

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LENOVO (UNITED STATES) INC.
Petitioner,

v.

INTELLECTUAL VENTURES I LLC,
Patent Owner.

IPR2024-01224
Patent 7,623,439 B2

Before JAMESON LEE, LARRY J. HUME, and AMBERL. HAGY,
Administrative Patent Judges.

HUME, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

Lenovo (United States) Inc. (“Petitioner” or “Lenovo”), filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review (“IPR”) of claims 1–3, 7–11, 13–16, and 18 (“the challenged claims”) of U.S. Patent No. 7,623,439 B2 (Ex. 1001, “the ’439 patent”). Intellectual Ventures I LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). Petitioner subsequently filed a Motion for Leave for Authorization to File a Preliminary Reply (Paper 8), which was opposed by Patent Owner (Paper 9). We denied Petitioner’s request to file a Preliminary Reply (Paper 10), because Petitioner did not show good cause for granting the motion.

In the Petition, Petitioner acknowledged that the ’439 patent was the subject of a previously filed *inter partes* proceeding—*Zebra Technologies, Corporation v. Intellectual Ventures I LLC*, Case No. IPR2024-00883 (“the Zebra IPR”), which was filed on May 1, 2024—and that we (“the Board”) had not, as of the filing date of the Petition, yet ruled on whether to institute the Zebra IPR. Pet. 1. As in the Zebra IPR, Petitioner relies upon a particular reference (“Dammann,” Ex. 1005) in support of each of the grounds of unpatentability.

Petitioner further asserted “[s]hould the Board institute the Zebra IPR, Petitioner will file a Motion for Joinder no later than one month after the institution date of the Zebra IPR (37 C.F.R. § 42.122(b)), requesting joinder with the aforementioned Zebra IPR proceeding as the present petition is substantially identical to the Zebra IPR (Ex. 1018); both seek *inter partes* review of the same claims of the same patent on the same grounds.” Pet. 1.

We subsequently denied institution of *inter partes* review of the '439 patent in the Zebra IPR on November 20, 2024, based on Petitioner in that case failing to establish sufficiently that Dammann has a publication date prior to the effective filing date of the '439 patent. IPR2024-00883, Paper 10.¹

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute review. The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least [one] of the claims challenged in the petition.” 35 U.S.C. § 314(a); *see* 37 C.F.R. § 42.4 (2024).

Having reviewed the parties' papers and the evidence of record, and applying those standards, we determine that Petitioner has not shown a reasonable likelihood it would prevail in establishing the unpatentability of at least one challenged claim. Therefore, we decline to institute an *inter partes* review of any of challenged claims 1–3, 7–11, 13–16, and 18 of the '439 patent, based on the grounds raised in the Petition.

B. Real Parties-in-Interest

Lenovo identifies itself as the real-party-in-interest for Petitioner, and further identifies Lenovo Group Ltd. as a real party-in-interest. Pet. 1. Intellectual Ventures I LLC identifies itself as the real party-in-interest for Patent Owner. Paper 5, 2.

¹ Petitioner in the Zebra IPR requested Director Review of our denial of institution on December 19, 2024. IPR2024-00883, Paper 11. A Decision on that request has not yet been made.

C. *Related Matters*

In the as-filed Petition and Updated Mandatory Notice, Petitioner states that the '439 Patent is currently involved in a parallel district court case, i.e., *Intellectual Ventures ILLC et al. v. Lenovo Group Limited*, 6:23-cv-307 (W.D. Tex., filed April 26, 2023). Pet. 1; Paper 7, 1.

Patent Owner identifies other related district court litigations including:

1. *Intellectual Ventures ILLC et al. v. Lenovo Group Limited*, 6:23-cv-00309-ADA (W.D. Tex. April 26, 2023);
2. *Intellectual Ventures ILLC et al. v. OnePlus Technology (Shenzen) Co., Ltd.*, 6:23-cv-00290-ADA (W.D. Tex. April 20, 2023); and
3. *Intellectual Ventures ILLC et al. v. Zebra Technologies Corporation*, 6:23-cv-00292-ADA (W.D. Tex. April 20, 2023).

Paper 5, 2.

In addition to the Zebra '883 IPR identified above, the parties also indicate that the '439 patent was asserted in another Petition for *inter partes* review, i.e., *TCL Electronics Holdings LTD. and TCL Industries Holdings Co., LTD. v. Intellectual Ventures ILLC*, Case No. IPR2024-01244 (“the TCL IPR”), which was filed July 31, 2024. Paper 5, 2; Paper 7, 2. After filing of the instant Petition, institution of *inter partes* review was denied in the TCL IPR. IPR2024-01244, Paper 7.

D. *The '439 Patent (Exhibit 1001)*

The '439 patent is titled “Cyclic Diversity Systems and Methods.” Ex. 1001, code (54). The '439 patent issued November 24, 2009, from U.S. Patent Application No. 11/121,661, filed May 4, 2005, which claims the

benefit of U.S. Provisional Application No. 60/572,481, filed on May 20, 2004. *Id.* at codes (21), (22), (45), (60).

The '439 patent describes “[e]mbodiments of cyclic diversity systems and methods,” for example, an embodiment of a system that

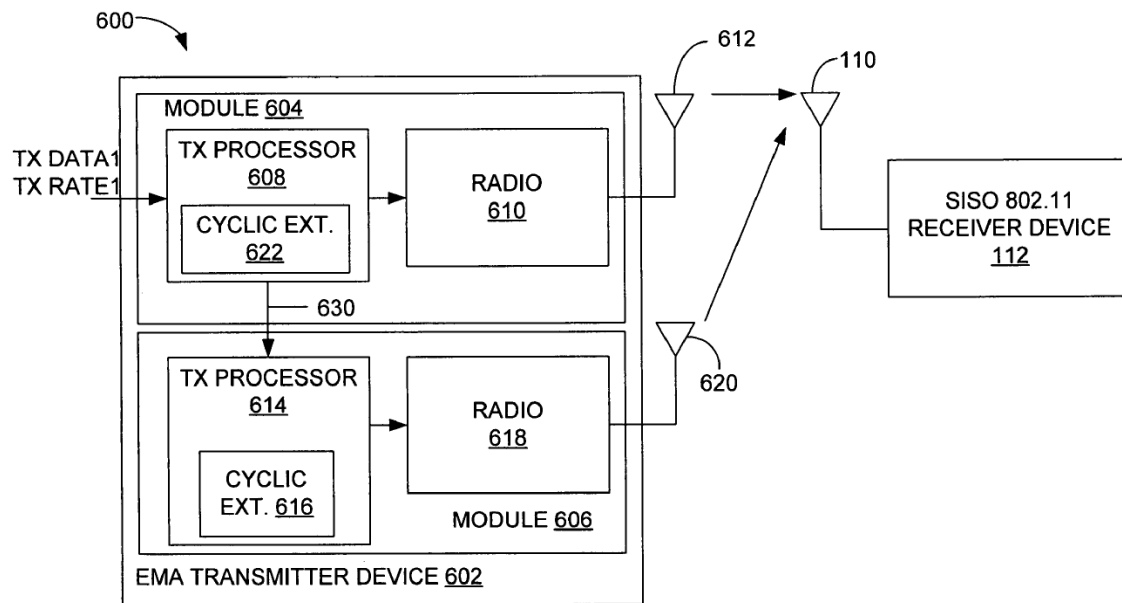
comprises a logic configured to cyclically advance, or perform the periodic equivalent of the same, one or more sections of an orthogonal frequency division multiplexing (OFDM) packet relative to the OFDM packet to be transmitted on a first transmit antenna, the packet having the one or more cyclically advanced sections to be transmitted on a second transmit antenna, the duration of the cyclic advance having a duration less than a guard interval.

