detect the directed scanning beam signals. *Id.* at 25 (citing Ex. 2001 ¶ 45).

We are not persuaded by Petitioner's arguments that the embodiment in which the scanning beam information identifies a downlink portion for transmission relates to the claimed scanning beam information useable to *detect* said directed scanning beam. Rather, the '931 patent discloses explicitly that the embodiment in which the scanning beam information identifies a downlink time slot is "another embodiment" than the embodiment set forth in claims 2, 9, and 11 in which the beam map contains scanning beam information usable to detect the directed scanning beam. *See* Ex. 1001, 9:35–44 (first describing the embodiment recited in claims 2, 9, and 11, and then describing "another embodiment" in which the scanning beam information identifies a downlink time slot). Thus, although as set forth in claim 3 (by virtue of its dependency from claim 2) the scanning beam information can include both types of information (information usable to detect directed scanning beam signals and identification of a downlink time slot), the disclosure of the '931 patent makes clear the information that identifies a downlink time slot is different than the information usable to detect directed scanning beam signals.

Furthermore, we determine Patent Owner's arguments—that the scanning beam information usable to detect the scanning beam signals must

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include information about which scanning beam will be used—are not an improper attempt to limit the claim language to a specific embodiment. As explained above and undisputed by the parties, the "first beam map" is a broadcast beam map. The '931 patent describes the information contained in the broadcast beam map as "data indicating which scanning beam (or beams) are used at which time." *See* Ex. 1001, 29:34–36. Petitioner cites to the same disclosure in support of its construction that a beam map is scheduling information for one or more beams. *See* Paper 39, 3 (citing Ex. 1001, 29:34–36). The other sections in the '931 patent describing the broadcast beam map all explain that the map contains information that informs the subscriber (wireless access) device which scanning beam is used and when (frame time) in which each beam starts. *See* Ex. 1001, 29:51–55, 29:66–30:2. We agree with Patent Owner that this information is what enables a device to detect a particular scanning beam. *See* Paper 38, 3.

We are mindful that claims must be interpreted in view of the specification without importing limitations from the specification unnecessarily. *E-Pass Techs., Inc. v. 3Com Corp.*, 343 F.3d 1364, 1369 (Fed. Cir. 2003). However, the disclosure of the '931 patent consistently describes that the broadcast beam map is scheduling information that indicates which scanning beam is used at which time. *See* Ex. 1001, 29:34–36, 29:51–55, 29:66–30:2. The correct inquiry in giving a claim term its broadest reasonable interpretation in light of the specification is an interpretation that corresponds with what and how the inventor describes his invention in the specification. *In re Smith Int'l*, 871 F.3d 1375, 1382–83 (Fed. Cir. 2017). Consistent with the description set forth in the '931 patent, our complete construction of "a first beam map containing scanning beam information usable by said wireless access devices to detect said directed

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scanning beam signals" is "scheduling information for one or more beams that provides data indicating which scanning beam is used at which time."

2. Other Terms

Petitioner proposes constructions for "sector" and "directed scanning beam signal(s)," both terms which appear in independent claims 1, 10, and 19. Pet. 10–13. Patent Owner asserts that the meaning of these terms do not appear to be in dispute and construction of these terms would not resolve any controversy. PO Resp. 15.

We agree with Patent Owner that these terms are not in controversy and, accordingly, determine that we need not explicitly construe these terms to resolve the issues before us. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy").

D. Anticipation by Vornefeld and Obviousness over Vornefeld and Andersson

Petitioner challenges claims 1–3, 6, 7, 10–12, 15, 16, 19–21, 24, 25, 28, and 29 as anticipated under 35 U.S.C. § 102(b) by Vornefeld. Pet. 19–35. Petitioner further challenges these claims as obvious under 35 U.S.C. § 103(a) over Vornefeld and Andersson. *Id.* at 44–50.

