

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

G+ COMMUNICATIONS, LLC,
Patent Owner.

IPR2023-00171
Patent 10,763,130 B2

Before GREGG I. ANDERSON, JASON M. REPKO, and
JULIET MITCHELL DIRBA, *Administrative Patent Judges*.

ANDERSON, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

I. INTRODUCTION

Samsung Electronics Co. Ltd., (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–5, 7–9, 14, and 20 of U.S. Patent No. 10,736,130 B2 (Ex. 1001, “the ’130 patent”). Paper 1 (“Pet.”). G+ Communications, LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). We have authority under 35 U.S.C. § 314. Upon considering the record developed thus far, for reasons discussed below, we institute *inter partes* review.

Per our authorization, Petitioner filed a Preliminary Reply to Patent Owner’s Preliminary Response (Paper 7, “Pet. Prelim. Reply”) directed to discretionary denial, which is discussed in Sections III.A and B below. As we also authorized, Patent Owner responded with its Preliminary Sur-Reply (Paper 8, “PO Prelim. Sur-Reply”).

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner states it and Samsung Electronics America, Inc. are the real parties in interest. Pet. 1. Patent Owner asserts it is the real party in interest. Paper 4, 1.

B. *Related Matters*

Both parties list a lawsuit filed by Patent Owner asserting the ’130 patent against Petitioner in the Eastern District of Texas captioned *G+ Communications, LLC v. Samsung Electronics Co., Ltd., et al.*, Case No. 2:22-cv-00078-JRG (E.D. Tex.) (“Texas Litigation”). Pet. 1; Paper 4, 1. A related *inter partes* review proceeding is also identified, *Samsung Electronics Co., Ltd. V G+ Communications LLC*, IPR2022-01598 (“’1598 IPR”). Paper 4, 1; *see also* ’1598 IPR, Paper 10 (instituting *inter partes* review).

C. The '130 Patent

The application for the '130 patent was filed as national stage application No. 16/089,060 on March 24, 2017, from PCT/CN2017/078212 filed on September 27, 2018. Ex. 1001, code 21, 22, 86. The PCT application claims priority to Chinese application 2016 1 0206116 (“’116 application”), filed March 31, 2016. *Id.* at code 30.

1. Background Technology

In conventional LTE (Long Term Evolution) and LTE-A (Long Term Evolution-Advanced) “Transmission Time Interval (TTI) is a basic unit for scheduling downlink and uplink transmission in a time domain.” Ex. 1001, 1:14–19. In an “LTE/LTE-A Frequency Division Duplex (FDD) system, a time dimension is divided into radio frames having the length of 10 ms” each frame divided into ten subframes of 1 ms. *Id.* at 1:18–22. Each subframe is in turn divided into two time slots. *Id.* at 1:23–25. Thus, each subframe time slot is 0.5 ms in length. *Id.* 1:23–24.

Contrasted with LTE and LTE-A, 3GPP and 5G (3rd and 5th Generation Partnership Project) “will support a higher rate (Gbps), a massive link (1M/Km²), an ultra-low time delay (1 ms), higher reliability, hundredfold energy efficiency improvement and the like so as to support a new change in demand.” Ex. 1001, 1:32–37. The ultra-low time delay has “direct impact” on certain “time delay constrained services such as an Internet of vehicles” and other applications. *Id.* at 1:38–42.

Air interference adds 10 ms to the time delay index in LTE and LTE-A systems. Ex. 1001, 1:43–45. Reducing the length of the TTI is a solution. *Id.* at 1:45–46. However, this solution increases overhead of Reference Symbols (RS) of an existing Physical Uplink Control Channel (PUCCH)

used to send receipt of transmission Acknowledgements (ACK) or Negative Acknowledgements (NACK). *Id.* at 1:50–57.

2. The '130 Patent

In one embodiment shown in Figure 1, the '130 patent describes a “method for uplink control signal transmission.” Ex. 1001, 3:47–49. Figure 1 is reproduced below.

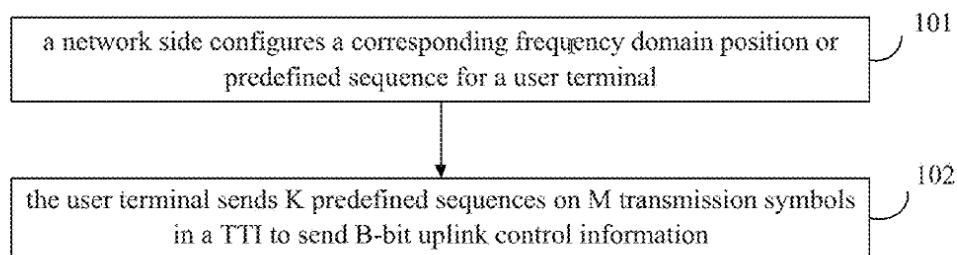


FIG. 1

Figure 1 is a flowchart of a method for uplink control signal transmission of one embodiment.

Ex. 1001, 2:58–60. The operations shown in Figure 1 include a network side 101 configuring a “frequency domain position or predefined sequence for a user terminal.” *Id.* at 3:52–54. A user terminal at 102 of Figure 1 sends “K predefined sequences on M transmission symbols in a TTI to send B-bit uplink control information.” *Id.* at 3:59–61. The number of transmission symbols “M is a positive integer, K is an integer, $1 \leq K \leq 2^B$, B is an integer greater than or equal to 1.” *Id.* at 3:62–63.

As illustrated in Figure 2, a symbol for an ACK and one for a NACK may be transmitted. Figure 2 is reproduced below.