See Ex. 1001, code (57). The '439 patent also describes an embodiment of a method that “comprises providing an orthogonal frequency division multiplexing (OFDM) packet corresponding to a first transmit antenna, and cyclically advancing, or the periodic equivalent, one or more sections of the OFDM packet corresponding to a second transmit antenna, the duration of the cyclic advance having a duration less than a guard interval.” *Id.* at 4:35–41.

The '439 patent discloses that “[b]y providing cyclic advances, cyclic shift diversity is employed which enables legacy receivers to experience improved packet error rate performance when compared to conventional diversity mechanisms, among other benefits.” *Ex. 1001, 5:37–41.* Unlike cyclic delay diversity, with cyclic advance diversity, “guard intervals are not consumed as they are in linear delay diversity” and there is no “net shifting of the FFT” (Fast Fourier Transformation) such that “the FFT placement remains substantially centered and unshifted” because the cyclic shifts created by cyclic extension modules “provide a shift that is in a direction opposite to any FFT shift that occurs in response to multi-path created by the

multiple antennas and reflections.” *Id.* at 7:48–58. According to the ’439 patent, “[s]mall cyclic advances are preferred over small cyclic delays” because the SISO (single-input, single-output) receiver “handles small amounts of delays or advances because they are designed in the context of expected multipath.” *Id.* at 7:59–62.

Figure 6 of the ’439 patent is reproduced below as a further aid in understanding the claimed invention.



’439 Patent – Fig. 6

Figure 6 of the ’439 patent is a “block diagram that illustrates a communication system comprising an embodiment of an enhanced, multiple antenna (EMA) transmitter device and a SISO transmitter device” (Ex. 1001, 5:5–8), in which communication system 600 comprises an embodiment of an enhanced, multiple-antenna (EMA) transmitter device 602 and legacy SISO receiver device 112. *Id.* at 5:42–47. EMA transmitter device 602 and SISO receiver device 112 may be

embodied in any wireless (e.g., radio frequency) communication device, including computers (desktop, portable,

laptop, etc.), consumer electronic devices (e.g., multi-media players), compatible telecommunication devices, personal digital assistants (PDAs), or any other type of network devices, such as printers, fax machines, scanners, hubs, switches, routers, set-top boxes, televisions with communication capability, etc.

Id. at 5:64–6:5.

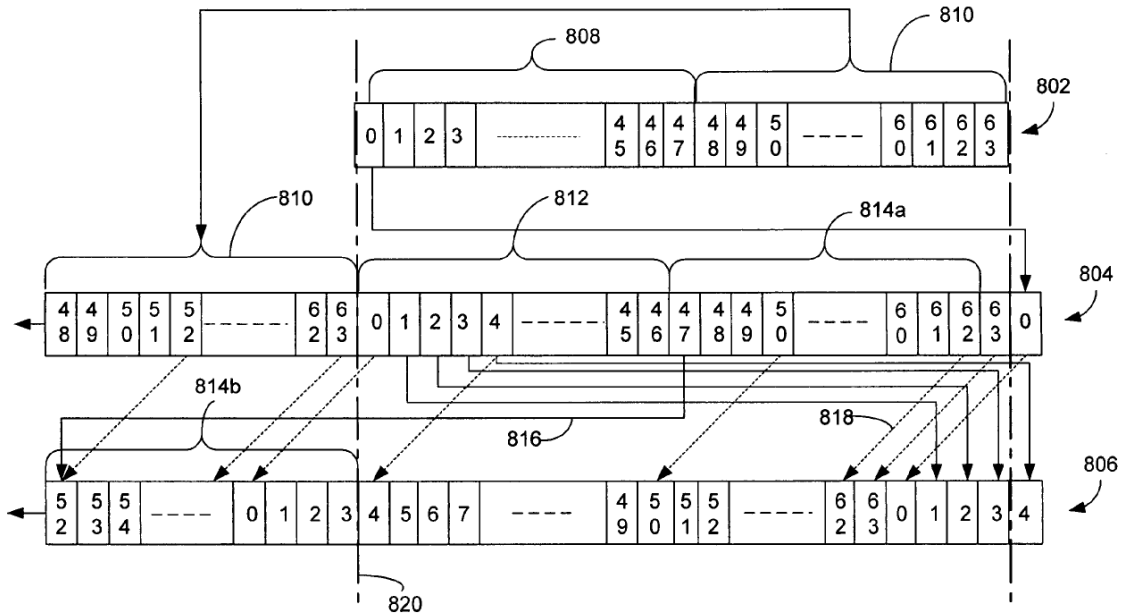
EMA transmitter device 602 or one or more of its components may be referred to as a cyclic diversity system and “may be implemented using individual SISO transmissions (e.g., one spatial stream per antenna) or using multiple-input, multiple-output (MIMO) technology that enables simultaneous or substantially simultaneous transmission over two or more spatial streams in the same spectrum” such that “cyclic diversity may be applied to MIMO one spatial stream preambles, headers, and data symbols as well as to one or more sections of SISO transmission packets.” Ex. 1001, 5:48–59. EMA transmitter device 602 comprises modules 604 and 606 and may be compliant with 802.11 standards. *Id.* at 5:61–64. Modules 604 and 606 comprise similar components and functionality, including transmit (TX) processor 608, 614 with cyclic extension module 616, 622; antenna 612, 620; and radio circuitry 610, 618 in communication with TX processor 608, 614 and antenna 612, 620. *Id.* at 6:6–34.

TX processor 608, 614 “includes baseband processing modules (i.e., logic, such as hardware and/or software) that comprise functionality for encoding, interleaving, mapping, and OFDM symbol generation and processing” and uses cyclic extension module 616, 622 as part of the symbol generation and processing functionality. Ex. 1001, 6:6–14. Cyclic extension module 616, 622 “provides for cyclic extension (e.g., guard intervals) insertion and cyclic advance diversity” and “may provide for delay

diversity (cyclic and/or linear).” *Id.* at 6:10–17. TX processors 608, 614 “encode and interleave the incoming data (designated TX data 1 at TX data rate 1 at module 604, which is also provided to module 606 as represented by connection 630)” and “map the interleaved data into respective sub-carrier channels as frequency domain symbols.” *Id.* at 6:42–47.