1. Scope and Content of Vornefeld

Vornefeld describes space-division multiple access (SDMA) techniques in the context of the HIPERLAN/2 system, which provides wireless network broadband services with guaranteed quality of service. Ex. 1004, 52. The system deploys a smart array antenna with several antenna systems that provides the ability to set up multiple antenna beams, which can be directed adaptively to the mobile terminal (MT) locations and

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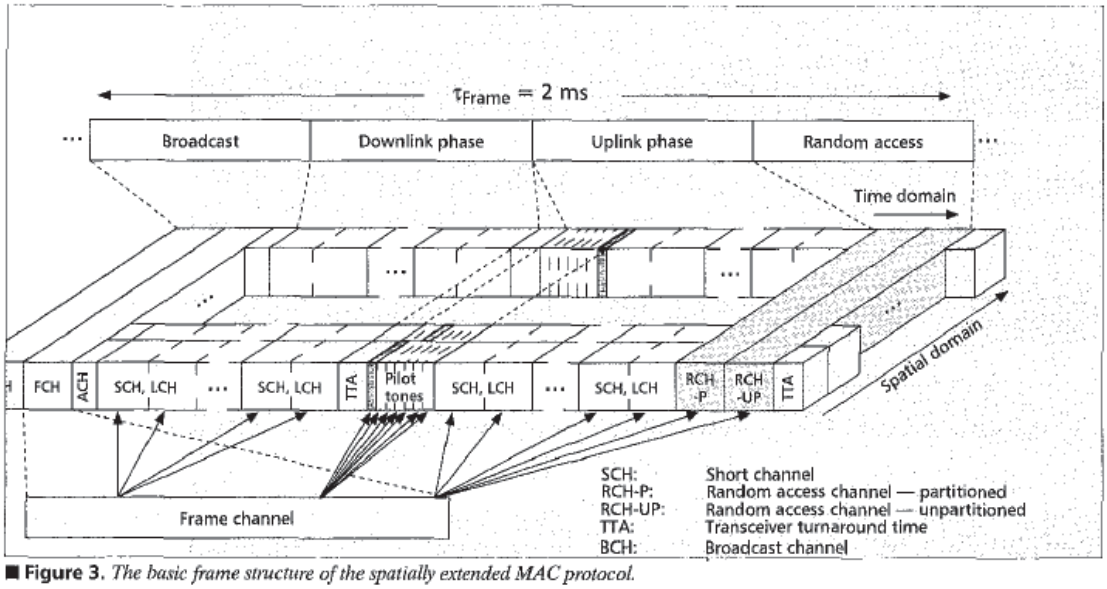
allows different users to be served on the same frequency channel at the same time. *Id.* Depending on the number of antenna elements and the applied beamforming algorithm, array antennas are able to simultaneously direct several beams conveying individual user signals to different positions. *Id.* at Fig. 2, 53. The system uses a Medium Access Control (MAC) protocol to coordinate the access of MTs to the shared radio channel. *Id.* at 54.

Figure 3 of Vornefeld is depicted below:



■ **Figure 3.** *The basic frame structure of the spatially extended MAC protocol.*

Figure 3 illustrates the basic MAC frame structure of the spatially extended MAC protocol. *Id.* at Fig. 3. MAC frame starts with broadcast channel (BCH), followed by frame channel (FCH), then a downlink phase, an uplink phase, and random access channels (partitioned, RCH-P, and unpartitioned, RCH-UP). *Id.* at 54. BCH conveys signaling information concerning the whole radio cell in the downlink direction and announces the location of the FCH and RCH within the actual MAC frame. *Id.* FCH is broadcast in the downlink direction and transmits information about the structure of the

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MAC frame for the up- and downlink phases; it contains announcements and reservations of long and short transport channels the individual MTs have to transmit or receive. *Id.* Short Channel (SCH) conveys data link control information and Long Channel (LCH) serves to transmit user data bi-directionally on the up- and downlink. *Id.* RCH-P and RCH-UP are contention channels. *Id.* As depicted in Figure 3, a number of MAC frames can be transmitted concurrently by extension into the space domain using the smart antenna system. *See id.* at Fig. 3, 53, 55. A space-time scheduler is used to determine the temporal transmission sequence of MAC PDUs (protocol data unit) as well as the MTs that can simultaneously be addressed or allowed to concurrently transmit their bursts. *Id.* at 55.

2. Scope and Content of Andersson

Andersson describes adaptive sectorization to solve problems associated with sectorization of cells in cellular communication systems. Ex. 1005, 3:37–40, 4:31–34. A transceiver structure located at a base station is connected to a set of sector antennas and each sector antenna is used to cover a sector of the cell. *Id.* at 4:42–44; *see also* Fig. 2 (depicting an antenna configuration with six sectors). The beacon carrier is also connected to an omni-directional antenna, which provides the same coverage area as all of the sector antennas together. *Id.* at 4:58–60.

