Trials@uspto.gov
571-272-7822

Paper 16
Date: December 10, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.,
Patent Owner.

IPR2025-01069
Patent 10,313,077 B2

Before TERRENCE W. McMILLIN, JON M. JURGOVAN, and DANIEL J. GALLIGAN, *Administrative Patent Judges*.

GALLIGAN, *Administrative Patent Judge*.

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

APPLE 1128 Apple Inc. v. HBCU
IPR2026-00107

I. INTRODUCTION

A. Background

Samsung Electronics Co., Ltd. ("Petitioner") filed a Petition for *inter partes* review (Paper 2 ("Pet." or "Petition")) challenging claims 1–14 of U.S. Patent 10,313,077 B2 (Ex. 1001 (the "'077 patent")). Wilus Institute of Standards and Technology Inc. ("Patent Owner") filed a Preliminary Response. Paper 10 ("Prelim. Resp."). The parties filed additional authorized papers to address various issues. Papers 12–15.

This Petition has been referred to the Board to determine whether to institute review. Paper 11. 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 the Preliminary Response shows "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

For the reasons explained below, we institute an *inter partes* review of all challenged claims on all grounds raised in the Petition.

B. Related Matters

As required by 37 C.F.R. § 42.8(b)(2), the parties identify various related matters. Pet. 77; Paper 4 at 1–2; Paper 7 at 1–2.

C. Real Parties in Interest

Petitioner identifies itself and Samsung Electronics America, Inc. as the real parties in interest. Pet. 77. Patent Owner identifies itself as the real party in interest. Paper 4 at 1; Paper 7 at 1.

D. Illustrative Claim of the '077 Patent

Claim 1 is reproduced below with Petitioner's identifiers in brackets. *See* Pet. v.

1. [pre] A wireless communication terminal that communicates wirelessly, the terminal comprising:

[1] a transceiver; and a processor, wherein the processor is configured to

[a] receive a non-legacy physical layer frame by using the transceiver,

[b] obtain a legacy signaling field including information decodable by a legacy wireless communication terminal from the non-legacy physical layer frame,

[c] obtain length information indicating information on a duration of the non-legacy physical layer frame, from the legacy signaling field,

[d] obtain information other than information on the duration of the non-legacy physical layer frame through a remaining value obtained by dividing the length information by a data size transmittable by a symbol of a legacy physical layer frame, wherein the data size transmittable by a symbol of the legacy physical layer frame is 3 octets when a data rate of the legacy physical layer frame is 6 Mbps, and

[e] determine the number of symbols of data of the non-legacy physical layer frame according to a following equation,

$N_{SYM} =$

$$\left\lfloor \left(\frac{L_{LENGTH} + m + 3}{3} \times 4 - T_{HE_PREAMBLE} \right) / T_{SYM} \right\rfloor - b_{PE_Disambiguity}$$

where ⌊x⌋ denotes a largest integer less than or equal to x,

L_LENGTH denotes the length information,

m denotes a value obtained by subtracting the remaining value from the data size transmittable by a symbol of the legacy physical layer frame,

$b_{PE_Disambiguity}$ denotes a value of PE Disambiguity field,

$T_{HE_PREAMBLE}$ denotes a duration of non-legacy preamble of the nonlegacy physical layer frame,

> T_{SYM} denotes a duration of a symbol of the data of the non-legacy physical layer frame,
>
> wherein the PE Disambiguity field is set based on the duration of a symbol of the data of the non-legacy physical layer frame and an increment of duration to set a value of the length information based on a duration of a symbol of the legacy physical layer frame.

E. Asserted Grounds of Unpatentability

Petitioner presents the following grounds (Pet. 1–2):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–5, 8–12	103[1]	Bharadwaj,[2] Yu[3]
4, 5, 11, 12	103	Bharadwaj, Yu, Azizi[4]
6, 7, 13, 14	103	Bharadwaj, Yu, Kenney[5]
1–5, 8–12	103	Bharadwaj
4, 5, 11, 12	103	Bharadwaj, Azizi
6, 7, 13, 14	103	Bharadwaj, Kenney

II. ANALYSIS

A. Principles of Law

A patent claim is unpatentable "if the differences between the claimed invention and the prior art are such that the claimed invention as a whole

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[1] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013, which precedes the earliest priority date for the '077 patent. Ex. 1001, code (30). Therefore, we apply AIA §§ 102 and 103.