OFDM symbols are created using Inverse Fast Fourier Transform (IFFT) logic, which performs an Inverse Fast Fourier transformation on the frequency domain symbols in baseband processing circuitry of TX processors 608, 614. Ex. 1001, 6:47–51. TX processors 608, 614 provide the processed data to radio circuitry 610, 618, “which provides such well-know[n] functions as filtering, modulation, amplification, and conversion (e.g., upconversion) functionality” and “provide[s] the processed signals (e.g., no advance and no delay, and advanced, respectively) to antennas 612 and 620, from which the transmitted signals are delivered to SISO receiver device 112.” *Id.* at 7:18–26. “The signals transmitted from antennas 612 and 620 are received at antenna 110 of SISO receiver device 112, demodulated and converted to baseband, and processed to recover the transmitted data.” *Id.* at 7:27–30.

Figure 8 of the '439 patent illustrates 4-sample cyclic advance diversity as implemented by communication system 600 shown in Figure 6, reproduced below.



'439 Patent – Fig. 8

Figure 8 of the '439 patent includes first tier 802, second tier 804, and third tier 806. “[F]irst tier 802 represents 80 total samples comprising 64 samples of symbol data 808 and 16 samples that are used for a guard interval 810,” and “second tier 804 is simply an extension of the first tier 802, showing the guard interval corresponding to samples 810 adjacent to the next set of samples,” which “comprises 64 samples of symbol data 812 and 16 samples corresponding to the guard interval 814a.” Ex. 1001, 7:33–40. “[T]hird tier 806 represents a 4-sample cyclic advance shift,” which “results in the guard interval 814b preceding the 80 sample symbol in the third tier 806 starting with sample 5/2, as represented by line 816.” *Id.* at 7:40–44. Dotted arrow-head lines 818 represent the shift of all of the other samples, and dashed line 820 shows that guard intervals 810, 814b remain aligned. *Id.* at 7:44–48.

E. Illustrative Claims

Of the challenged claims,² claims 1 and 8 are independent. Challenged claims 2, 3, and 7 directly or indirectly depend from claim 1, and claims 9, 10, 11, 13–16, and 18 directly or indirectly depend from claim 8. For purposes of this Decision, claims 1 and 8 are illustrative of the challenged claims and are reproduced below (with formatting added for clarity and with bracketed alphanumeric identification added by Petitioner for ease of reference):

Claim 1 recites:

[1 Preamble] A method for transmitting orthogonal frequency division multiplexing (OFDM) signals comprising:

[1A] generating a first OFDM packet for transmission including a guard interval portion and a symbol data portion each comprised of a plurality of samples;

[1B] cyclically advancing the first OFDM packet by shifting the samples in a first direction an amount less than a sample duration of the guard interval portion to generate a shifted version of the first OFDM packet for transmission in which at least a non-zero number of the samples from the symbol data portion of the first OFDM packet are shifted into the guard interval portion of the shifted version and a same non-zero number of samples from the guard interval portion of the first OFDM packet are shifted out of the guard interval portion of the shifted version; and

[1C] substantially simultaneously transmitting the first OFDM packet and the shifted version of the OFDM packet.

² We note independent claim 19 and claims 20 and 21, depending from claim 19, have not been challenged in the Petition.

Ex. 1001, 9:32–49; *see* Pet. 14–15, 33–42 (Full Statement of the Reasons for the Relief Requested).

Claim 8 recites:

[8 Preamble] A signal transmitting system for transmitting orthogonal frequency division multiplexing (OFDM) signals comprising:

[8A] a first transmit processor for generating a first OFDM packet for transmission including a guard interval portion and a symbol data portion each comprised of a plurality of samples;

[8B] a second transmit processor for cyclically advancing the first OFDM packet by shifting the samples in a first direction an amount less than a sample duration of the guard interval portion to generate a shifted version of the first OFDM packet for transmission in which at least a non-zero number of the samples from the symbol data portion of the first OFDM packet are shifted into the guard interval portion of the shifted version and a same non-zero number of samples from the guard interval portion of the first OFDM packet are shifted out of the guard interval portion of the shifted version;

[8C] a plurality of radio transmitters for converting the OFDM packet and the shifted version of the OFDM packet to corresponding radio signals; and

[8D] a plurality of radio antennas correspondingly coupled to the plurality of radio transmitters for transmitting the radio signals;

[8E] wherein the first transmit processor and the second transmit processor are configured to substantially simultaneously cause the transmission of the first OFDM packet and the shifted version of the OFDM packet via corresponding transmitters and antennas.

Ex. 1001, 10:7–36; *see* Pet. 46–54 (Full Statement of the Reasons for the Relief Requested).

F. Asserted Challenges to Patentability

Petitioner asserts Grounds 1 and 2 of unpatentability as shown in the table below. Pet. 5, 33–62.

Ground	Claims Challenged	35 U.S.C. §	References/Basis
1	1, 3, 7–10, 13, 14, 16	103(a) ³	Dammann, ⁴ Hervin ⁵
2	2, 11, 15, 18	103(a)	Dammann, Hervin, Kannan ⁶

Pet. 4–5.

Petitioner asserts Dammann, Hervin, and Kannan qualify as prior art under at least 35 U.S.C. § 102(b). Pet. 22–23, 25–26; *see* 35 U.S.C. § 102(b).

Patent Owner contends Petitioner has failed to show that Dammann qualifies as a prior art printed publication under 35 U.S.C. § 102(b). Prelim. Resp. 42–52.

³ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (2011), amended several provisions of 35 U.S.C. including sections 102 and 103. Because the ’439 patent has an effective filing date before the AIA’s effective date (March 16, 2013), this decision refers to pre-AIA 35 U.S.C. §§ 102(b) and 103(a). *Cf.* Pet. 5, 33 *et seq.* (referring to § 103).

⁴ Armin Dammann et al., *On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM* (Ex. 1005, “Dammann”).

⁵ U.S. Patent No. 5,961,575, issued Oct. 5, 1999 (Ex. 1006, “Hervin”).

⁶ U.S. Patent App. Pub. No. 2002/0122499 A1, published Sept. 5, 2002 (Ex. 1007, “Kannan”).

G. Testimonial Evidence

Petitioner supports its challenge with a declaration from Zhi Ding, Ph.D. Ex. 1003, “Ding Declaration.”⁷

Patent Owner supports its arguments with a declaration from Gary Lomp, Ph.D. Ex. 2001, “Lomp Declaration.”

II. ANALYSIS

A. Legal Standards

“In an [inter partes review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc.*, 815 F.3d at 1363 (citing 35 U.S.C. § 312(a)(3) (requiring inter partes review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in inter partes review).