3. Claims 2, 11, and 20

Claim 2 depends from claim 1 and recites "wherein said broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals." Claims 11 and 20 depend from claims 10 and 19, respectively, and recite the same limitation set forth in claim 2.

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Petitioner contends "Vornefeld discloses that the broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signal." Pet. 26 (citing Ex. 1003 ¶¶ 151–152); *see also id.* at 50 (citing to the analysis of "Ground 1" to support the assertion that claims 2, 11, and 20 are obvious over Vornefeld and Andersson). Specifically, Petitioner asserts the frame channel (FCH) described in Vornefeld is equivalent to the claimed 'first beam map" because Vornefeld discloses the FCH is broadcast in the downlink direction, transmits information about the structure of the MAC frame for the up-and downlink phases and contains announcements and reservations of long and short transport channels the individual MTs have to transmit or receive in. *Id.* at 26 (citing Ex. 1004, 54–55; Ex. 1003 ¶ 152).

Petitioner further asserts that because each of the SCH and LCH portions of the frame are transmitted in different signals (or directed beams) in the spatial domain, the base station must inform each subscriber unit when it should listen for its specific directive beam signal. Reply 5 (citing Ex. 1011, 29:12–30:3 (testimony of Mr. Proctor)). Mr. Proctor testifies that the FCH, which is broadcast to all users, will have a map in it that describes which time slots particular mobile terminals should decode on the downlink phase. Ex 1011, 30:15–19. Mr. Proctor further testifies that this information sent in Vornefeld would be sufficient to demodulate or detect the downlink signal and that downlink is a directed beam signal. *See id* at 47:18–48:2; *see also* Tr. 31 (Petitioner's assertion that the FCH includes information sufficient to allow the subscriber units to detect the directed scanning beam signal that is sent out). Petitioner further asserts, citing the testimony of Mr. Proctor, that one would not need to include information about the beams

themselves to be a beam map as the claim only requires information be usable to demodulate a directed signal. Reply 12–13 (citing Ex. 1011, 47:2–11).

Patent Owner contends that Vornefeld does not disclose a beam map containing scanning beam information and asserts that the FCH signal cited by Petitioner is not "equivalent" to the recited "first beam map." PO Resp. 20–21. Patent Owner asserts the FCH signal includes only information about the structure of the frame (when the base station will be sending and receiving information) and does not include information about what scanning beam signal will be used to cover the sector, or when it will be used. *Id.* at 21. Patent Owner further asserts that Vornefeld accomplishes beam forming with the use of algorithms and says nothing about using beam maps in a broadcast beam signal. *Id.* at 21–22 (citing Ex. 1004, 53; Ex. 2001 ¶ 43); *see also* Tr. 61:2–4 (asserting the reason Vornefeld does not disclose a beam map is because Vornefeld discloses an algorithm for determining where beams would be directed and it does not need to send maps). Patent Owner asserts that Vornefeld also does not inherently disclose the recited beam map because a beam forming station may inform each subscriber unit when it should listen for its specific directive beam signal in any number of ways. Sur-Reply 4. Mr. Humphrey testifies that one of ordinary skill in the art would not assume that the start of frame information would include beam map information because beam maps are unnecessary in schemes that broadcast with beams cycled in round robin rotation as noted in the '931 patent or using various multiple antenna diversity techniques. *See* Ex. 2001 ¶¶ 46–47.

In our Institution Decision, we were not persuaded Petitioner established a reasonable likelihood that Vornefeld discloses the recited first

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beam map usable to detect directed scanning beam signals. Dec. 17. In particular, we were not persuaded that Petitioner provided sufficient analysis to establish that one of ordinary skill in the art would understand Vornefeld's description of transmitting broadcast timeslot reservations for long and short transport channels (channel slots in a MAC frame) to be a beam map usable to detect directed scanning beam signals. *Id.* at 17–18. After consideration of the entire record, we remain unpersuaded that Vornefeld discloses a first beam map containing scanning beam information useable to detect said directed scanning beam signals.