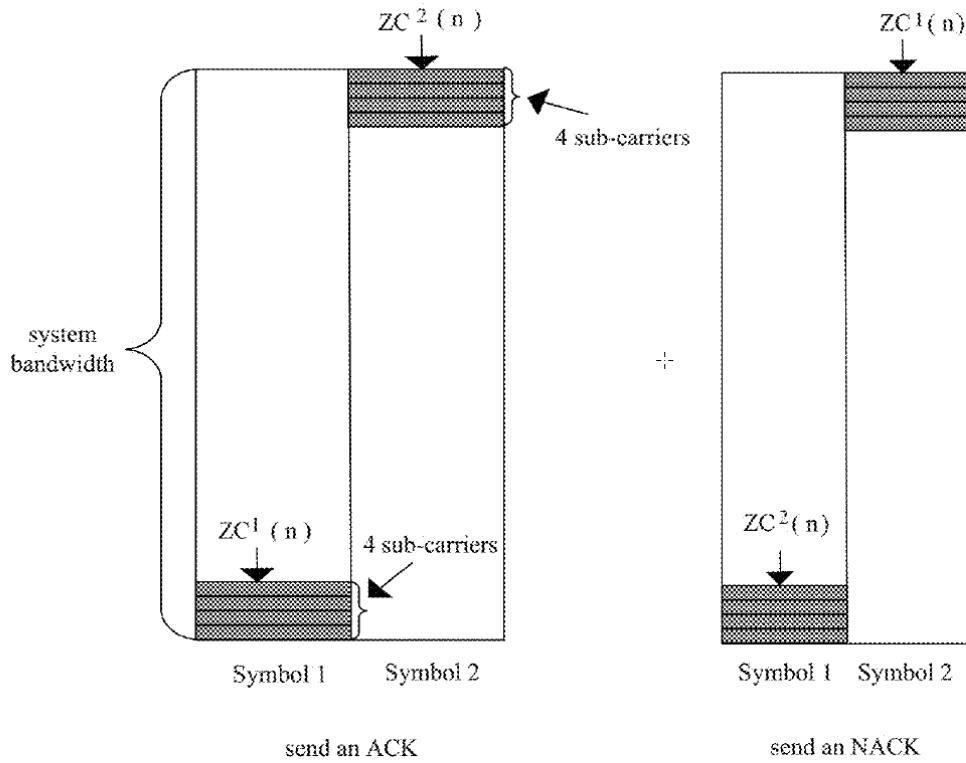


FIG. 2

Figure 2 is a schematic diagram showing a user terminal sending a 1-bit ACK/NACK using two predefined sequences having a length of 4 on two symbols.

Ex. 1001, 2:61–64. The two predefined sequences, $ZC_1(n)$ and $ZC_2(n)$, are distributed by a network to the user and are generated by the following formula:

$$ZC_q(n) = \exp\left(\frac{-jq\pi n^2}{N}\right)$$

Id. at 11:35–46. In the above formula, “q is a basic sequence index, and the $ZC_1(n)$ and the $ZC_2(n)$ may be obtained by respectively performing different time domain cyclic shifts on the basic sequence.” *Id.* at 11:46–49.

As further shown in Figure 2, “when the ACK message is sent, the user terminal sends the sequence $ZC_1(n)$ at the symbol 1 place, and sends the sequence $ZC_2(n)$ at the symbol 2 place.” Ex. 1001, 11:50–52. When the NACK message is sent, “the user terminal sends the sequence $ZC_2(n)$ at the symbol 1 place, and sends the sequence $ZC_1(n)$ at the symbol 2 place.” *Id.* at 11:53–55. The “frequency domain positions on the two symbols, to which the predefined sequences are mapped, are different, and are located at two sides of a system bandwidth.” *Id.* at 11:55–58. The ’130 patent discloses that,

by carrying the uplink control information to a scene having the TTI length being 2–4 symbols, a frequency diversity gain can be obtained; and thus, the demodulation complexity of noncoherent detection at a receiving end is low, the synchronization with the user terminal is convenient, and the transmission of the ACK/NACK and the SR [“Scheduling Request”] may be fed back during desynchronization. According to the technical solutions provided by the embodiments of the disclosure, the transmission efficiency of the uplink control information is improved, the data time delay is reduced, and thus the communication efficiency is improved.

Id. at 2:43–54, 1:53 (“SR”).

D. Illustrative Claim

Claims 1–5, 7–9, 14, and 20 of the ’130 patent are challenged. Pet. 2. Claims 1 and 20 are independent and claim a method and a device respectively. Claims 2–5, 7–9, and 14 depend directly or indirectly from claim 1.

1[.pre]¹ A method for uplink control signal transmission, comprising:

¹ Both parties identify each claim by claim number followed by a letter for each claim limitation. *See, e.g.,* Pet. 12–13 (claim 1); Prelim. Resp. xi

[1.a] sending, by a user terminal, K predefined sequences on M transmission symbols in a Transmission Time Interval (TTI) to send B-bit uplink control information,

[1.b] wherein M is a positive integer, K is an integer, $1 \leq K \leq 2^B$, B is an integer greater than or equal to 1,

[1.c] on each of the M transmission symbols, one of the K predefined sequences is sent and

[1.d] each of the K predefined sequences has a length of N and is mapped to N subcarriers of the transmission symbols corresponding to the each of the K predefined sequences,

[1.e] wherein $N=2n$ with n being a positive integer.

Ex. 1001, 27:15–25 (line breaks added); *see also id.* at 32 (certificate of correction).

E. Evidence of Record

This proceeding relies on the following prior art reference and Expert testimony:

Kwak, U.S. Patent No. 10,615,925 B2, issued Apr. 7, 2020 (Ex. 1005);

Kwak Provisional, U.S. Prov. Appln. No. 62/308,820, filed March 15, 2016 (Ex. 1006);

Petitioner relies on the Declaration of Dr. Zhi Ding in Support of Petition for Inter Partes Review of U.S. Patent No. 10,736,130 (Ex. 1002, “Ding Declaration”); and

(Claim Listing (claim 1)). We adopt that convention for purposes of this Decision.

Patent Owner relies on the Declaration of Robert Akl in Support of Patent Owner’s Preliminary Response (Ex. 2001, “Akl Declaration”).

F. Asserted Grounds

Claim(s) Challenged	35 U.S.C. ² §	Reference(s)/Basis
1–5, 7–9, 14, 20	102	Kwak ³
8, 9	103	Kwak ⁴

III. DISCRETION UNDER 35 U.S.C. § 314(a)

Institution of *inter partes* review is discretionary. *See Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016) (“[T]he [U.S. Patent and Trademark Office] is permitted, but never compelled, to institute an IPR proceeding.”). Patent Owner urges us to exercise discretion to deny institution of *inter partes* review under § 314(a) based on the factors established in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, 2020 WL 2126495, at 2–3 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”). Prelim. Resp. 45–

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-129, 125 Stat. 284, 285–288 (2011), revised 35 U.S.C. §§ 102 and 103 effective March 16, 2013. Because the challenged patent was filed after March 16, 2013, we refer to the current version of these statutes. The findings and analysis in this Decision would be the same under the pre-AIA versions.