The legal 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 ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). One seeking to establish obviousness based on more than one reference also must articulate sufficient reasoning with rational

⁷ Petitioner relies upon Dr. Ding’s declaration from the related case, IPR2024-00883, Ex. 1003.

underpinnings to combine teachings. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

We analyze the obviousness challenges according to these principles.

B. Level of Ordinary Skill in the Art

Factors pertinent to “determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) prior-art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field.”

Envtl. Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* “These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art.” *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). Moreover, the prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Supported by the testimony of Dr. Ding, Petitioner asserts the level of ordinary skill in the art corresponds to a person having “a bachelor’s degree in electrical engineering, computer engineering, or the equivalent, from an accredited program, and two or more years of experience with wireless communications networks.” Pet. 21 (citing Ex. 1003 ¶ 38). Petitioner contends that “[m]ore practical experience could qualify one not having the aforementioned education as a [person of ordinary skill in the art (POSITA)], while a higher level of education could offset lesser experience.” *Id.*

Patent Owner does not address the level of ordinary skill in the art.
See generally Prelim. Resp.

We note that the open-ended “or more” language set forth by Petitioner expands the range of experience indefinitely with no upper bound. Therefore, we do not adopt this aspect of Petitioner’s formulation. Based on the record before us, and as modified above, we adopt Petitioner’s position as to the level of ordinary skill in the art at the time of the claimed invention, as articulated above. On this record, we are satisfied that Petitioner’s proposed definition, apart from the “or more” language, generally comports with the level of ordinary skill as reflected by the ‘439 patent and the asserted prior art. This definition also is supported by the testimony of Dr. Ding. *See* Ex. 1003 ¶ 38.

C. *Claim Construction*

In an *inter partes* review, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b). In applying such standard, claim terms are generally given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Petitioner proposes a construction for the limitation reciting “cyclically advancing the first OFDM packet by shifting the samples in a first direction” in claims 1 and 8. Pet. 22. According to Petitioner, “[d]uring the Underlying Litigation, Petitioner explained that this term should be construed to mean ‘cyclically advancing the first OFDM packet by shifting the samples in the direction of transmission.’ Patent Owner argued that the correct construction is plain and ordinary meaning.” *Id.* Petitioner contends “[t]he construction Petitioner presented during the Underlying Litigation is correct, because that construction is the plain and ordinary meaning,” but “the scope of the claims includes the prior art under any reasonable construction” so “the Board does not need to construe any claim term for purposes of evaluating whether the claims cover the prior art addressed in this Petition.” *Id.*

Patent Owner takes no position on the meaning of any claim terms; however, Patent Owner indicates that the district court construed “cyclically advancing the first OFDM packet by shifting the samples in a first direction” as “cyclically advancing the first OFDM packet by shifting the samples in the direction of transmission” (*i.e.*, Petitioner’s proposed construction). Prelim. Resp. 22 n.2 (citing Ex. 2005, 8; Ex. 2006, 25–26).

We do not find it necessary to address the construction of any claim terms or phrases to decide whether Petitioner satisfies the “reasonable likelihood” standard for instituting trial. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (noting that “we 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))).

D. Summary of Asserted Prior Art References

1. Dammann (Ex. 1005)

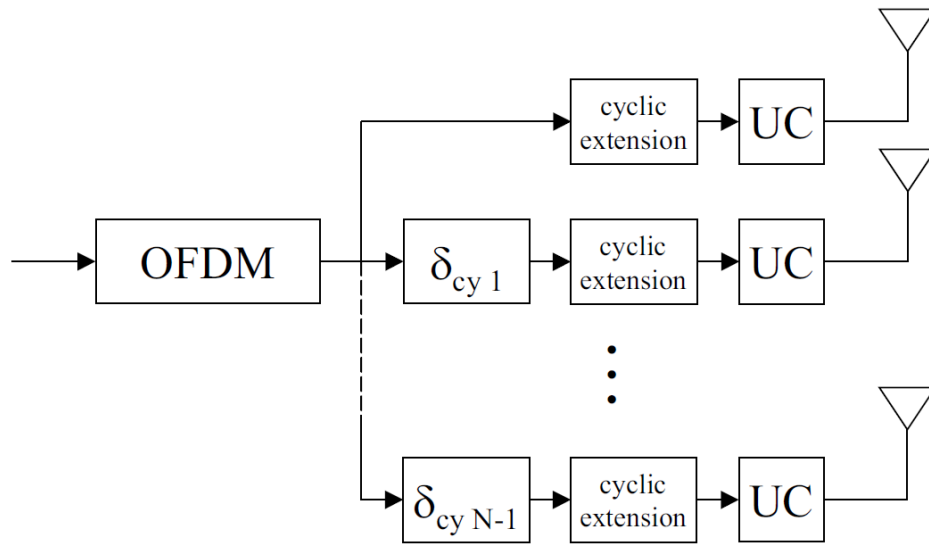
a) Overview

Dammann is a document titled “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM.” Ex. 1005, 1. Dammann purports to show “the equivalence of Space-Time block coding to multipath propagation with respect to Cyclic Delay Diversity [(CDD)] for OFDM systems.” *Id.*

According to Dammann, “[m]obile communication systems mainly suffer from time-varying multipath fading with extremely different multipath intensity profiles,” but “[o]rthogonal frequency division multiplexing (OFDM) is a suitable technique for broadband transmission in multipath fading environments and is implemented in new broadcast standards like terrestrial digital video broadcasting (DVB-T) as well as wireless local area network (WLAN) standards such as HIPERLAN/2 or IEEE 802.11a.” Ex. 1005, 1 (citations omitted). Dammann reports that “it is necessary for wireless communications systems to use techniques like interleaving and channel coding in addition to OFDM. These techniques add redundancy and diversity in time and frequency direction.” *Id.*

Dammann describes, “[f]or many scattering environments, spatial diversity is another effective way to improve the error performance of wireless radio systems” and “space-time-coding is proposed in order to get the benefits of channel coding in combination with spatial (antenna) diversity.” *Id.* Other approaches “to achieve spatial diversity effects for OFDM systems are techniques like Delay Diversity, Cyclic Delay Diversity [(“CDD”)] or Phase Diversity.” *Id.*