Vornefeld discloses its FCH is "[u]sed to transmit the information about the structure of the MAC frame for the up- and downlink phases." Ex. 1004, 54. The FCH "contains announcements and reservations of long and short transport channels the individual MTs have to transmit or receive in." *Id.* We agree with Petitioner and Mr. Proctor that this information may be used by an MT to demodulate the downlink signal. *See* Reply 6; Ex. 1011, 47:18–23.

But, we are not persuaded by Petitioner's assertions, or the testimony of Mr. Proctor, that this demodulation information is what the claim requires. *See* Reply 12–13; Ex. 1011, 47:2–11. As discussed in our claim construction analysis above, the disclosure of the '931 patent makes clear that information that identifies a downlink time slot (demodulation information) is different than the information usable to detect directed scanning beam signals. *See* Ex. 1001, 9:35–44.

We are also not persuaded that the FCH demodulation information disclosed by Vornefeld meets our construction of the limitation set forth in claims 2, 11, and 20, namely "scheduling information for one or more beams that provides data indicating which scanning beam is used at which time."

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Rather, we agree with Patent Owner that the FCH described in Vornefeld does not include information about which scanning beam signal will be used or when it will be used. PO Resp. 21; *see* Ex. 1004, 54. We are persuaded by Mr. Humphrey's testimony that Vornefeld discloses beam forming is accomplished with the use of algorithms and not a beam map.[4] *See* Ex. 2001 ¶ 43; Ex. 1004, 53 (describing the use of a beam forming algorithm to adjust the phases at the antenna elements to steer towards the desired MT). Thus, we determine that Petitioner fails to establish, by a preponderance of the evidence, that Vornefeld discloses a first beam map containing scanning beam information usable by the wireless access devices to detect the directed scanning beam signals.

We conclude Petitioner has not demonstrated that claims 2, 11, and 20 are anticipated by Vornefeld. Petitioner does not assert Andersson meets the limitation set forth in these claims, but rather relies on its anticipation analysis discussed above. *See* Pet. 50. Accordingly, Petitioner has also not demonstrated that claims 2, 11, and 20 would have been obvious over Vornefeld and Andersson.

4. Claims 3, 6, 7, 12, 15, 16, 21, 24, and 25

Claims 3, 6, 7, 12, 15, 16, 21, 24, and 25 depend from claim 2, 11, or 20. In its analysis of these claims, Petitioner does not cure its failure to demonstrate Vornefeld discloses the "first beam map" limitation recited in

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[4] Petitioner asserts Mr. Humphrey does not qualify as a person of ordinary skill in the art because he did not obtain his experience prior to 2001. *See* Reply 16. We agree with Patent Owner that Petitioner's assertion is immaterial as it is not necessary for an expert to obtain the relevant experience by the time of the filing of the patent. *See* Sur-Reply 11. We are persuaded Mr. Humphrey has sufficient qualifications to credit his testimony. *See* Ex. 2001 ¶ 7; Ex. 2002.

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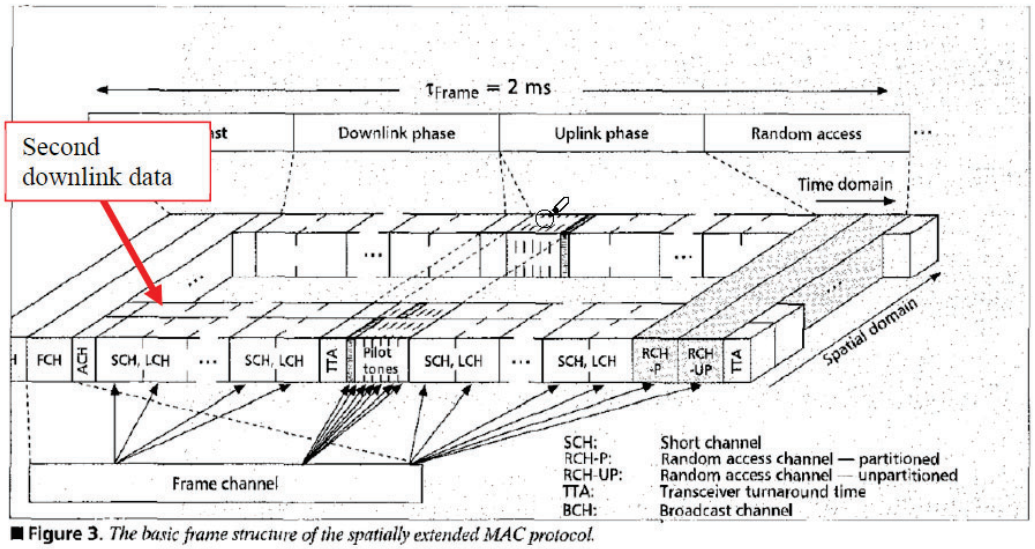
these claims by virtue of their dependency. *See* Pet. 27–31, 33–34, 50. Accordingly, we conclude Petitioner has not demonstrated that claims 3, 6, 7, 12, 15, 16, 21, 24, and 25 are anticipated by Vornefeld. Petitioner has also not demonstrated that these claims would have been obvious over Vornefeld and Andersson.