[2] US 2016/0345202 A1, published Nov. 24, 2016 (Ex. 1006), incorporating US Provisional Application No. 62/170,059 (Ex. 1007 ("Bharadwaj-Prov059")).

[3] US 2016/0286012 A1, published Sept. 29, 2016 (Ex. 1019), incorporating US Provisional Application No. 62/145,428 (Ex. 1020 ("Yu-Prov428")).

[4] US 2016/0127948 A1, published May 5, 2016 (Ex. 1015).

[5] US 2015/0139205 A1, published May 21, 2015 (Ex. 1010).

would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains." 35 U.S.C. § 103; *see also 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 ordinary skill in the art; and (4) any secondary considerations, if in evidence.[6] *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner argues that a person of ordinary skill in the art "would have had a Bachelor's degree in electrical engineering, computer engineering, computer science, or a related field, and at least 3 years of experience in the research, design or development of wireless communication devices, systems, and/or networks, or the equivalent, as of the Critical Date," which Petitioner identifies as August 20, 2015. Pet. 2, 10 (citing Ex. 1003 ¶ 42). Petitioner also contends that "[i]ncreased educational experience can make up for less work experience, and vice versa." Pet. 10.

Patent Owner responds as follows:

> Patent Owner does not dispute this definition except to the extent that Petitioner requires that the required experience and/or education level be acquired by the Critical Date, [Patent Owner] objects to this requirement because it is not relevant or needed for someone to be a [person of ordinary skill in the art].

Prelim. Resp. 2.

[6] Patent Owner has not introduced secondary considerations evidence.

Patent Owner's position is unclear, but we provide the following guidance on possible interpretations. To the extent Patent Owner disputes the critical date, Patent Owner should explain what date should apply.

To the extent Patent Owner contends that a person of ordinary skill in the art need not be defined as of the critical date, we disagree. Under Section 103, we must determine "if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious *before the effective filing date* of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains" (emphasis added). "Obviousness is determined from the vantage point of a hypothetical person having ordinary skill in the art to which the patent pertains." *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). Thus, we define the hypothetical person of ordinary skill in the art as of a time before the effective filing date.

To the extent Patent Owner's argument is that, to testify from the perspective of a person of ordinary skill in the art, one need not have been a person of ordinary skill in the art as of the critical date, we agree. Although one must at least possess ordinary skill in the art to testify from the perspective of a person of ordinary skill,

> [a]n expert need not have acquired that skill level prior to the time of the invention to be able to testify *from the vantage point* of a person of ordinary skill in the art. Rather, an expert can acquire the necessary skill level later and develop an understanding of what a person of ordinary skill knew at the time of the invention.

Osseo Imaging, LLC v. Planmeca USA Inc., 116 F.4th 1335, 1341 (Fed. Cir. 2024).

To the extent necessary, and for purposes of this Decision, we accept the uncontested assessment offered by Petitioner, which appears consistent with the '077 patent and the asserted prior art, except that we delete the qualifier "at least" to eliminate vagueness as to the amount of experience.

C. Claim Construction

The parties agree that no claim terms require express construction. Pet. 10; Prelim. Resp. 2–4. Patent Owner, however, notes that, in related district court litigation, Petitioner has asserted that some claims terms are indefinite. Patent Owner argues that the Petition should be denied because Petitioner has taken inconsistent claim construction positions between the district court and the Board. Paper 14 at 1–3 (citing *Tesla, Inc. v. Intellectual Ventures II LLC*, IPR2025-00340, Paper 18 at 4 (PTAB Nov. 5, 2025) (informative); *Revvo Techs., Inc. v. Cerebrum Sensor Techs., Inc.*, IPR2025-00632, Paper 20 at 4–5 (PTAB Nov. 3, 2025) (precedential)).

Petitioner responds that, in the related district court litigation, the parties have narrowed the claim construction disputes and that Petitioner accords the plain and ordinary meaning to claim terms and no longer asserts that any claim term of the '077 patent is indefinite. Paper 15 (citing, *inter alia*, Ex. 1126 (Defendants' Responsive Claim Construction Brief)). The evidence supports Petitioner's position because, in the related district court litigation, the defendants agree with the plaintiff (Patent Owner) that certain phrases in the '077 patent claims should be given their "[p]lain and ordinary meaning" and are "not indefinite." Ex. 1126, 6 (native page 1). Thus, the record does not show inconsistent claim construction positions that warrant denial under PTAB precedent. *See Revvo*, Paper 20 at 5 (addressing a situation in which a petitioner advances "different claim construction positions" in district court and at the PTAB).