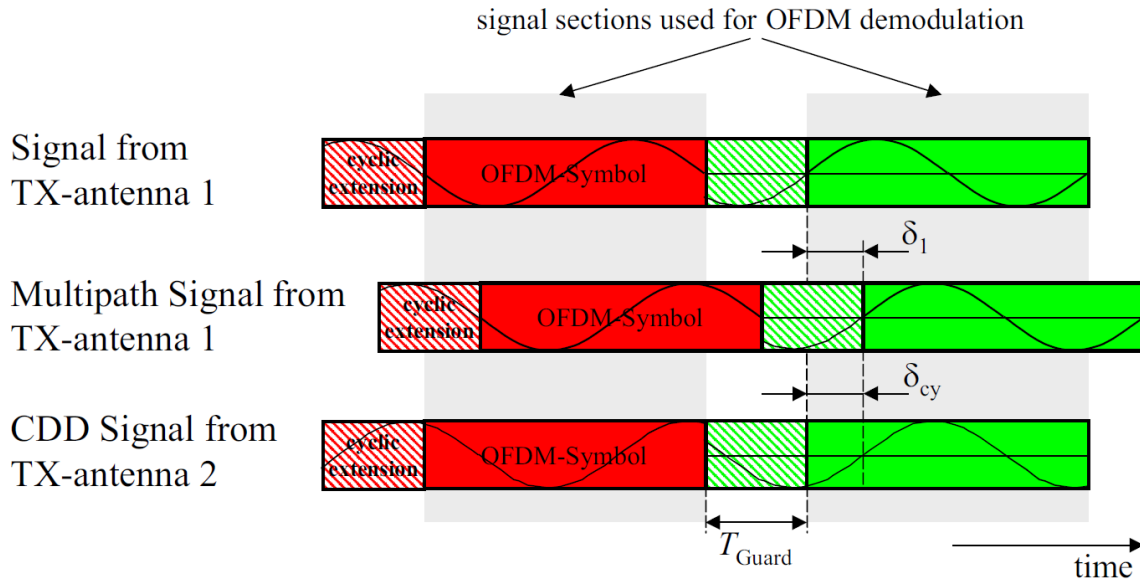
Dammann describes the application of CDD to OFDM systems in Figure 1, which is reproduced below.



Dammann – Fig. 1

Figure 1 “shows the block diagram of an N -antenna OFDM transmitter with CDD.” Ex. 1005, 1. In Figure 1, “ $\delta_{cy n}, n = 1, \dots, N - 1$, denote cyclic shifts of the OFDM symbol in the time domain.” *Id.* The OFDM modulated signal in Figure 1 “is transmitted over N antennas, whereas the particular signals only differ in an antenna specific cyclic shift.” *Id.* “After cyclic shifting, a cyclic prefix is inserted to avoid intersymbol interference and maintain subcarrier orthogonality for multipath channels,” and “[t]he functional block ‘UC’ performs an upconversion of the signals from the baseband into RF-band.” *Id.*

Figure 2 shows the equivalence between multipath propagation and CDD and is reproduced below.



Dammann – Fig. 2 (coloration in original)

In Figure 2, an OFDM time signal with cyclic extension is transmitted from antenna 1 (TX-antenna 1) and a second CDD OFDM time signal is transmitted from antenna 2 (TX-antenna 2) such that “the OFDM time domain symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1.”

Ex. 1005, 2. In Figure 2, “ T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel” and “one carrier is drawn as a sine wave with a different phase per OFDM symbol.” *Id.*

Dammann states that “we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1 .” *Id.*

According to Dammann, “[t]he cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when $T_{Guard} \geq \delta_{max} (\geq \delta_1)$.” *Id.* According to Dammann, if the signal sections used for OFDM demodulation are compared, “one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel

model” such that “an arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range.” *Id.*

b) Dammann’s Status as a Printed Publication

Petitioner contends Dammann is a technical paper that was presented at a conference in 2002, and qualifies as prior art to the ’439 patent under 35 U.S.C. § 102(b) as of the conference date of February 27, 2002. Pet. 22–23 (citing Exs. 1014–1016). Patent Owner disagrees (Prelim. Resp. 42–65) and contends “[t]he Petition lacks the evidence required to demonstrate that Dammann was a ‘printed publication’ before the priority date of the ’439 Patent.” *Id.* at 43. As pointed out by Patent Owner (Prelim. Resp. 46, 52–65), the asserted priority date of the ’439 patent under 35 U.S.C. § 119(e) is the filing date of the corresponding provisional application serial no. 60/572,481, filed on May 20, 2004. Ex. 1001, (60). Therefore, to be considered prior art, the asserted references, Dammann included, must have a publication date that predates the ’439 patent’s priority date of May 20, 2004.

The burden of persuasion always remains with Petitioner. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016) (“In an *inter partes* review, the burden of persuasion is on the petitioner to prove ‘unpatentability by a preponderance of the evidence,’ 35 U.S.C. § 316(e), and that burden never shifts to the patentee.”). At this stage, we assess whether Petitioner has demonstrated a reasonable likelihood of prevailing. 35 U.S.C. § 314(a).

Only patents and printed publications may serve as the applied prior art under 35 U.S.C. §§ 102 and 103 in a petition for *inter partes* review.

35 U.S.C. § 311(b). Therefore, Dammann must qualify as a printed publication to be applied as prior art by Petitioner.

Our reviewing court holds that “[p]ublic accessibility” is the “touchstone” in determining whether a prior art reference constitutes a printed publication. *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 772 (Fed. Cir. 2018); *Jazz Pharm., Inc. v. Amneal Pharm., LLC*, 895 F.3d 1347, 1355 (Fed. Cir. 2018); *In re Hall*, 781 F.2d 897, 898–99 (Fed. Cir. 1986). A reference is considered publicly accessible if it was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter can locate it with exercise of reasonable diligence. *Acceleration Bay*, 908 F.3d at 772; *Jazz Pharm.*, 895 F.3d at 1355–56 (citing *In re Wyer*, 655 F.2d 221, 226 (CCPA 1981)).

We observe that the Petition never cites or analyzes the Board’s precedential *Hulu* decision⁸ regarding the accessibility requirement for a printed publication to be considered as prior art, and also never squarely addresses the key issue of whether Dammann was publicly accessible. Instead, Petitioner asserts that “Dammann is a technical paper, which was presented at the European Wireless 2002 conference titled ‘Next Generation Wireless Networks: Technologies, Protocols, Services and Applications,’ in Florence, Italy on February 27, 2002.” Pet. 22 (citing Exs. 1014, 1016). Petitioner further contends the conference “was sponsored by at least Alcatel, Ericsson, IAT, Omnitel, Vodafone, Siemens, and Telecom Lab Italia,” and notes that “152 papers, including Dammann, were accepted for

⁸ *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 (PTAB Dec. 20, 2019) (precedential) (“*Hulu*”).

presentation in the conference and publication in the proceedings. . . . Thus, Dammann is prior art to the '439 Patent under at least Section 102(b).” *Id.* at 23 (citing Ex. 1014; Ex. 1015; Ex. 1016 at 1, 6).

Exhibit 1014 is described by Petitioner as a screenshot from The Wayback Machine - <https://web.archive.org/web/20021028185444/http://docenti.ing.unipi.it:80/ew2002/>, and is reproduced below:

European Wireless 2002
Next Generation Wireless Networks:
Technologies, Protocols, Services and Applications
February 25-28, 2002 – Florence, Italy

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Important Dates:

Paper Submissions Due	September 15, 2001 (*)
Notification of Acceptance	November 15, 2001 (**)
Camera-Ready Versions Due	December 15, 2001
Conference Dates	February 26-28, 2002

(*) Due to the many requests received the paper submission deadline has been extended to September 22, 2001.