5. Claims 28 and 29

Claim 28 depends from claim 1 and recites "wherein said transmit path circuitry transmits, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices within an other of said sectors using an other of said directed scanning beam signals." Petitioner contends Vornefeld discloses that its array antennas are able to simultaneously direct several beams to different positions conveying individual user signals. Pet. 34 (citing Ex. 1004, Fig. 2, 53); Reply 15. Petitioner asserts Figure 3 of Vornefeld clearly shows "second downlink data traffic" being transmitted in the downlink portion of the frame using a different directed scanning beam signal. *Id.* Petitioner provides an annotated version of Figure 3, depicted below:



■ **Figure 3.** *The basic frame structure of the spatially extended MAC protocol.*

Figure 3, as annotated by Petitioner, illustrates Petitioner's assertions that Vornefeld discloses second downlink data in its spatially extended MAC protocol. Pet. 35. Petitioner further asserts Figure 3 of Vornefeld shows a single frame with multiple channels being transmitted in parallel in the spatial domain and that each channel represents a different directive scanning beam. Reply 15. Petitioner asserts a person of ordinary skill in the art would understand that the ULAs in Vornefeld transmit downlink data to different sectors using different directive scanning beams. *Id.* at 15–16.

Patent Owner contends Vornefeld does not disclose using a different directed scanning beam signal within a TDD frame. PO Resp. 26. Patent Owner asserts the second downlink data identified by Petitioner is in a different, spatially-separated, simultaneous TDD frame. *Id.* Patent Owner asserts Vornefeld does not disclose using different or multiple beams in the same TDD frame. *Id.*

Petitioner has not met its burden to establish claim 28 is anticipated by, or would have been obvious over, Vornefeld. Claim 28 requires the transmit circuitry to transmit second downlink data traffic in the same (said) downlink portion of the same (said) TDD frame recited in claim 1. The block that Petitioner relies on for the second downlink data traffic is depicted as a different (spatially separated) TDD frame that is simultaneously transmitted with the other frames. *See* Pet. 35; *see also* Ex 1004, 54 (describing concurrent transmission of MAC PDUs in the spatial domain). We agree with Patent Owner that Petitioner does not establish Vornefeld discloses using different beams in the same TDD frame (i.e., second downlink data traffic, transmitted in "said downlink portion of said TDD frame") to transmit to devices within a different sector.

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We conclude Petitioner has not demonstrated that claim 28 is anticipated by Vornefeld. Petitioner relies on its analysis of claim 28 to support its assertion that claim 29, which recites similar limitations as claim 28, is anticipated by Vornefeld. *See* Pet. 35. Accordingly, Petitioner has also not demonstrated that claim 29 is anticipated by Vornefeld.

Petitioner does not assert Andersson meets the limitations set forth in claims 28 and 29. *See id.* at 50. Therefore, we conclude Petitioner has not demonstrated that claims 28 and 29 would have been obvious over Vornefeld and Andersson.

E. Obviousness over Vornefeld and Ahy, and Obviousness over Vornefeld, Andersson, and Ahy

Petitioner challenges claims 4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, and 27 as unpatentable as obvious under 35 U.S.C. § 103(a) over Vornefeld and Ahy. Pet. 35–44. Petitioner further challenges these claims as unpatentable as obvious under 35 U.S.C. § 103(a) over Vornefeld, Andersson, and Ahy. *Id.* at 50–51.