³ Petitioner presents this as two separate grounds. For “Ground 1,” Petitioner relies on Kwak’s PCT filing date of December 9, 2016. Pet. 2, 12–40. For “Ground 2,” Petitioner relies on Kwak’s Provisional Application No. 62/308,820 filing date of March 15, 2016. Pet. 3, 40–76; *see also* Ex. 1005, code 60. Petitioner asserts that the latter is only necessary if Patent Owner alleges that the ’130 patent claims are entitled to the benefit of the March 31, 2016, filing date of the ’116 application. Pet. 3 n. 2.

⁴ Petitioner also presents this as two separate grounds. For “Ground 3,” Petitioner relies on Kwak’s PCT filing date (Pet. 3, 74–75), and for “Ground 4,” Petitioner relies on Kwak’s Provisional Application (*id.* at 3, 75–76).

52; PO Prelim. Sur-Reply. Petitioner urges us not to exercise such discretion. Pet. 76–79; Pet. Prelim. Reply.

On June 21, 2022, the Director of the USPTO issued an Interim Procedure for Discretionary Denials in AIA Post Grant Proceedings with Parallel District Court Litigation, *available at* https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf (the “Interim Procedure”). The Interim Procedure explains that “[c]onsistent with *Sotera Wireless, Inc.*, the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB.” Interim Procedure 3 (internal footnote omitted) (citing *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential as to § II.A)). The Interim Procedure explains that such a *Sotera* stipulation “mitigates concerns of potentially conflicting decisions and duplicative efforts between the district court and the PTAB [and] allows the PTAB to review grounds that the parallel district court litigation will not resolve.” *Id.* at 7–8.

In this proceeding, Petitioner stipulates that “it will not pursue an invalidity defense in the parallel district court action based on the same grounds as in this petition or any grounds that could have reasonably been raised before the PTAB.” Pet. Prelim. Reply 1. Petitioner asserts that its stipulation is the same as the one in *Sotera*. *Id.* at 1–2. Patent Owner does not dispute that Petitioner adopts the identical stipulation from *Sotera* but argues it “cannot cure the fact that [*Fintiv*] Factors 2, 3, 5 and 6 all remain heavily in favor of denying institution.” *See* PO Prelim. Sur-Reply 3.

We disagree with Patent Owner’s argument. *See id.* The *Fintiv* factors help the Board assess the potential for conflicting decisions and duplicative efforts when there is a PTAB proceeding held in parallel to district-court litigation. *See* Interim Procedure 1–2. But here, Petitioner’s *Sotera* stipulation ensures the grounds that the Board resolves will differ from those considered in the parallel district-court litigation. *See id.* at 7–8. This eliminates the potential for conflicting decisions and duplicative efforts. *See id.* Thus, in light of Petitioner’s stipulation, we decline to deny institution under *Fintiv*. *Id.* at 3.

IV. PATENTABILITY ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner proposes that a person of ordinary skill in the art for the invention of the ’130 patent “would have had an undergraduate degree in electrical engineering, computer engineering, computer science or a related field along with at least two years of work experience in the field of wireless communication technology.” Pet. 5 (citing Ex. 1003 ¶ 23). Patent Owner does not propose a level of ordinary skill. *See* Prelim. Resp.

For purposes of this Decision, we adopt Petitioner’s proposed level of ordinary skill because we are satisfied that it comports with the level of skill necessary to understand and implement the teachings of the ’130 patent.

B. Claim Construction

In an *inter partes* review, a claim shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history

pertaining to the patent. 37 C.F.R. § 42.100 (2019); *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

Petitioner asserts “claim terms are typically given their ordinary and customary meanings, as would have been understood by a [person of ordinary skill in the art] at the time of the invention, having taken into consideration the language of the claims, the specification, and the prosecution history of record.” Pet. 11–12 (citing *Phillips* 415 F.3d at 1313; *see also id.* at 1312–1316). Petitioner deems that express construction is unnecessary and does not propose any term for construction. *Id.* Patent Owner agrees and “requests that the Board adopt the ordinary and customary meaning of the claim terms as understood by one of ordinary skill in the art.” Prelim. Resp. 20.

However, as discussed below, Patent Owner does argue the meaning of certain claim terms. We identify these terms below and provide a preliminary construction.

1. “on each of the M transmission symbols, one of the K predefined sequences is sent” (limitation 1.c)

Patent Owner alleges that limitation 1.c, “on each of the M transmission symbols, one of the K predefined sequences is sent,” means “that for any signal being sent, only one sequence is sent on each symbol.” Prelim. Resp. 26–27 (quoting Ex. 1001, 12:54–13:12); Ex. 2001 ¶ 60 (Akl Declaration supporting testimony). Petitioner provides argument and evidence that the limitation is met even if construed as Patent Owner proposes. *See* Pet. 16 n.9 (“cyclically shifted sequence” is the recited “predefined sequence”), 18–19 (arguing first predefined sequence corresponding to CS index 0 *or* 6 is sent in symbol 0 and a second

predefined sequence corresponding to CS index 5 *or* 11 is sent in symbol 1) (emphasis added).

At this stage of the proceeding, we do not need to resolve this dispute because, even applying Patent Owner’s proposed construction (i.e., that “one” means “only one”), we are preliminarily persuaded that Kwak discloses this limitation, as explained in Section IV.G below. If Patent Owner elects to advance its proposed construction at trial, then it should identify (in the Patent Owner Response) any intrinsic and extrinsic evidence that supports its contention that “one,” as recited in this limitation, means “only one.”