(**) Due to the many papers received the notification of acceptance will be delayed of approximately 10 days.

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Exhibit 1014, page 1, purports to depict a “Webpage for European Wireless 2002 Conference,” described by Petitioner as being archived by The Wayback Machine on October 28, 2002, allegedly obtained from the website “docenti.ing.unipi.it,” and which purportedly lists key dates for the conference. Pet. iv (Exhibit List), 22.

Petitioner also relies upon Exhibit 1016, page 1, a relevant portion of which is reproduced below:

Wednesday, February 27, 2002					
	<u>Monday 25</u>	<u>Tuesday 26</u>	<u>Wednesday 27</u>	<u>Thursday 28</u>	
Time	Track A	Track B	Track C		
9.00					
9.15					
9.30	<u>Ad Hoc Wireless Networks I</u>	<u>Capacity of Wireless Networks</u>	<u>Signal Equalization and Channel Estimation</u>		
9.45					
10.00					
10.15					
10.30	Coffee Break				
10.45					
11.00	<u>QoS in Wireless</u>	<u>QoS and Services in Mobile Internet</u>	<u>Modulation and Signal Synchronization</u>		
11.15					
11.30					
11.45					
12.00					
12.15					
12.30	Lunch				
12.45					
13.00					
13.15					
13.30					
13.45					
14.00	<u>Energy Efficient Computation</u>	<u>Advanced Wireless Systems and Services</u>	<u>Space-Time Signal Processing for Wireless Systems</u>		
14.15					
14.30					
14.45					
15.00					
15.15	Coffee Break				
15.30					
15.45	<u>New MAC Protocol for QoS Guarantees in Wireless Networks</u>	<u>Mobile Agents in Wireless Networks</u>	<u>Channel Coding: from Theory to Practice</u>		
16.00					
16.15					
16.30					
16.45					

The excerpt of page 1 of Exhibit 1016, above, purportedly illustrates a “Webpage for European Wireless 2002 Conference – Schedule,” purportedly archived by the Wayback Machine on November 23, 2004, allegedly obtained from the website “docenti.ing.unipi.it.” Pet. iv (Exhibit List), 22. According to Petitioner, Exhibit 1016 depicts the scheduled date and time for a presentation called “Space-Time Signal Processing for Wireless Systems,” allegedly discussing the Dammann reference accepted for presentation in the conference (Pet. 23), and offered as § 102(b) prior-art evidence in this proceeding.

Exhibit 1016, page 6, also cited by Petitioner, is partially reproduced below:



The excerpt of page 6 of Exhibit 1016, above, appears to reference a conference session titled “Space-Time Signal Processing for Wireless Systems,” archived by The Wayback Machine on November 23, 2004, allegedly obtained from the website “docenti.ing.unipi.it,” and which

purportedly discusses the subject “On the equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM,” in which the authors of the Dammann reference are listed as participants.

We note the first page of the Dammann reference itself, as well as the remaining four pages, are devoid of *any* publication date, associated conference, or conference date. *See* Ex. 1005, 1 *et seq.* Thus, Petitioner relies *solely* on Exhibits 1014 through 1016 to assert Dammann is prior art under at least 35 U.S.C. § 102(b). Pet. 22–23.

Patent Owner responds, “[t]he Petition lacks the evidence required to demonstrate that Dammann was a ‘printed publication’ before the priority date of the ’439 Patent,” i.e., May 20, 2004. Prelim. Resp. 43. Patent Owner argues that Exhibits 1014 and 1015 do not even mention the Dammann paper offered as evidence by Petitioner. *Id.* at 43–44. As for Exhibit 1016, Patent Owner points out that the “docenti.ing.unipi.it” archive date of this exhibit is November 23, 2004, which is *after* the asserted critical date of the ’439 patent. *Id.* at 46. Patent Owner does, however, acknowledge that Exhibit 1016, page 6, “makes mentions Dammann” in the “Space-Time Signal Processing for Wireless Systems” conference session. *See* Prelim. Resp. 47.

Petitioner ultimately has the burden to prove that Dammann is a printed publication. *See Jazz Pharm.*, 895 F.3d at 1356. At this stage, we assess whether Petitioner has submitted evidence “sufficient to establish a reasonable likelihood” that Dammann is a printed publication. *Hulu* at 3.

As our reviewing court has held, “public accessibility” requires more than technical accessibility. *Acceleration Bay*, 908 F.3d at 773. “A reference is considered publicly accessible if it was ‘disseminated or

otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it.” *Id.* at 772. Because there is no evidence of record that Dammann was actually physically disseminated to the public, such as at the conference site, our inquiry is focused on whether an interested skilled artisan, using reasonable diligence, would have found Dammann on the “docenti.ing.unipi.it” website.

Patent Owner argues:

Exhibits 1014-1016 fail to demonstrate that Dammann was disseminated in any way before the effective filing date of the '439 Patent. While Exhibit 1015 refers to certain unnamed papers being “accepted” for “publication in the proceedings” — there is no evidence that any of the “proceedings” were in fact published at the time of the conference. For example, Petitioner has failed to show that there was a physical publication that included “accepted” papers that was provided to conference participants. Nor has Petitioner shown that, at the time of the conference, there was a website from which conference participants (or members of the public) could access a copy of Dammann. Significantly, Exhibit 1016 (the only archived web page that even mentions Dammann) is dated November 23, 2004 — which is two years after the conference, and after the priority date of the '439 Patent (May 20, 2004).

Prelim. Resp. 49.

Patent Owner further contends, “Exhibits 1014-1016 are archived pages from a website called ‘docenti.ing.unipi.it.’ The Petition fails to explain what relationship existed — if any — between ‘docenti.ing.unipi.it’ and the ‘Wireless Conference 2002.’ Given the complete absence of information about the ‘docenti.ing.unipi.it’ website, there is no evidence that a POSITA would have known to even look at ‘docenti.ing.unipi.it’ for relevant information.” *Id.* “Thus, even if Exhibit 1016 was [sic] dated

before the priority date of the '439 Patent, it still would fail to demonstrate that Dammann met the standard for public accessibility required under Section 102(b) (Pre-AIA), because the Petition contains no evidence that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, could have located Dammann.” *Id.* at 50.

As our reviewing court has explained, it is “critical” that there be “some evidence that a person of ordinary skill could have reasonably found” a reference that is proffered as an invalidating printed publication. *Samsung Elecs. Co. v. Infobridge Pte. Ltd.*, 929 F.3d 1363, 1369, 1372 (Fed. Cir. 2019). In agreement with Patent Owner, we note the lack of any testimonial evidence of record that a person interested in wireless diversity in OFDM systems would have been aware of the “docenti.ing.unipi.it” website as a place to search for such subject matter. *See* Prelim. Resp. 51; *see also Blue Calypso v. Groupon*, 815 F.3d 1331, 1349–50 (Fed. Cir. 2016) (holding that the patent challenger failed to point to any evidence that the reference at issue was viewed or downloaded, or that a query of a search engine before the critical date, using any combination of search words, would have led to the reference at issue appearing in the search results).