1. Scope and Content of Ahy

Ahy describes adaptive point to multipoint wireless communications. Ex. 1006, 1:65–66. A base station controller (BSC) maintains a set of physical (PHY) parameters and media-access-control (MAC) parameters, each of which is adaptively modified by the BSC for communication with a plurality of customer premises equipment (CPE). *Id.* at 2:15–21, 7:18–20. The BSC adjusts communication with each CPE individually and adaptively in response to changes in communication characteristics. *Id.* at 2:21–23. Control of each parameter by the BSC is independent and individual with regard to each CPE. *Id.* at 7:20–22. Each parameter actually has two values: a first value for transmission by the BSC and a second value for

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transmission by the CPE. *Id.* at 7:65–8:1. The communication parameters that can be adapted include: antenna selection to choose the antenna to be used at the BSC and the CPE; modulation type to determine the bit per symbol rate to use to exchange information; and error code type to choose the error detection and correction technique. *See id.* at 8:50–59, 10:38–48, 11:40–45.

Communications between the BSC and each CPE are conducted using a TDD technique in which time durations are divided into individual frames, each of which includes a "downstream" and "upstream" portion. *Id.* at 7:1–5. The BSC controls transmission for both upstream and downstream directions without specific requests from CPEs. *Id.* at 7:5–9. The TDD frame includes a sequence of parameter setting values for the BSC to use to inform each selected CPE of the PHY and MAC parameters the BSC is using to send messages to that selected CPE, and the PHY and MAC parameters the selected CPE should use to send messages to the BSC during its allocated part of the upstream portion. *Id.* at 15:11–20.

2. Claims 4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, and 27

In its challenges based on Vornefeld, Petitioner relies on Vornefeld to disclose the "first beam map" limitation set forth in these claims by virtue of their dependency from one of claims 2, 11, and 20.[5] Pet. 35–44, 50–51. Therefore, Petitioner fails to cure the deficiencies in Vornefeld discussed above and has not demonstrated that claims 4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, and 27 are obvious over Vornefeld and Ahy. Petitioner also fails to

[5] Petitioner relies on Ahy to disclose the "first beam map" limitation only in its challenge based on Newman. *See* Pet. 58. Accordingly, we address Petitioner's assertions about Ahy in the Newman ground discussed below.

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demonstrate that these claims are obvious over Vornefeld, Andersson, and Ahy.

F. Obviousness over Newman, Andersson, and Ahy

Petitioner challenges claims 1–29 as obvious under 35 U.S.C. § 103(a) over Newman, Ahy, and Andersson. Pet. 51–63.

1. Scope and Content of Newman

Newman describes a multi-beam antenna system for communicating with mobile users. *Id.* at 1:4–6. The multi-beam communication system includes a sector antenna having a beamwidth providing sector coverage and a transmitter and a receiver system for receiving user signals from a user located in the sector. Ex. 1007, 2:10–14; *see also id.* at 4:5–6. A sector antenna has a beamwidth effective to provide coverage of a 120 degree azimuth sector. *Id.* at 4:12–15. The antenna system further includes a multi-beam antenna, which may comprise four side-by-side vertical arrays of dipoles or other radiating element arrangements suitable for providing four antenna beams, each having a beam width narrower than the 120 degree sector and aligned so that the four beams collectively cover at least a portion of the sector. *Id.* at 4:35–42. The beams may be provided with the inclusion of a suitable beam forming network. *Id.* at 4:47–50. Access to the four beams of the multi-beam antenna is provided by operation of the beam forming network, which may be included as part of the multi-beam antenna. *Id.* at 10:35–38. With this arrangement, communication with a particular user can be enhanced by a significant increase in transmitted signal strength, for example, by transmitting to the user via a narrow beam instead of the sector beam. *Id.* at 38–42.

2. Claims 2–9, 11–18, and 20–27

Petitioner contends Ahy discloses "a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals," as recited in claims 2, 11, and 20. Pet. 58; *see also id.* at 63 (asserting claims 11 and 20 are obvious for the same reasons given with respect to claim 2). In particular, Petitioner asserts Ahy teaches that the start of each TDD frame includes a first parameter value for transmission by the BSC and a second parameter value for transmission by the CPE, which allows the BSC and the CPE to transmit using different sets of parameters. *Id.* at 58 (citing Ex. 1006, 7:67–8:3). Petitioner asserts Ahy also discloses that the first part of the frame includes a value for the length for subsequent downstream payload elements for each CPE. *Id.* (citing Ex. 1006, 15:25–30). Thus, Petitioner asserts Ahy teaches providing information usable by CPEs (wireless access devices) to detect directed scanning beam signals. *Id.* (citing Ex. 1003 ¶ 153). Petitioner further asserts it would have been obvious to incorporate the TDD frame structure in Ahy into the beam forming network disclosed in Newman for the reasons described with respect to claim 1. *Id.*; *see also id.* at 52–53, 57 (asserting incorporating Ahy's TDD frame structure in Newman is nothing more than the use of known techniques to improve similar methods in the same way to yield predictable results).