2. “ $1 \leq K \leq 2^B$ ” (*limitation 1.b*)

Patent Owner alleges Kwak fails to disclose or teach the expression $1 \leq K \leq 2^B$, asserting that the expression “defines the number of sequences that can be used depending on the number of bits being sent.” Prelim. Resp. 31–32 (citing Ex. 2001 ¶ 51). Stated slightly differently, the question raised by Patent Owner is does the expression require that K be derived from B? In connection with this issue, the claim says “K *predefined* sequences.” Does this mean the number of sequences is predefined, precluding “deriving” the sequences?

At this stage and on the current record, we preliminarily determine that the intrinsic evidence in the form of the claim language does not require that the expression be met at all times. Rather, under the construction that we adopt for determining whether to institute trial, it is sufficient that, sometimes, the method operates in a way such that “M is a positive integer, K is an integer, $1 \leq K \leq 2^B$, B is an integer greater than or equal to 1.” The record at this stage does not indicate that K must be derived from B. Patent Owner argues as if the claim recites an *equation* for deriving K from B.

Prelim. Resp. 31–32. By contrast, the construction that we adopt for this decision treats the claim as if it recites a *condition* that K and B need only satisfy some of the time. In other words, under our preliminary construction, if Petitioner shows that $1 \leq K \leq 2^B$ is satisfied by an embodiment of Kwak, then Petitioner does not also need to show that Kwak separately discloses the condition ($1 \leq K \leq 2^B$).

During trial the parties should address the meaning of this claim limitation and whether “the expression $1 \leq K \leq 2^B$ defines the number of sequences that can be used depending on the number of bits being sent.” *See* Prelim. Resp. 32.

3. remaining terms

It may be that argument based on plain and ordinary meaning is sufficient for all remaining terms. The parties are cautioned that arguments not timely raised are forfeit. In other words, if a party raises a claim construction issue at a final hearing, it may be too late. In general, the parties should review this Decision, as well as the record developed during trial, for possible claim construction issues. Pending further development of the record, we proceed on the plain and ordinary meaning to a person of ordinary skill in the art as to all remaining claim terms.

C. Legal Standard for Anticipation

In order for a prior art reference to serve as an anticipatory reference, it must disclose every limitation of the claimed invention, either explicitly or inherently. *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). We must analyze prior art references as a skilled artisan would. *See Scripps Clinic & Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991), *overruled on other grounds by Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282 (Fed. Cir. 2009) (to anticipate, “[t]here must be no difference between the

claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention”). As the Federal Circuit has held:

This modest flexibility in the rule that “anticipation” requires that every element of the claims appear in a single reference accommodates situations where the common knowledge of technologists is not recorded in the reference; that is, where technological facts are known to those in the field of the invention, albeit not known to judges. It is not, however, a substitute for determination of patentability in terms of § 103.

Cont’l Can Co. USA v. Monsanto Co., 948 F.2d 1264, 1268–69 (Fed. Cir. 1991). A claim limitation is inherent if it is necessarily present in the prior art, not merely probably or possibly present. *Akamai Techs., Inc. v. Cable & Wireless*, 344 F.3d 1186, 1192 (Fed. Cir. 2003).

D. Legal Standard for Obviousness

A patent claim is invalid as obvious if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103(a).

The ultimate determination of obviousness is a question of law, but that determination is based on underlying factual findings. . . . The underlying factual findings include (1) “the scope and content of the prior art,” (2) “differences between the prior art and the claims at issue,” (3) “the level of ordinary skill in the pertinent art,” and (4) the presence of secondary considerations of nonobviousness such “as commercial success, long felt but unsolved needs, failure of others,” and unexpected results.

In re Nuvasive, Inc., 842 F.3d 1376, 1381 (Fed. Cir. 2016) (citing *inter alia* *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966)).

“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Furthermore, in assessing the prior art, the Board must consider whether a person of ordinary skill would have been motivated to combine the prior art to achieve the claimed invention. *Nuvasive*, 842 F.3d at 1381.

As the Federal Circuit found, in quoting from the Supreme Court’s decision in *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418–419 (2007),

“because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known,” “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.”

Personal Web Techs., LLC v. Apple, Inc., 848 F.3d 987, 991–92 (Fed. Cir. 2017).

E. Ding Declaration

Patent Owner argues we should give no weight to the Ding Declaration, Exhibit 1002, in part because the Declaration merely copies the Petition. Prelim. Resp. 22. This argument finds support in our recent decision in *Xerox*. See *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 (August 24, 2022) (precedential). In *Xerox*, we denied institution and held a declaration is entitled to little weight when it contains an exact restatement of the petition’s conclusory arguments without any additional supporting evidence or reasoning. Although we agree that the Petition and

the Ding Declaration are all but copies of each other, neither are devoid of supporting evidence or reasoning.

For the reasons explained below, at this stage, we are persuaded that the Petition and Ding Declaration are sufficiently supported by the disclosures from Kwak. The weight given to the Ding Declaration is not dispositive for any disputed issue.

F. Lack of Particularity

Patent Owner also alleges “the Petitioner’s anticipation grounds lack particularity and are not sufficiently developed.” Prelim. Resp. 24–25 (citing 35 U.S.C. § 312(a)(3); remaining citations omitted). Patent Owner more specifically alleges that Petitioner “fails to allege, let alone demonstrate, that Kwak discloses all of the claim limitations.” *Id.* at 25.

For reasons discussed below, we disagree.

G. Anticipation of Claims 1–5, 7–9, 14, and 20 by Kwak

Petitioner alleges claims 1–5, 7–9, 14, and 20 would have been anticipated by Kwak based on its filing date. Pet. 2–3, 12–40. Petitioner also alleges claims 1–5, 7–9, 14, and 20 would have been anticipated using the filing date of the Kwak Provisional because “at least one claim of the Kwak non-provisional is supported.” *Id.* at 40–74; *see also* Ex. 1002 ¶¶ 43 (Ding Declaration chart showing support for Kwak claim 15 in Kwak Provisional), 84–117 (mapping Kwak Provisional to challenged claims of ’130 patent).