Our precedential decision in *Hulu*, cited above, holds “at the institution stage, the petition must identify, with particularity, evidence sufficient to establish a reasonable likelihood that the reference was publicly accessible before the critical date of the challenged patent and therefore that there is a reasonable likelihood that it qualifies as a printed publication.” *Hulu* at 13.

For the reasons given above, on this record, and in agreement with Patent Owner, we determine that, even for purposes of institution, Petitioner has failed to meet its threshold burden under *Hulu* to show a reasonable

likelihood that the Dammann reference was publicly accessible before the critical date. As a result, we determine that Petitioner fails to sufficiently establish, even for purposes of institution, that Dammann qualifies as a printed publication under 35 U.S.C. § 102(b) with a publication date prior to the '439 patent's effective filing date.

2. *Hervin (Ex. 1006)*

a) *Summary*

Hervin is a U.S. patent titled “Microprocessor Having Combined Shift and Rotate Circuit” and issued on October 5, 1999. Ex. 1006, codes (45), (54). The invention described in Hervin generally relates to “microprocessors and, more particularly, to a microprocessor having a multiple stage shifter which selectively performs preprocessing and shift/rotate/pass operations to produce improved performance of shift/rotate operations.” *Id.* at 1:7–11.

For example, Hervin describes a “[c]ircuit for performing arithmetic operations in a 32-bit architecture” that “includes a five stage shift and rotate circuit coupled between first and second 32-bit busses in the following sequence: an 8-bit shift and rotate circuit, a 16-bit shift and rotate circuit, a 1-bit shift and rotate circuit, a 2-bit shift and rotate circuit and a 4-bit shift and rotate circuit.” *Id.* at code (57). Hervin discloses that the invention “is directed to a circuit for performing arithmetic operations which both reduces the number of interconnections necessary to provide a combined shifter/rotator circuit while eliminating the need for a preconditioning unit used to pre-process byte and word sized operands to be used in shift/rotate operations performed in 32-bit architectures.” *Id.* at 2:7–13.

According to Hervin, “[d]igital circuitry for performing arithmetic operations such as shift and/or rotate operations have long been known in the art.” Ex. 1006, 1:13–15. “In a shift operation, data stored in a storage device, commonly referred to as a shift register, is moved relative to the boundaries of the device” such that “[a]n arithmetic shift right effects a divide by 2 operation while an arithmetic shift left effects a multiply by 2 operation.” *Id.* at 1:15–19. In a circular shift operation or rotation, “the rightmost and leftmost positions in the shift register are treated as being adjacent during the shift.” *Id.* at 1:19–21. According to Hervin,

[a] rotate operation may be a rotate left (or “ROL”) operation in which all of the bits of an operand are shifted left by one or more positions and the most significant bits are shifted around to become the least significant bits or a rotate right (or “ROR”) operation in which all of the bits of the operand shifted right by one or more positions and the least significant bits are shifted around to become the most significant bits.

Id. at 1:21–29.

b) Hervin’s Status as Analogous Art

Patent Owner contends the Petition fails to show that Hervin is analogous art. Prelim. Resp. 38–40. The Petition does not address whether Hervin is analogous art to the invention claimed in the ’439 patent.

See generally Pet.

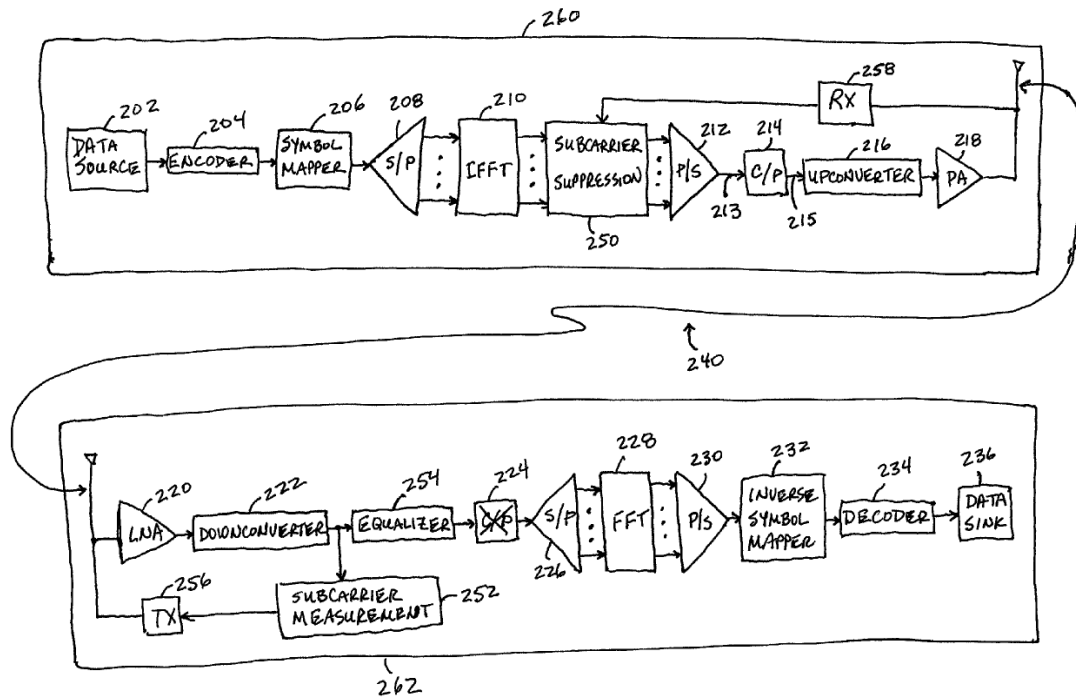
For purposes of our decision declining to institute trial, we need not reach a determination as to whether Hervin is analogous art to the claimed invention. *See, e.g., Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (explaining that an administrative agency “is at perfect liberty” to reach a decision based on a “single dispositive issue”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-

precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding”).

3. *Kannan (Ex. 1007)*

Kannan is a U.S. patent application publication titled “Method and Apparatus for Error Reduction in an Orthogonal Modulation System,” filed on December 22, 2000, and published on September 5, 2002. Ex. 1007, codes (12), (22), (43), (54). Kannan describes a method and apparatus which “reduces error in a communication system that includes multiple orthogonal subcarriers by suppressing a subcarrier in a transmitting communication device and by equalizing a received signal in a receiving communication device.” *Id.* at code (57).

Figure 2 shows an embodiment of the invention described in Kannan and is reproduced below.