On this record, we determine that no terms need express construction. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) ("The Board is required to construe 'only those 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. Alleged Unpatentability Based on Bharadwaj Alone and Based on the Combination of Bharadwaj and Yu (Claims 1–5, 8–12)

Petitioner asserts that claims 1–5 and 8–12 would have been obvious over Bharadwaj alone and also over the combination of Bharadwaj and Yu, specifically relying on the prior art disclosures in Bharadwaj-Prov059 and Yu-Prov428. Pet. 1–2, 13–65, 75–76. Patent Owner opposes. Prelim. Resp. 15–23.

1. Prior Art Status of Bharadwaj

Bharadwaj is a published US patent application that claims priority to two provisional applications, one of which is Provisional Application No. 62/170,059 (Ex. 1007, "Bharadwaj-Prov059"). Ex. 1006 ¶ 1. Petitioner argues that "Bharadwaj unambiguously incorporates the entire contents of Bharadwaj-Prov059, making Bharadwaj-Prov059 part of Bharadwaj's disclosure." Pet. 13. Patent Owner responds that, "[t]o the extent Petitioner relies on matters in Bharadwaj beyond 'incorporation by reference' of the Bharadwaj-Prov59, Petitioner failed to meet its burden of proving that these other matters in Bharadwaj are entitled to the priority date of its provisional application." Prelim. Resp. 20–21.

We agree with Patent Owner that Bharadwaj includes subject matter that is not in Bharadwaj-Prov59, namely the change from adding the value

of m to determine length at the transmitter to subtracting m. Prelim. Resp. 20; Ex. 1007 ¶ 51 (adding m); Ex. 1006 ¶ 50 (subtracting m); Prelim. Resp. 20. Petitioner, however, points out this change in the Petition and acknowledges that it is after the identified critical date of August 20, 2015. *See* Pet. 28. Thus, we do not understand Petitioner to be relying on Bharadwaj's disclosure of subtracting m to determine length, as disclosed in the publication of the non-provisional application, as a *prior art* disclosure.

We understand Petitioner to be relying on disclosures in Bharadwaj-Prov059 for *prior art* teachings for its obviousness contentions. Patent Owner does not appear to dispute that Bharadwaj-Prov59's disclosures are prior art, arguing instead that it is improper to rely "on matters in Bharadwaj beyond 'incorporation by reference' of the Bharadwaj-Prov59." *See* Prelim. Resp. 20–21.

On this record, we determine that Bharadwaj-Prov59's disclosures are prior art as of its June 2, 2015, filing date by virtue of its incorporation by reference into Bharadwaj, a published US patent application. Ex. 1006 ¶ 1; *see* Pet. 12–13.

2. Overview of Bharadwaj

Bharadwaj is a publication of a US patent application that claims priority to, and incorporates by reference, Bharadwaj-Prov59. Ex. 1006, code (60), ¶ 1. Bharadwaj-Prov59 discloses added a value m, which is either 1 or 2, to a length value included in a legacy signaling field so that the transmitted length value is not a multiple of 3. Ex. 1007 ¶ 51.

3. Overview of Yu

Yu is a publication of a US patent application that claims priority to, and incorporates by reference, Yu-Prov428. Ex. 1019, code (60), ¶ 1. Yu-Prov428 discloses subtracting a value M, which is 0, 1, or 2, from a

length value included in a legacy signaling field, which can indicate three different states. Ex. 1020, 16.

4. Claim 1

Petitioner argues that Bharadwaj-Prov59 discloses a wireless communication terminal comprising a transceiver and a processor, as recited in claim 1, citing Figure 13's depiction of block diagram of processing system 1314 showing processor 1304 coupled to transceiver 1310. Pet. 32–35; *see* Ex. 1007 ¶¶ 99 ("FIG. 13 shows a block diagram 1300 illustrating an example of a processing system 1314 that supports signal extension signaling operations."), 100 ("The processing system 1314 may be coupled to a transceiver 1310 via an interface 1308."), 100 ("The software, when executed by the processor 1004, causes the processing system 1314 to perform the various functions described in the disclosure for signal extension signaling.").