At this time, Patent Owner does not argue the filing date of the ’116 application precludes Kwak as prior art under 35 U.S.C. § 102(a)(2). *See* Prelim. Resp. 21 (arguing both the first and second grounds together based on Kwak’s alleged failure to disclose all limitations of claims 1 and 20). More specifically, Patent Owner’s Preliminary Response treats grounds 1

and 2 as all but indistinguishable. *Id.* at 21 (“Grounds 1 and 2 fail to show a reasonable likelihood of success”), 25 (“In Grounds 1 and 2, respectively, Petitioner relies upon ‘Kwak’ for its anticipation arguments but fails to allege, let alone demonstrate, that Kwak discloses all of the claim limitations.”). Patent Owner’s arguments then focus on Kwak and mention the Kwak Provisional only to point out that its disclosure is also present in Kwak.⁵ *Id.* at 26–45. The Akl Declaration does not discuss the Kwak Provisional. *See*, generally Ex. 2001.

We preliminarily determine Kwak is prior art to the ’130 patent claims based on Kwak’s December 9, 2016 PCT filing date, and we do not further address the priority issue at this time. Petitioner argues that Kwak anticipates the challenged claims, thereby satisfying its initial burden of production. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1379–80 (Fed. Cir. 2015). At trial, Patent Owner may argue that Kwak is not prior art because the challenged claims are entitled to an earlier filing date (*see id.*), in which case it should also address whether the relied-upon disclosure of Kwak is entitled to the filing date of the Kwak Provisional. The burden of proving unpatentability remains on Petitioner at all times. *See id.* at 1378 (“In an *inter partes* review, the burden of persuasion is on the petitioner to prove ‘unpatentability by a preponderance of the evidence,’ and that burden never shifts to the patentee.” (quoting 35 U.S.C. § 316(e))).

⁵ For example, Patent Owner cites page 48 of the Petition as “explaining that claim element 1[e] is taught by Fig. 6 of the [Kwak Provisional], which is Fig. 23 of the Kwak patent.” Prelim. Resp. 38.

1. Kwak (Ex. 1005)

Kwak discloses “a method for transmitting uplink control channels in a wireless communication system.” Ex. 1005, Abs. Kwak identifies TTI data delay as a problem in LTE and LTE-A. *Id.* at 1:56–67; 49:26–31. Kwak recognizes that one particular area impacted by the shortened TTI is the physical uplink control channel (PUCCH). *Id.* at 1:56–59. The uplink control information (UCI) transmitted on the PUCCH includes, for example, the ACK/NACK information. *Id.* at 12:4–8. Kwak recognizes the need for a shortened TTI (i.e., TTI whose length is reduced from the conventional LTE 1 ms TTI). *Id.* at 49:26–31.

The user terminal may utilize a first cyclically shifted sequence to transmit an ACK and a second cyclically shifted sequence to transmit a NACK. Ex. 1005, 56:25–61. The user terminal may be allocated CS indices 0 and 6 “and may transmit a PUCCH using the CS index 0 in the case of ACK and may transmit a PUCCH using the CS index 6 in the case of NACK.” *Id.* The sequence to which cyclic shift is applied may be a “Zadoff-Chu (ZC) sequence,” which is “one of the CAZAC [‘constant amplitude zero autocorrelation’] sequences.” *Id.* at 15:36–44, 12:31–32 (CAZAC). Figure 43(b) describes transmission of a PUCCH in a TTI having two slots, where there is “one symbol per slot.” *Id.* at 73:53–54.

2. Claim 1

Petitioner contends with respect to limitations 1.a, 1.b, and 1.c that the recited “predefined sequences” are the CS indices of Kwak transmitted in a PUCCH. Pet. 13–19 (citing Ex. 1005, 73:53–54, 74:9–17 (“transmission method based on a base sequence . . . a different CS index may be applied for each slot.”), Figs. 43(b), 44; Ex. 1002 ¶ 56). In connection with limitation 1.a, Petitioner argues Figure 43(b) “describes transmission of a

PUCCH in a TTI having two slots, where there is ‘one symbol per slot.’” *Id.* at 14 (citing Ex. 1005, 73:53–54, Fig. 43(b)). Petitioner further argues that Kwak’s disclosure “means that a different cyclically shifted sequence is sent in each slot, which constitutes ‘sending, by a user terminal, ***K predefined sequences*** on M transmission symbols in a Transmission Time Interval (TTI).” *Id.* at 15 (citing Ex. 1005, Fig. 44; Ex. 1002 ¶ 50) (emphasis in original). Petitioner concludes that “Kwak discloses that the user terminal sends a PUCCH ‘on M transmission symbols in a TTI,’ where M=2.” *Id.*

Specific to limitation 1.c, Petitioner argues “a cyclic shift index (0 or 6) may be used for *Slot 0, a first symbol*, and a different cyclic shift index (5 or 11) may be used for *Slot 1, the second symbol*.” Pet. 18 (citing Ex. 1005, 74:9–17; Fig. 44) (emphasis added). That is, Petitioner argues the slots of Kwak are the claimed “symbol.” *See id.* at 18. Petitioner explains:

This means that a first predefined sequence (a cyclically shifted base sequence corresponding to CS index 0 or 6) is sent in symbol 0 and a second predefined sequence (a cyclically shifted base sequence corresponding to CS index 5 or 11) is sent in symbol 1.

Id. at 18–19 (citing Pet. 13–18 (Pet. Section IX.A.1.ii.)). Petitioner notes that the selection of which CS index used is an “option,” that is 0 or 6 and 5 or 11. *Id.* at 16 n.2.

Patent Owner does not address directly Petitioner’s showing. Instead, Patent Owner’s arguments relate to other parts of Kwak which it contends do not show one “predefined sequence” for “each symbol” of limitation 1.c. Prelim. Resp. 26–31 (citing Ex. 1005, 73:49–51, Figs. 43(a), 44; Ex. 2001 ¶¶ 62–64). For support that Kwak has more than one sequence per symbol, Patent Owner cites to Kwak’s disclosure that if “a TTI includes ***one symbol***,

as in FIG. 43(a), a user may transmit a PUCCH in two regions (*two regions* divided *based on the frequency*).” *Id.* at. 28 (citing Ex. 1005, 73:49–51).

