

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

TELEFONAKTIEBOLAGET LM ERICSSON,
Patent Owner.

IPR2022-00561
Patent 10,306,669

Before GEORGIANNA W. BRADEN, NATHAN A. ENGELS, and
SOCTT RAEVSKY, *Administrative Patent Judges*.

BRADEN, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Apple Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–3, 6–8, 11, 12, and 17–19 (the “challenged claims”) of U.S. Patent No. 10,306,669 (Ex. 1001, “the ’669 patent”). Paper 2 (“Pet.”).

Telefonaktiebolaget LM Ericsson (“Patent Owner”) timely filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4. An *inter partes* review may not be instituted unless it is determined that “the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314; *see also* 37 C.F.R. § 42.4(a) (2021) (“The Board institutes the trial on behalf of the Director.”). The reasonable likelihood standard is “a higher standard than mere notice pleading,” but “lower than the ‘preponderance’ standard to prevail in a final written decision.” *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

For the reasons provided below and based on the record before us, we determine Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing the unpatentability of at least one of the challenged claims. Accordingly, we decline to institute an *inter partes* review of the ’669 patent based on the challenges to patentability presented in the current Petition.

B. Real Parties in Interest

Petitioner states that it is the real-party-in-interest. Pet. 70. Patent Owner lists Telefonaktiebolaget LM Ericsson and Ericsson Inc. as real-parties-in-interest. Paper 3 (Patent Owner’s Mandatory Notices), 2.

C. Related Proceedings

Petitioner states it is aware of one related matter involving the ’669 patent: *Samsung v. Ericsson*, IPR2021-00487 (January 29, 2021). Pet. 70. Patent Owner does not identify any related proceedings. *See* Paper 3, 1.

D. The ’669 Patent (Ex. 1001)

The ’669 patent is titled “Physical Uplink Control Channel (PUCCH) Resource Allocation,” and issued on May 28, 2019. Ex. 1001, codes (45), (54). The ’669 patent claims priority to a US-filed application filed on October 26, 2018. *Id.* at code (63).

1. Written Description

The ’669 patent relates to a cellular communication networks and includes techniques for Physical Uplink Control Channel Resource Allocation that enable flexible processing. *Id.* at 1:15–17, 3:1–3. The method comprises a series of information exchanges between a wireless mobile device (also referred to as user equipment, or UE) and a network. *Id.* at 1:22–24. According to the ’669 patent, uplink control information (“UCI”) “can be transmitted on a separate control channel (e.g., occurring either at the end of the slot interval or during the slot interval), or the UCI can be multiplexed with data and transmitted on a data channel.” *Id.* at 1:28–31. For example, “the separate control channel could be a Physical Uplink Control Channel (PUCCH),” or “the data channel could be a Physical Uplink Shared Channel (PUSCH).” *Id.* at 1:31–35.

The '669 patent describes that a PUCCH resource that is used by a UE to transmit UCI may be defined by the Physical Resource Blocks (PRBs), the Orthogonal Frequency Division Multiplexing (OFDM) symbols, the sequences along with their cyclic shifts, and Orthogonal Cover Codes (OCCs) used. *Id.* at 2:13–19. It should be noted that OCCs, sequences, and cyclic shifts are applicable only for some PUCCH formats. *Id.* at 2:16–19. The '669 patent indicates that in the “Long Term Evolution (LTE)” wireless communication system, a mobile device chooses from among available uplink resources an appropriate Physical Uplink Control Channel (PUCCH) or Physical Uplink Shared Channel (PUSCH). *Id.* at 1:22–35, 2:38–56.

The '669 patent discloses that a mobile device can determine which uplink resources to use through various techniques. *Id.* at 2:38–56. For example, such resource determination can be performed explicitly, e.g. via specific directions from the network; implicitly, e.g. based on where the initial downlink message is received and its characteristics; or through a combination of explicit and implicit techniques. *Id.* at 2:38–56, 7:9–18. The '669 patent describes that use of implicit resource determine can reduce the overhead costs to incurred for dynamic signaling and help to avoid collisions between the PUCCH resources determined by different UEs for transmission of UCL. *Id.* at 2:53–56. Implicit determination techniques may struggle in systems that feature variable message timing or multiple control slots that could all potentially receive the initial downlink messages. *Id.* at 7:9–35. The '669 patent purports to use a combination of explicit and implicit techniques to mitigate overhead costs and to provide additional flexibility. *Id.* at 2:53–3:3; 7:36–44.

One embodiment of the '669 patent is shown in Figure 11, reproduced below.