For the operation recited in limitation 1a ("receive a non-legacy physical layer frame by using the transceiver"), Petitioner argues that Bharadwaj-Prov59 discloses receiving IEEE 802.11ax data units (frames) and that IEEE 802.11ax is a non-legacy standard compared to IEEE 802.11ac, which is a legacy standard. Pet. 36–37 (citing Ex. 1007 ¶¶ 3, 29–31, 40, 43, Figs. 3A–3B, 4A–4B, 6A–6C; Ex. 1003 ¶¶ 87–90); *see* Ex. 1007 ¶¶ 3 ("[I]n the IEEE 802.11ax Wi-Fi standard, a larger number of tones are processed and decoded when compared to earlier or legacy Wi-Fi standards (e.g., IEEE 802.11ac)."), 29 ("The receiver device, however, has to process a received data unit and generate a response to the received data unit under IEEE 802.11ax in the same amount of time as it would have under the legacy IEEE 802.11ac.").

For the operations recited in limitations 1b ("obtain a legacy signaling field including information decodable by a legacy wireless communication terminal from the non-legacy physical layer frame") and 1c ("obtain length information indicating information on a duration of the non-legacy physical layer frame, from the legacy signaling field"), Petitioner argues that Bharadwaj-Prov59 discloses transmitting length information in the legacy signal field L-SIG, which is decodable by a legacy device, in IEEE 802.11ax (non-legacy) transmissions. Pet. 41–42 (citing Ex. 1007 ¶¶ 33, 44, 48, 51, 52; Ex. 1003 ¶¶ 91–92); *see* Ex. 1007 ¶ 48 ("In IEEE 802.11ax, the Length field (L_LENGTH) transmitted through the legacy signal (L-SIG) field in the legacy preamble can be used to indicate[] both the data unit (e.g., data unit 330) duration (TXTIME) and the signal extension.").

Limitation 1d recites

> obtain information other than information on the duration of the non-legacy physical layer frame through a remaining value obtained by dividing the length information by a data size transmittable by a symbol of a legacy physical layer frame, wherein the data size transmittable by a symbol of the legacy physical layer frame is 3 octets when a data rate of the legacy physical layer frame is 6 Mbps.

This limitation essentially requires obtaining a remainder from dividing the received length by 3. Petitioner argues that Bharadwaj-Prov59 discloses at a transmitter adding a value m, which is either 1 or 2, to the length value to distinguish IEEE 802.11ax transmissions from IEEE 802.11ac transmissions. Pet. 46 (citing Ex. 1007 ¶ 51; Ex. 1003 ¶ 96). Bharadwaj-Prov59 discloses that "[a]t the transmitter device (e.g., APl 105-a or STAl 115-a), the duration of the data unit 330 (e.g., physical layer convergence protocol (PLCP) data unit (PPDU)) is included in a Length field (L_LENGTH) of the legacy signal (L-SIG) field of the legacy preamble

335." Ex. 1007 ¶ 51. Bharadwaj-Prov59 discloses that L_LENGTH is determined as follows:

$$L_{LENGTH} = \left\lceil \frac{(TXTIME-20)}{4} \right\rceil \times 3 - 3 + m,$$

where m = 1, 2 and TXTIME = $T_{L_PREAMBLE}$ (legacy preamble) + $T_{HE_PREAMBLE}$ (high efficiency (HE) or 802.11ax preamble) + T_{DATA} (duration of data portion) + T_{SE} (signal extension duration). Ex. 1007 ¶ 51.[7] Petitioner argues that a person of ordinary skill in the art would have understood that the receiver device divides the length by 3 to obtain a remainder to distinguish legacy and non-legacy transmissions based on Bharadwaj-Prov59's disclosure that "[t]he value *m* shown above has been added in IEEE 802.11ax to ensure that L_{LENGTH} is not exactly a multiple of 3 and is therefore used to distinguish between IEEE 802.11ax and IEEE 802.11ac transmissions (e.g., auto-detections)" (Ex. 1007 ¶ 51). Pet. 48.