Patent Owner acknowledges:

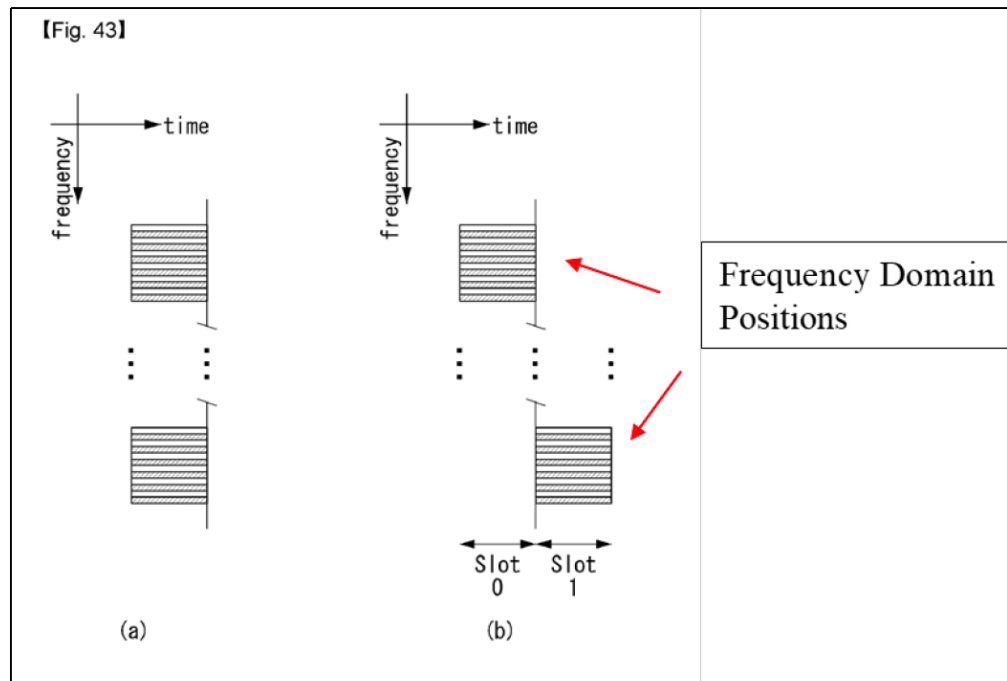
There is no doubt that Kwak discloses a method for sending control signals using symbols and sequences and thus bears a resemblance to the method of the ’130 patent. The ’130 Patent, however, discloses a different method for encoding signals.

Prelim. Resp. 29 (citing Ex. 1005, 72:63–66, Fig. 41; Ex. 2001 ¶ 64). The difference between the methods disclosed in Kwak and the ’130 patent is described by Patent Owner as follows:

The ’130 patent method, however, encodes the signal over multiple symbols, with *each symbol carrying only a single sequence*. [] *Multiple sequences are not crammed into a single symbol unlike the Kwak method.*

Id. at 29–30 (citing Ex. 1005, Figs. 41(a), 41(b); Ex. 2001 ¶ 64) (emphasis added).

Patent Owner’s annotation of Kwak Figure 43 is reproduced below:



Kwak Figures 43(a) and (b) annotated illustrating an example of a frequency hopping structure when a PUCCH is transmitted in a 1-symbol TTI and a 2-symbol TTI.

Prelim. Resp. 29 (annotated Figs. 43(a), (b)); Ex. 1005, 6:1–4; *see also* Pet. 22 (annotated Figure 43(a)). Annotated Figure 43(b) shows transmission of a PUCCH in two regions divided based on frequency. Ex. 1005, 73:49–52. Figure 43(b) shows transmission of a PUCCH using one symbol per slot. *Id.* at 11:53–54. If we assume *arguendo* that limitation 1.c requires that “only one” sequence be sent on a symbol (as Patent Owner argues), then Figure 43 of Kwak discloses different teachings, one meeting limitation 1.c and the other not meeting it. But it is sufficient that one of Kwak’s teachings discloses the limitation. *See Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1361 (Fed. Cir. 2012) (affirming finding of anticipation where one of a number of disclosed combinations disclosed all the limitations of the claim.); *see also Hewlett-Packard Co. v. Mustek Sys., Inc.*,

340 F.3d 1314, 1326 (Fed. Cir. 2003) (“[A] prior art product that sometimes, but not always, embodies a claimed method nonetheless teaches that aspect of the invention.”).

We also preliminarily find that the showing being made in connection with limitation 1.a does not preclude it from supporting limitation 1.c. First, Petitioner specifically refers to limitation 1.a in its showing for limitation [1.c]. *See* Pet. 18. To the point, Petitioner argues “[a]s discussed with respect to claim limitation [1.a], Kwak discloses sending different sequences in the two symbols.” *Id.*

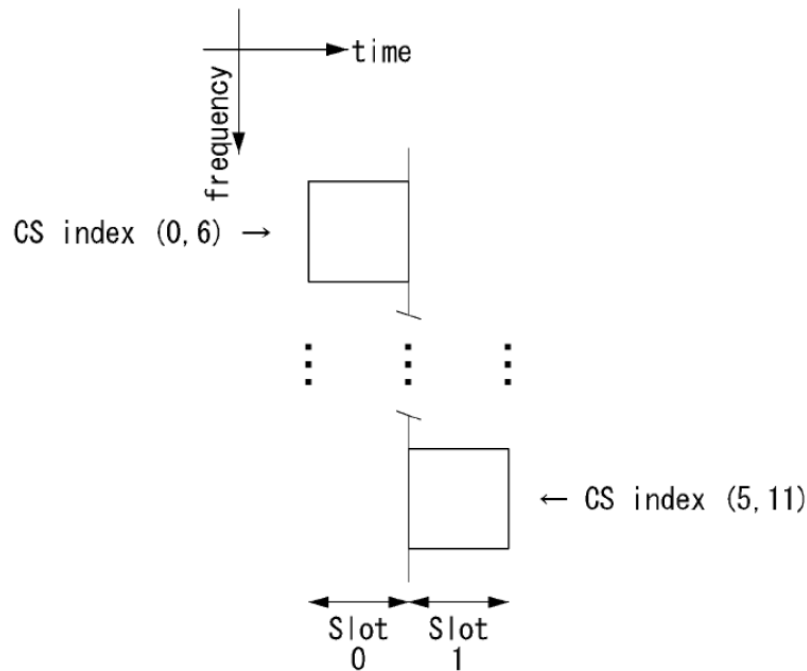
On this record, we therefore conclude preliminarily that Petitioner has sufficiently shown that Kwak discloses limitation 1.c.