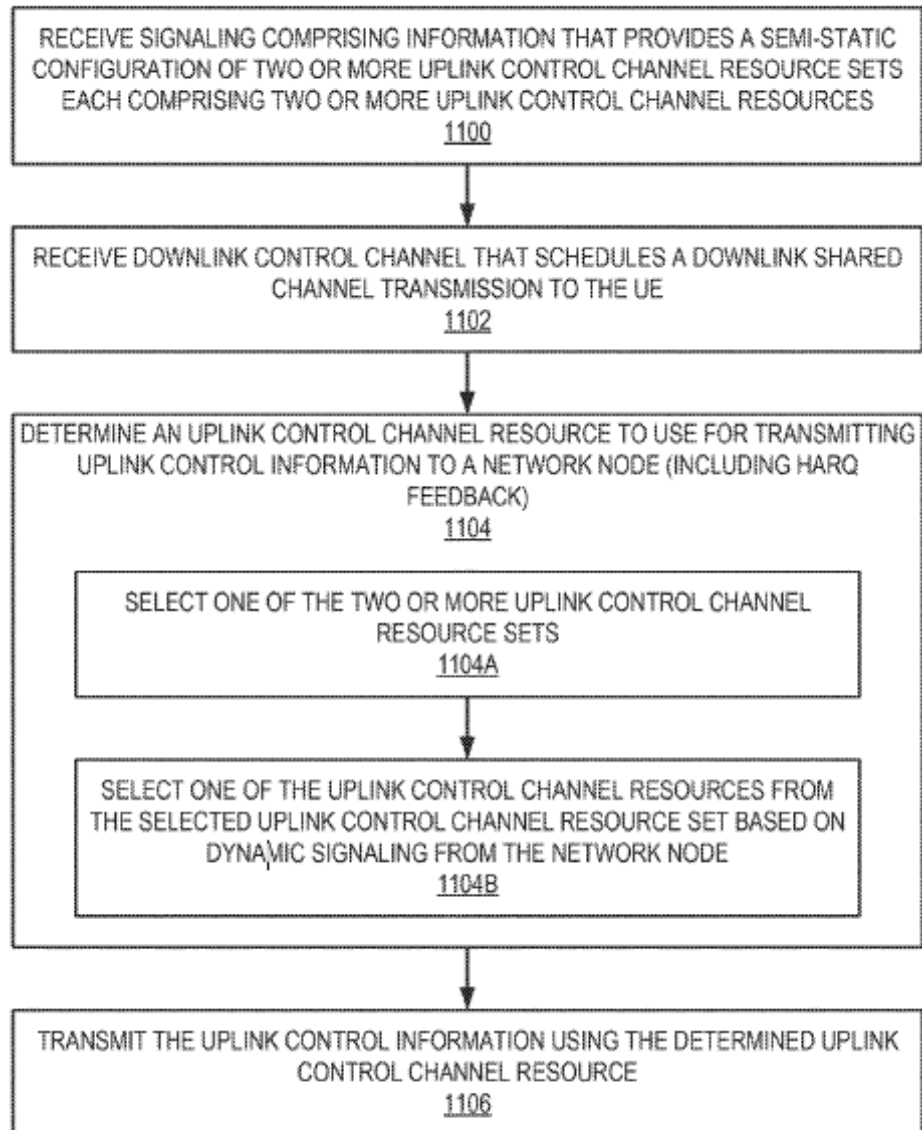


FIG. 11

Figure 11 illustrates is a flowchart in a wireless network according to one embodiment of the '669 patent. *Id.* at 4:4–5; 5:65–67, 6:29–30. The '669 patent discloses that, as illustrated in Figure 11, the UE receives, from the network node, signaling comprising information that provides a semi-static configuration of two

or more uplink control channel resource sets each comprising two or more uplink control channel resources (step 1100). *Id.* at 31:37–42. The '669 patent further discloses that the UE receives a downlink control channel that schedules a downlink shared channel transmission to the UE (step 1102). *Id.* at 31:42–44. Then, according to the '669 patent, “[t]he UE determines an uplink control channel resource to use for transmitting UCI to a network node (step 1104).” *Id.* at 31:44–46.

The '669 patent states that, in some embodiments, “the selection of the uplink control channel resource set is based on the CCE index, the search space of the successfully received PDCCH, and optionally the identifier (Radio Network Temporary Identifier (RNTI)) used to scramble the PDCCH is then used to determine a single PUCCH resource set within the group of configured PUCCH resource sets corresponding to the chosen PUCCH format.” *Id.* at 32:25–32. According to the '669 patent, “[t]he UE selects, as the uplink control channel resource to use for transmitting the uplink control information to the network node, one of the two or more uplink control channel resources from the selected uplink control channel resource set based on dynamic signaling from the network node (step 1104B).” *Id.* at 32:32–37. The '669 patent discloses that “[t]he UE transmits the UCI using the determined uplink control channel resource (step 1106).” *Id.* at 32:37–38.