200

FIG. 2

Kannan – Fig. 2

Figure 2 is a block diagram of communication system 200 that includes transmit side 260 and receive side 262. Ex. 1007 ¶ 25. Communication system 200 may be “a cellular telephone system in which the transmit side 260 is embodied within a cell phone or other type of subscriber radio unit, and the receive side 262 is embodied within a base station or other fixed receiving equipment, or vice versa.” *Id.* Transmit side 260 includes data source 202 that provides user information, such as data in binary form, to encoder 204. *Id.* ¶ 28. Encoder 204 “applies an error correcting code, preferably a forward error correction code (FEC), to the data,” encodes the data using a convolutional code such as a Viterbi coding algorithm or a block code, and outputs a bit stream to symbol mapper 206. *Id.* ¶¶ 28–29. “Symbol mapper 206 groups the bit stream into groups of P bits (P-tuples) and maps each P-tuple to a corresponding symbol to produce a symbol stream” and then “conveys the symbol stream to an S/P converter 208.” *Id.* ¶¶ 29, 31.

In one embodiment, “S/P converter 208 converts the symbol stream from a serial to a parallel form, producing N parallel symbols wherein N is the number of subcarriers contained in a frequency bandwidth allocated for a communication session,” and then “applies the N parallel symbols to an orthogonal modulator 210.” Ex. 1007 ¶ 31. “[W]hen fewer than the N subcarriers are modulated by orthogonal modulator 210, S/P converter 208 produces a quantity of parallel symbols corresponding to a quantity of subcarriers modulated by the orthogonal modulator.” *Id.* “Orthogonal modulator 210 modulates each subcarrier of N orthogonal subcarriers by a symbol of the N parallel symbols, wherein each subcarrier corresponds to a sub-band included in the frequency band” and conveys subcarriers constituting the IFFT output to subcarrier suppression block 250 that

“suppresses one or more subcarriers and conveys both the suppressed subcarriers and the non-suppressed subcarriers, or alternatively only the non-suppressed subcarriers, to a parallel-to-serial (P/S) converter 212” to provide a first layer of error reduction. *Id.* ¶¶ 32–33, 35. Orthogonal modulator 210 may implement its functionality “with an inverse fast Fourier transform (IFFT), or alternatively with an inverse discrete Fourier transform (IDFT)” such that “[t]he N parallel symbols are provided as input to the IFFT and the IFFT outputs N parallel subcarriers Φ_n , wherein each subcarrier of the N parallel subcarriers is modulated by a corresponding input symbol of the N parallel input symbols.” *Id.* ¶ 33.

P/S converter 212 is preferably a multiplexer and “converts the subcarriers received from subcarrier suppression block 250, or alternatively from orthogonal modulator 210, from a parallel form to a serial form to produce an output signal” and “conveys output signal 213 to a cyclic prefix (C/P) adder 214 that appends a guard band interval, or cyclic prefix, to signal 213 to produce output signal 215.” Ex. 1007 ¶ 40. The “C/P adder 214 conveys output signal 215 to an upconverter 216 that upconverts signal 215 from a baseband frequency to a transmit frequency,” and “[t]he upconverted signal is conveyed to power amplifier (PA) 218 that amplifies the signal and transmits the amplified signal via an antenna” to the receive side 262 of the communication system 200. *Id.* ¶¶ 41–42.

4. *Knowledge of a Person of Ordinary Skill in the Art*

Petitioner contends various figures and disclosures in the '439 patent constitute applicant admitted prior art (“AAPA”) within the knowledge of a person of ordinary skill in the art. Pet. 11–13, 19–21. According to Petitioner, “the '439 Patent describes that each of Figures 1-2, 3A, 3B, 4A,

4B, and 5 are all prior art, including for each of those figures, an express notation that the Figure itself is prior art” in the form of a label that says “(PRIOR ART).” *Id.* at 10.

Patent Owner contends Petitioner improperly relies on the detailed description of the ’439 patent as evidence of the prior art. Prelim. Resp. 28–29.

However, because our decision not to institute trial is based upon other reasons, i.e., on this record, Petitioner has not met its threshold burden of establishing that Dammann is a prior art printed publication to the claims of the ’439 patent, for purposes of denial of institution, we need not reach the issue of whether Petitioner’s reliance upon various disclosures of the ’439 patent is improper.

E. Ground 1: Alleged Obviousness of Claims 1, 3, 7–10, 13, 14, and 16 over Dammann and Hervin in View of the Knowledge of a Person of Ordinary Skill in the Art Under § 103

Petitioner contends the subject matter of challenged claims 1, 3, 7–10, 13, 14, and 16 would have been obvious over Dammann and Hervin in view of the knowledge of a person of ordinary skill in the art. Pet. 31–57. Patent Owner argues that Petitioner’s showing is insufficient. Prelim. Resp. 27–40.

We have considered the parties’ arguments and the evidence presented. For the reasons explained above, including Patent Owner’s arguments, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that the subject matter of claims 1, 3, 7–10, 13, 14, and 16 would have been obvious over Dammann and Hervin in view of the knowledge of a person of ordinary skill in the art.

We reach this conclusion because Petitioner has not sufficiently shown that Dammann has a publication date prior to the effective filing date

of the '439 patent. Accordingly, Dammann is not available in this proceeding as prior art to the claims of the '439 patent.

F. Ground 2: Alleged Obviousness of Claims 2, 11, 15, and 18 over Dammann, Hervin, and Kannan in View of the Knowledge of a Person of Ordinary Skill in the Art Under § 103

Petitioner contends claims 2, 11, 15, and 18 are unpatentable under § 103(a) as obvious over Dammann, Hervin, and Kannan⁹ in view of the knowledge of a person of ordinary skill in the art. *See* Pet. 58–62.

For the reasons stated above in connection with Ground 1, in particular because of our conclusion that Petitioner has failed to demonstrate that Dammann is prior art, Petitioner has not shown a reasonable likelihood that it would prevail in establishing obviousness of any of claims 2, 11, 15, and 18 over Dammann, Hervin, Kannan, and the knowledge of a person of ordinary skill in the art.

G. Objective Indicia of Nonobviousness

Patent Owner contends the Petition is “deficient because it fails to address — let alone dispute — the experimental results in the specification demonstrating the superior performance of the claimed cyclic advances over the small cyclic delays in the prior art.” Prelim. Resp. 41.

Because we conclude, as discussed above, that Petitioner’s application of prior art lacks sufficient merit, we need not reach the issue of whether

⁹ *See* Pet. 26 (stating that Kannan is prior art at least under 35 U.S.C. § 102(b)). Patent Owner does not take issue with Petitioner’s general statement that Kannan qualifies as prior art to the '439 patent under § 102(b). *See generally* Prelim. Resp.

objective indicia of non-obviousness mitigate against the obviousness challenges in our Decision.

III. CONCLUSION

As explained above, we determine that Petitioner has not established a reasonable likelihood of prevailing in its challenge to at least one claim of the '439 patent.

IV. ORDER

It is:

ORDERED that the Petition is *denied*, and no trial is instituted.

IPR2024-01224
Patent 7,623,439 B2

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