Additionally, Petitioner asserts that, during Mr. Proctor's deposition, Mr. Proctor further explained why Ahy discloses the "beam map" and pointed to the "antenna selection" parameter in Ahy that includes a choice of antenna at the BSC 120 and choice of antenna at each CPE 130. Reply 7–8 (citing Ex. 1006, 8:54–59; Ex. 1011, 45:21–46:3). Petitioner asserts the antenna selection parameter in Ahy identifies the specific beam used to

transmit the signal to the CPE. *Id.* at 8, 14. Petitioner asserts the value of the length of the subsequent downstream payload elements for each CPE informs the CPE when it should listen. *Id.* at 8 (citing Ex. 1006, 15:25–30; Ex. 1003 ¶ 153). Petitioner asserts this "scanning beam information" is usable by the CPE to detect directed scanning beam signals, and therefore meets the "beam map" limitations of claims 2, 11, and 20. *Id.* Petitioner also asserts that the antenna selection parameter (along with the timeslot reservation) clearly identifies the specific beams and their precise start times, which are usable by the CPE to detect the directed scanning beam signal. *Id.* at 14.

Patent Owner asserts that Ahy says nothing about directed scanning beam signals and nothing about sending a beam map containing scanning beam information that would allow the CPEs to detect directed scanning beam signals. PO Resp. 23. Patent Owner asserts Ahy's start of frame signal does not include information about which scanning beam will be used to cover the sector, or when it will be used. *Id.* at 23–24. Patent Owner asserts that Petitioner has not explained or provided supporting facts or evidence showing how or why the frame disclosed in Ahy would require a beam map containing scanning information. Sur-Reply 8.

We determine Petitioner fails to establish Ahy discloses "scheduling information for one or more beams that provides data indicating which scanning beam is used at which time," based on our construction of the beam map limitation set forth above. Ahy discloses

> [e]ach of the following parameters actually has two values: a first value for transmission by the BSC 120 and a second value for transmission by the CPE 130. Thus, the BSC 120 can transmit using a first set of parameters while the CPE 130 is instructed to transmit using a second set of parameters.

Ex. 1006, 7:65–8:3(bolding omitted). Petitioner relies on this passage, along with Ahy's disclosure that the BSC sends the length of each downstream payload element in the time synchronization portion, to meet the beam map limitation. *See* Pet. 58 (citing Ex. 1006, 7:67–8:3; 15:25–30). But, Petitioner does not provide sufficient analysis in its Petition to explain why one of ordinary skill in the art would understand Ahy's description that the BSC and CPE can transmit using different values, in combination with its description that the length of the downstream payload elements is also transmitted in the time synchronization portion, discloses scheduling information for one or more beams indicating which scanning beam is used at which time.[6]

We are also not persuaded that Ahy's description of the BSC transmitting the length of each of the downstream payload elements discloses a start time of the beam. *See* Ex. 1006, 15:25–30. Petitioner does not provide sufficient reasoning to explain why the length of a payload informs the CPE the time it should listen. *See* Reply 8, 14. Mr. Proctor's testimony does not support Petitioner's assertion that the payload length indicates a start time; rather, Mr. Proctor merely states that Ahy discloses the

[6] In its Reply, Petitioner newly cites to Ahy's disclosure of an antenna selection parameter (which includes a choice of antenna at the BSC 120 and antenna at CPE 130) to support its assertion that Ahy discloses identification of the specific beam used to transmit the signal. *See* Reply 7–8 (citing Ex. 1006, 8:54–59). Mr. Proctor also newly relies on the antenna selection parameter to support his testimony that Ahy informs the CPE which antenna the BSC would be transmitting on. *See* Ex. 1011, 45:15–46:3. We decline to consider Petitioner's new assertions because they raise a new issue and exceeds the scope of a proper reply. *See* 37 C.F.R. § 42.23(b); *see also* Office Practice Trial Guide, 77 Fed. Reg. 48,765, 48,767 (Aug. 14, 2012) (a reply that raises a new issue will not be considered).