The operation recited in limitation 1e involves determining the number of symbols in a non-legacy frame according to the following equation:

$$N_{SYM} = \left\lfloor \left(\frac{L_{LENGTH}+m+3}{3} \times 4 - T_{HE_PREAMBLE} \right) / T_{SYM} \right\rfloor - b_{PE_Disambiguity}.$$

[7] Brackets styled ⌈⌉ denote a ceiling (rounding up) function, and those styled ⌊⌋ denote a flooring (rounding down) function; for example, 3.4 would be rounded to 4 in a ceiling function and to 3 in a flooring function. Ex. 1007 ¶¶ 48, 51.

Bharadwaj-Prov59 discloses that the number of symbols is calculated according to the following equation:

$$N_{SYM} = \left\lfloor \frac{(RXTIME - T_{L_PREAMBLE} - T_{HE_PREAMBLE})}{T_{SYM}} \right\rfloor - SE_{disambiguation_bit}.$$

Ex. 1007 ¶ 57. Bharadwaj-Prov59 discloses that RXTIME is equal to $\lceil (L_{LENGTH} - m + 3)/3 \rceil \times 4 + 20$. Ex. 1007 ¶ 56. Petitioner notes that, because $T_{L_PREAMBLE}$ is 20 µs (Ex. 1007 ¶ 59), Bharadwaj-Prov59's equation to determine the number of symbols reduces to the following:

$$N_{SYM} = \left\lfloor \left(\frac{L_{LENGTH} - m + 3}{3} \times 4 - T_{HE_PREAMBLE} \right) / T_{SYM} \right\rfloor - SE_{disambiguition_bit}.$$

Pet. 51.

Petitioner acknowledges that Bharadwaj-Prov059's equation to determine the number of symbols differs from the claimed equation, highlighting that, in Bharadwaj-Prov059's equation, m is subtracted rather than added. *See* Pet. 51 (highlighting "– *m*"), 56. Petitioner provides various reasons that it would have been obvious "to *subtract* rather than add m in the L_{LENGTH} equation" at the transmitter such that m would be added in the equation to determine the number of symbols at the receiver. Pet. 18–31, 56–57. For example, Bharadwaj-Prov059 discloses setting m to 1 or 2 "to ensure that L_{LENGTH} is not exactly a multiple of 3." Ex. 1007 ¶ 51. Petitioner correctly notes that "a non-zero remainder could only equal 1 or 2, which are the only values less than the divisor of 3." Pet. 19. Petitioner argues that a person of ordinary skill in the art "would have understood that the values of m=1 or 2 could only be applied as a constant offset by *addition* to the L_{LENGTH} equation at the transmitter (as disclosed in

Bharadwaj-Prov059) or *subtraction* from the L_{LENGTH} equation at the transmitter (as disclosed in Yu-Prov428)." Pet. 20 (citing Ex. 1003 ¶ 65). Petitioner argues that "Yu-Prov428 recognized a benefit to signaling additional information in the Length equation in a manner that involves *subtracting* m because it would not disturb the operation of legacy receivers that did not recognize m as additional signaling information." Pet. 20–21. Petitioner further argues that "it would have been obvious to try other predictable potential values for m, including m = −1 or −2." Pet. 31.

Patent Owner disputes Petitioner's contentions that it would have been obvious to arrive at the claimed formula's addition, rather than subtraction, of m. Prelim. Resp. 15–19, 21–23.

At the outset, we address Patent Owner's accusation that Petitioner and its technical declarant Dr. Ding made a "truly disingenuous" change to the equation in Bharadwaj-Prov059 to determine RXTIME by adding m rather than subtracting it. Prelim. Resp. 17–18 (citing Pet. 22, 57); *see also* Paper 13. We disagree because we do not understand Petitioner to have been attempting to represent that Bharadwaj-Prov059 actually discloses adding m to calculate RXTIME at the receiver. *See* Pet. 22 (RXTIME = $\left\lceil \frac{(240+m)+3}{3} \right\rceil \times 4 + 20$). Rather, we understand Petitioner's point to be that, when the actual length is 240, the transmitted length value would be 241 or 242, depending on whether m is 1 or 2, and that a legacy receiver would not account for the addition of m. *See* Pet. 22–23 (citing Ex. 1003 ¶ 67 ("[L]egacy 802.11ac devices do not compensate for the *m* value added to the *LENGTH* by the transmitter.")). Petitioner illustrates this by showing the following equations:

$$\text{RXTIME} = \left\lceil \frac{(240+m)+3}{3} \right\rceil \times 4 + 20 = 348.$$

Pet. 22.[8] Dr. Ding explains that such an incorrect RXTIME would mean that legacy devices defer channel access for longer than required. Ex. 1003 ¶ 67. Petitioner notes that the correct value would be 344 if the receiver knew that m were added to the transmitted length value. Pet. 22–23.