Limitation 1.a recites “sending, by a user terminal, K predefined sequences on M transmission symbols in a Transmission Time Interval (TTI) to send B-bit uplink control information.” Limitation 1.b recites “wherein M is a positive integer, K is an integer, $1 \leq K \leq 2^B$, B is an integer greater than or equal to 1.” Patent Owner notes that Petitioner argues limitations 1.a and 1.b together and does so as well. *See* Prelim. Resp. 31 n.2 (citing Pet. 12–18). Unless otherwise noted, we also address limitations 1.a and 1.b together.

Petitioner argues that Figure 43(b) of Kwak (see annotation above) “describes transmission of a PUCCH in a TTI having two slots, where there is ‘one symbol per slot.’” Pet. 14 (citing Ex. 1005, 73:53–54). Based on the preceding, Petitioner alleges Kwak “discloses that the user terminal sends a PUCCH ‘on M transmission symbols in a TTI,’ where M=2.” *Id.* (citing Ex. 1005, Fig. 43(b); Ex. 1002 ¶¶ 48–49 (Ding Declaration support)).

Petitioner points to Figure 44 of Kwak for its disclosure of a different CS index for each slot. Pet. 15 (citing Ex. 1005, 74:9–12, Fig. 44). Figure 44 is reproduced below.

【Fig. 44】



Kwak Figure 44 illustrating an example of a frequency hopping structure when a PUCCH is transmitted in a 2-symbol TTI based on a base sequence.

Ex. 1005, 6:5–8; *see also* Pet. 15 (reproducing Fig. 44), 22 (reproducing annotated Figure 44 showing two frequency position one at index 0,6 and another at index 5,11). Petitioner then argues that:

[b]ecause a different cyclic index is applied in each slot (i.e., each symbol), each slot includes transmission of a different cyclically shifted sequence. [] Thus, Kwak discloses a TTI with two symbols ($M=2$) and *further discloses sending a different cyclically shifted sequence on each symbol, i.e., $K=2$.*

Pet. 15–16 (citing Ex. 1005, 74:9–12, 56:25–67, 51:1–6, 15:36–44, Fig. 44); Ex. 1002 ¶ 50) (emphasis added). Petitioner further contends that Kwak’s Figure 44 shows that the CS indices 0 or 6 in slot 0 corresponds to an ACK and 5 or 11 in slot 1 correspond to a NACK. *Id.* at 17 (citing Ex. 1005, 56:46–61; *see also* Ex. 1002 ¶¶ 51–52 (Ding Declaration support)).

Patent Owner repeats its argument for limitation 1.c that Kwak does not disclose each “predefined sequence” includes one “transmission signal.” Prelim. Resp. 31. We addressed this argument above in our analysis of limitation 1.c.

In addition, Patent Owner alleges Kwak fails to disclose or teach the expression $1 \leq K \leq 2^B$, asserting that the expression “defines the number of sequences that can be used depending on the number of bits being sent.” Prelim. Resp. 31–32 (citing Ex. 2001 ¶ 51). Patent Owner shows how the number of predefined sequences K is one or two sequences when a single bit is sent ($B=1$) and one up to four when two bits are transmitted ($B=2$).⁶ *Id.* at 32 (citing Ex. 2001 ¶¶ 52–54).

Patent Owner contends “Petitioner does not show how Kwak example discloses or teaches $1 \leq K \leq 2^B$.” Prelim. Resp. 34 (citing Ex. 2001 ¶ 55). The basis for this assertion is that the recited expression for K “requires that the number of bits to be sent determine the number of sequences that can be used” because Petitioner shows the integer variable values for “ B and K , but

⁶ When $B=1$, the expression is 2^B or 2^1 , which is 2. The number of predefined sequences K is 2 and the integer is between or equal to 1 and 2 ($1 \leq K \leq 2$), which means the sequences are 1 or 2. Prelim. Resp. 32 (citing Ex. 2001 ¶ 52). If two bits are sent, the expression is 2^B or 2^2 , which is 4. Then K is an integer between or equal to 1 and 4 ($1 \leq K \leq 4$), and there can be 1, 2, 3 or 4 sequences. *Id.* (citing Ex. 2001 ¶ 53).

these do not vary the number of sequences in relation to the *other variables*.” *Id.* (emphasis added). As we explain above in Section IV.B.2, under the construction that we adopt for determining whether to institute trial, it is sufficient that, sometimes, the method operates in a way such that “M is a positive integer, K is an integer, $1 \leq K \leq 2^B$, B is an integer greater than or equal to 1.”

Patent Owner also argues Petitioner does not explain “how the example in Kwak, when sending a 1-bit signal would use a single sequence, i.e., $K=1$, to send the signal.” Prelim. Resp. 33–34 (citing Ex. 2001 ¶ 55). Patent Owner alleges slots 0 and 1 in Kwak Figures 43 and 44 are “two different sequences.” *Id.* (citing Ex. 2001 ¶ 56).

We are not persuaded that showing all the variables involved in a PUCCH transmission does not show the expression claimed. Petitioner shows that each variable of the expression is disclosed in Kwak Figures 43(b) and 44. Pet. 14–16.

On this record, we therefore conclude preliminarily that Petitioner has sufficiently shown that Kwak discloses limitations 1.a and 1.b.

Limitation 1.d recites “each of the K predefined sequences has a length of N and is mapped to N subcarriers of the transmission symbols corresponding to the each of the K predefined sequences.” Petitioner alleges Kwak “generates its cyclically shifted sequence by applying a cyclic shift to a base sequence.” Pet. 19 (citing Ex. 1005, 74:9–12). Petitioner alleges the cyclic shift is described in Kwak with reference to equations 23 and 24. *Id.* (citing Ex. 1005, 50:62–67, 52:1–6). Equation 24 is reproduced below.

$$r^{(\alpha)}(n) = e^{j\alpha n} \bar{r}(n), \quad 0 \leq n \leq 11$$

[Equation 24]

Pet. 19; Ex. 1005, 52:4. According to Petitioner, equation 24 “specifies the cyclically shifted sequence as having a length of ‘12’ given that ‘n’ in equation 24 below extends from 0 through 11.” *Id.* (citing Ex. 1005, 50:62–67, 53:33–37 (“[i]n the present invention, basically, assuming the transmission of a 12-subcarrier unit corresponding to 1 RB, a 12-length base sequence is described as an example.”), Ex. 1005, 4:35 (“resource block (RB)”). Petitioner concludes that “Kwak discloses that each of the K predefined sequences ‘has a length of N,’ which as discussed above is 12.” *Id.* at 20 (citing Ex. 1005, Figs. 34 and 43(b) (both illustrating “12 subcarriers”)).