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first part of the frame "includes a value of the length for subsequent downstream payload elements for each CPE" (without further explanation of the relevance of this disclosure) and that this, in conjunction with the ability for the BSC and CPE to transmit using different sets of parameters teaches "providing information usable by CPEs (e.g., wireless access devices) to detect directed scanning beam signals. Ex. 1003 ¶ 153.

Finally, we observe that Petitioner relies on Newman, and not Ahy, to disclose the multi-beam antenna system and the "said directed scanning beam signals" recited in claims 2, 11, and 20. *See* Pet. 53–55. Petitioner relies on a combination argument—incorporation of the TDD frame structure in Ahy into the beam forming network disclosed in Newman—to meet the beam map limitation. *See* Pet. 58. However, Petitioner only provides reasoning why one of ordinary skill in the art would incorporate the capability of communicating using TDD into the communications system in Newman. *Id.* at 52–53, 58. This reasoning is insufficient to explain why one of ordinary skill would have incorporated Ahy's disclosure of BSC and CPE parameters and transmission of payload length into Newman.

For the reasons stated above, Petitioner fails to establish the Newman-Ahy-Andersson combination discloses the beam map limitation recited in claims 2, 11, and 20. Claims 3–9, 12–18, and 21–27 depend from claim 2, 11, and 20, respectively. Petitioner's analysis of these claims does not cure the deficiency. *See* Pet. 59–63.

We conclude Petitioner has not demonstrated that claims 2–9, 11–18, and 20–27 would have been obvious over Newman, Ahy, and Andersson.

5. Claims 28 and 29

Petitioner contends that claims 28 and 29 are obvious over the combination of Newman, Ahy, and Andersson for the same reasons given

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with respect to claims 2–9. However, claims 28 and 29 recite limitations that do not appear in claims 2–9. Petitioner fails to explain how the cited references teach transmit circuitry that "transmits, in said downlink portion of said TDD frame, second downlink data traffic to substantially only wireless access devices within an other of said sectors using an other of said directed scanning beam signals," as recited in claim 28. Petitioner also fails to explain how the references teach the substantially similar limitation that appears in claim 29. Accordingly, Petitioner has not demonstrated that claims 28 and 29 would have been obvious over Newman, Ahy, and Andersson.

III. CONCLUSION

For the reasons stated above, we enter adverse judgement against Patent Owner with respect to claims 1, 10, and 19 of the '931 patent. We further determine

A. Claims 2, 3, 6, 7, 11, 12, 15, 16, 20, 21, 24, 25, 28, and 29 have not been shown to be unpatentable under 35 U.S.C. § 102(b) as anticipated by Vornefeld;

B. Claims 2, 3, 6, 7, 11, 12, 15, 16, 20, 21, 24, 25, 28, and 29 have not been shown to be unpatentable under 35 U.S.C. § 103(a) over Vornefeld and Andersson;

C. Claims 4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, and 27 have not been shown to be unpatentable under 35 U.S.C. § 103(a) over Vornefeld and Ahy;

D. Claims 4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, and 27 have not been shown to be unpatentable under 35 U.S.C. § 103(a) over Vornefeld, Andersson, and Ahy; and

E. Claims 2–9, 11–18, and 20–29 have not been shown to be unpatentable under 35 U.S.C. § 103(a) over Newman, Ahy, and Andersson.

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IV. ORDER

It is

ORDERED that that adverse judgement is entered against Patent Owner as to claims 1, 10, and 19 of U.S. Patent No. 7,230,931 B2; and

FURTHER ORDERED that claims 2–9, 11–18, and 21–29 of U.S. Patent No. 7,230,931 B2 have not shown to be unpatentable.

This is a final written decision of the Board under 35 U.S.C. § 318(a), and, therefore, 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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PETITIONER:

Robert C. Hilton
George B. Davis
Jason Cook
MCGUIREWOODS LLP
rhilton@mcguirewoods.com
gdavis@mcguirewoods.com
jcook@mcguirewoods.com

PATENT OWNER:

Anthony E. Dowell
DOWELL IP
aedowell@dowellip.com

Richard T. McCaulley
DOWELL IP
rmccaulley@mccaulleydowell.com