Patent Owner also cites page 57 of the Petition as an example of Petitioner's changing the formula in Bharadwaj-Prov059. Prelim. Resp. 17. Page 57 of the Petition, however, is laying out the proposed modification of Bharadwaj-Prov059's formula according to Petitioner's obviousness contentions. Pet. 57 ("By applying Yu-Prov428's suggestion to *subtract* m . . . .").

Thus, we do not agree with Patent Owner that Petitioner presented "disingenuous" representations of the teachings of Bharadwaj-Prov059. *See* Prelim. Resp. 17–18.

Patent Owner argues that a person of ordinary skill would not have changed Bharadwaj-Prov059's calculation of the number of symbols from subtracting m to adding m as of the critical date. Prelim. Resp. 15, 18–19. According to Patent Owner, the "industry's consensus at the time" was to subtract m, a technique that "was accepted by IEEE and was the industry standard even after the priority date of the '077 Patent." Prelim. Resp. 15. Patent Owner argues that the "industry did not recognize" that

[8] We invite the parties to address Bharadwaj-Prov059's calculation of L_{LENGTH} in paragraph 60. Given a TXTIME of 341.6 μs, the formula $\left\lceil \frac{TXTIME-20}{4} \right\rceil \times 3 - 3 + 1$ would appear to produce a value of 241 because (341.6 – 20) divided by 4 is 80.4, which would then be rounded up to 81, which would then be multiplied by 3 to get 243, from which 2 would be subtracted. Thus, Bharadwaj-Prov059's calculated length of 240 appears to be an error, which then propagates to the calculation of RXTIME of 344 μs in paragraph 62, rather than 348 μs.

Bharadwaj-Prov059's technique of adding m at the transmitter and subtracting it at the receiver adversely impacts legacy devices, as discussed above with respect to the example in the Petition (Pet. 22–23), "until after the priority date of the '077 Patent." Prelim. Resp. 13–14 (citing Ex. 1016 (November 2015 proposed revision)).

On this record, we find Petitioner's contentions of obviousness sufficiently persuasive. Bharadwaj-Prov059 discloses coding information in a remainder value of a division by 3 operation: "The value *m* shown above has been added in IEEE 802.11ax to ensure that LLENGTH is not exactly a multiple of 3 and is therefore used to distinguish between IEEE 802.11ax and IEEE 802.11ac transmissions (e.g., auto-detections)." Ex. 1007 ¶ 51. Yu-Prov428 also discloses coding information in this manner, noting that "the LENGTH [field] in the legacy SIG, can be used" and expressing length as follows:

$$\text{Length} = \frac{TXTIME-20}{4} \times 3 - 3 - M, 0 \leq M \leq 2.$$

Ex. 1020, 16. Yu-Prov428 states that "L-LENGTH can imply three different states with the value of M without changing the operation of the legacy receiver." Ex. 1020, 16.

On this record, we are sufficiently persuaded that, once the idea of coding information in a remainder of a division by 3 operation is known, there are four ways to accomplish that given a dividend (in this case, length information) that is a multiple of 3: add 1, add 2, subtract 1, and subtract 2. *See* Pet. 20. We recognize that, as a mathematical matter, the set of numbers that can be added to achieve a non-zero remainder of a division by 3 operation is technically infinite because any constant offset that is not divisible by 3 (e.g., 4, 5, 7, 8, etc. (*see* Pet. 19–20)) will yield a remainder

of 1 or 2. But for practical purposes, the constant offsets are 1 and 2, as reflected in Bharadwaj-Prov059 (Ex. 1007 ¶ 51) and Yu-Prov428 (Ex. 1020, 16). We are persuaded, on this record, that a person of ordinary skill in the art would have found it obvious to try adding 1 or 2 or subtracting 1 or 2 as these represent a finite number of options to signal information in a non-zero remainder of a division by 3 operation. *See* Pet. 31; Ex. 1003 ¶ 73. As the Supreme Court has stated, "[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp." *KSR*, 550 U.S. at 421.