At present, Patent Owner does not dispute Petitioner’s showing. On this record, we conclude preliminarily that Petitioner has sufficiently shown that Kwak discloses limitation 1.d.

Limitation 1.e recites “wherein $N=2n$ with n being a positive integer.” Petitioner alleges Kwak discloses this limitation where $N=12$ and n is 6. Pet. 21 (citing Ex. 1002 ¶ 59).

At present, Patent Owner does not dispute Petitioner’s showing. On this record, we conclude preliminarily that Petitioner has sufficiently shown that Kwak discloses limitation 1.e.

3. Claim 20

Having already decided to institute trial on claim 1, we proceed to trial on all claims challenged, including claim 20. *SAS Inst. v. Iancu*, 138 S. Ct. 1348, 1356 (U.S. 2018). Claim 20 recites a “device for uplink control signal transmission, comprising: a memory storing processor-executable instructions.” Claim 20 has similar limitations to those of method claim 1. For example, claim 20 recites in part:

sending K predefined sequences on M transmission symbols in a Transmission Time Interval (TTI) to send B-bit uplink control information, wherein M is a positive integer, K is an integer, $1 \leq K \leq 2^B$, B is an integer greater than or equal to 1.

Ex. 1001, 30:9–15, Certificate of Correction. Petitioner denominates the limitation as 20.b and 20.c in the Petition. *See* Pet. 73. The limitations are all but identical to limitations 1.a and 1.b discussed above. *See id.* at 13–18. Petitioner repeats its showing for limitations 1.a and 1.b for limitations 20.b and 20.c. *Id.* at 39–40.

Patent Owner also focuses on the arguments it made in connection with claim 1, also noting that limitations 20.b and 20.c are the same as limitation 1.a and 1.b. Prelim. Resp. 44. Patent Owner asserts that “Kwak fails to teach or disclose claim elements 20[b] and 20[c] for the same reasons it fails to teach or disclose claim elements 1[a] and 1[b].” *Id.* at 44–45.

4. Claims 2–5, 7–9, and 14

We have reviewed Petitioner’s showing regarding claims 2–5, 7–9, and 14. Pet. 21–36; Ex. 1002 ¶¶ 60–75. Patent Owner does not separately argue patentability of dependent claims 2–5, 7–9, and 14 relying on its arguments for claim 1. Prelim. Resp. 44. Those arguments are addressed above. Because we have decided to institute on claim 1, we also institute on claims 2–5, 7–9, and 14.

H. Obviousness of Claims 8 and 9 over Kwak

Claim 8 depends from claim 5 and recites:

wherein the uplink control information comprises an Acknowledgement (ACK) and a Negative Acknowledgement (NACK); wherein the ACK corresponds to a bit “1” and the NACK corresponds to a bit “0”, when the ACK or the NACK is sent, the ACK or the NACK is respectively indicated by different predefined sequences sent on each transmission symbol.

Petitioner alleges the limitation of claim 8 is shown because “transmission using cyclically shifted sequences in figure 44 is applicable for sending an ACK/NACK (Ex. 1005, 74:16–18, ‘the aforementioned methods for ACK/NACK information and/or SR transmission may be applied to the structure’), which is one type of uplink control information (*id.*, 12:4–8).” Pet. 29. Augmenting its showing, Petitioner argues Figure 7 of Kwak discloses “[a] positive acknowledgement response (ACK) may be encoded as ‘1’ and a negative acknowledgement response (NACK) may be encoded as ‘0’.” *Id.* at 29–30 (citing Ex. 1005, 15:27–30).

Claim 9 also depends from claim 5 and recites:

wherein the uplink control information comprises an ACK and an NACK; wherein the ACK corresponds to bit “1” and the NACK corresponds to a bit “0”, when the ACK or the NACK is sent, the ACK or the NACK is respectively indicated by the predefined sequences being mapped to different frequency domain subcarrier positions on the transmission symbols.

Petitioner references its showing for claim 8 that an ACK correspond to a bit “1” and a NACK corresponds to a bit “0.” Pet. 31, *see also id.* at 29–30 (quoting Ex. 1005, 15:27–30).

Petitioner argues:

Thus, implementing ACK as a ‘1’ and NACK as a ‘0’ is merely one of two choices available to a POSITA, who would have been able to make and implement such a choice with reasonable success. (*Id.*) As such, implementing ACK as ‘1’ and NACK as a ‘0’ would have been obvious. *Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1340 (Fed. Cir. 2020) (“a person of ordinary skill would therefore have two predictable choices for when to perform plotting, providing them with a simple design choice as to whether to plot server-side or terminal-side.”).

Pet. 75.

Patent Owner relies on its arguments for claim 1 because of the dependency of claims 8 and 9 from claim 5, which depends from claim 1. Prelim. Resp. 45. Those arguments were addressed above. Because have decided to institute on claim 1, we also institute on claims 8 and 9. .

V. CONCLUSION

As explained above, we determine that Petitioner has established a reasonable likelihood of prevailing in its challenge to at least claim 1 of the '130 patent. Thus, we institute an *inter partes* review of all challenged claims on all asserted grounds.

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review is *instituted* with respect to all claims and all grounds of unpatentability raised in the Petition;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '130 patent is hereby instituted commencing on the entry date of this Order, and 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; and

FURTHER ORDERED that within ten (10) days of any developments in the parallel Texas Litigation (Section II.B above) relating to claim construction, the parties shall file a joint report detailing any such development.

IPR2023-00171
Patent 10,736,130 B2

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