Patent Owner also disputes Petitioner's argument that it would have been obvious "to use m = −1 or −2" (Pet. 23), which Patent Owner asserts is mathematically impossible because the length is not a negative value and thus would not yield a negative remainder. Prelim. Resp. 18. Although we agree that the remainder would not be negative, we understand Petitioner's contentions in this regard not to be "chang[ing] the definition of m in Bharadwaj-Prov59," as asserted by Patent Owner (Prelim. Resp. 18), but simply to be indicating a subtraction operation rather than addition, even if imprecisely presented. *See* Pet. 23 (asserting that a person of ordinary skill in the art "would have been motivated to use m = −1 or −2 (i.e., '−m')").

On this record, we are persuaded by Petitioner's contentions for limitation 1e based on Bharadwaj-Prov059 and the finite number of options for constant offsets to produce a remainder.

As to the combination with Yu-Prov428, Patent Owner argues that a person of ordinary skill in the art "would not be motivated to combine the two because they are of technically different fields. 'Bharadwaj' is related to an extension of a signal, and 'Yu' is related to a reduction of a signal

duration." Prelim. Resp. 21. According to Patent Owner, Bharadwaj-Prov059's lower case m signals different information from Yu-Prov428's capitalized M, which is "is defined to have a completely different definition relating to, e.g., the number of used data tones in the last symbol before padding." Prelim. Resp. 23.

On this record, we find Petitioner's reliance on Yu-Prov428 sufficiently persuasive. Even if Bharadwaj-Prov059 and Yu-Prov428 use m and M, respectively, to signal different information, as alleged by Patent Owner (Prelim. Resp. 21–23), both references still disclose using a legacy signaling field to encode information in a remainder of a division by 3 operation for a non-legacy (802.11ax) device. *See* Ex. 1007 ¶ 51 ("The value *m* shown above has been added in IEEE 802.11ax to ensure that LLENGTH is not exactly a multiple of 3 and is therefore used to distinguish between IEEE 802.11ax and IEEE 802.11ac transmissions (e.g., auto-detections)."); Ex. 1020, 16 (disclosing that "the LENGTH [field] in the legacy SIG, can be used" to "imply three different states with the value of M without changing the operation of the legacy receiver"). Claim 1 does not require specific information to be conveyed by the remainder value, just "information other than information on the duration of the non-legacy physical layer frame." Thus, claim 1 requires some information other than duration information to be obtainable via the remainder after dividing the length information by 3.

Patent Owner also argues that, "while Yu discloses the calculation for the length field, it provides no disclosure of calculations performed by a receiving device, such as N_{sym}." Prelim. Resp. 23. Bharadwaj-Prov059, however, discloses how to calculate N_{sym} (Ex. 1007 ¶ 57), and Petitioner explains how Bharadwaj-Prov059's N_{sym} calculation would change if a

constant offset were subtracted, rather than added, on the transmit side. Pet. 57–58.

For the reasons discussed above, we find Petitioner's contentions sufficiently persuasive for limitations 1d and 1e, and we are also persuaded by Petitioner's contentions for the remaining limitations of claim 1, which Patent Owner does not presently dispute. Therefore, we determine that there is a reasonable likelihood that Petitioner would prevail with respect to at least claim 1 based on Bharadwaj alone and based on the combination of Bharadwaj and Yu.

III. CONCLUSION

For the foregoing reasons, we determine that the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail in challenging at least one claim of the '077 patent, and we institute *inter partes* review of all challenged claims on all grounds raised in the Petition. *See* 37 C.F.R. 42.108(a) ("When instituting *inter partes* review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim."). At this stage of the proceeding, we have not made a final determination with respect to the patentability of any of the challenged claims or the construction of any claim term.

IV. ORDER

Accordingly, it is

ORDERED that, pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4, an *inter partes* review is hereby instituted as to claims 1–14 of the '077 patent on all challenges raised in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which will commence on the entry date of this decision.

FOR PETITIONER:

W. Karl Renner
Jeremy Monaldo
Nicholas Stephens
Kim Leung
FISH & RICHARDSON P.C.
axf-ptab@fr.com
jjm@fr.com
nstephens@fr.com
leung@fr.com

FOR PATENT OWNER:

Reza Mirzaie
Neil Rubin
Philip Wang
RUSS AUGUST & KABAT
rmirzaie@raklaw.com
nrubin@raklaw.com
pwang@raklaw.com