Another embodiment of the '669 patent is shown in Figure 13, reproduced below.

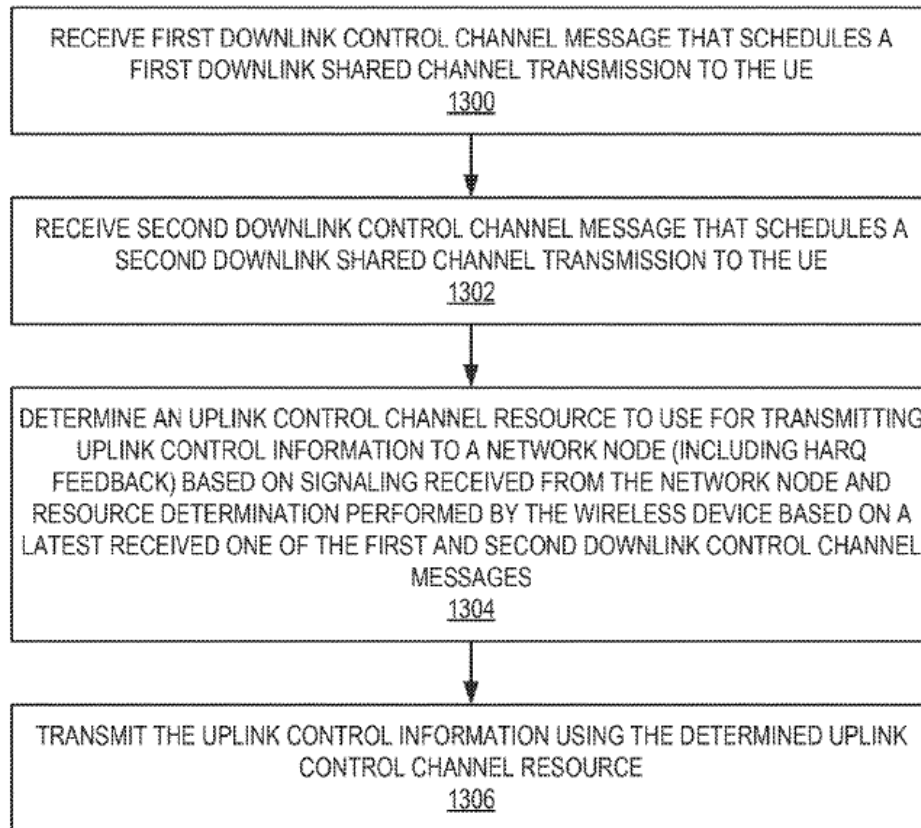


FIG. 13

Figure 13 illustrates a flowchart in a wireless network according to one embodiment of the '669 patent. *Id.* at 6:33–34. The '669 patent discloses that the UE receives, from the network node, a first downlink control channel message that schedules a first downlink shared channel transmission to the UE (step 1300) and a second downlink control channel message that schedules a second downlink shared channel transmission to the UE (step 1302). *Id.* at 33:25–29. The '669 patent further discloses that the UE determines an uplink control channel resource to use for transmitting UCI to a network node (step 1304). *Id.* at 33:30–31. According to the '669 patent, the UCI comprises HARQ feedback for the downlink

shared channel transmission, while the uplink channel resource to use for transmitting the UCI is determined based on signaling received from the network node and a latest received one of the first and second downlink control channel messages. *Id.* at 33:34–39. The '669 patent states that the UE transmits the UCI using the determined uplink control channel resource (step 1306). *Id.* at 33:39–40.

2. *Illustrative Claims*

As noted previously, Petitioner challenges claims 1–3, 6–8, 11, 12, and 17–19 of the '669 patent, of which claims 1, 6, 11, and 18 are independent. *See* Pet. 1; Ex. 1001, 43:16–48:47. Claim 1 is illustrative of the challenged subject matter and is reproduced below.

1. A method performed by a wireless device, comprising:
 - receiving a first downlink control channel message that schedules a first downlink shared channel transmission;
 - receiving a second downlink control channel message that schedules a second downlink shared channel transmission;
 - determining an uplink control channel resource to use for transmitting uplink control information to a network node on an uplink control channel, wherein:
 - the uplink control information comprises Hybrid Automatic Repeat Request, HARQ, feedback for both the first downlink shared channel transmission and the second downlink shared channel transmission; and
 - wherein determining the uplink control channel resource to use for transmitting the uplink control information comprises determining the uplink control channel resource based on (a) signaling received from the network node and (b) resource determination performed by the wireless device based on a latest received one of the first downlink control channel message and the second downlink control channel message; and
 - transmitting the uplink control information using the determined uplink control channel resource;
 - wherein the signaling received from the network node comprises information that provides a semi-static configuration of two or more

uplink control channel resource sets each comprising two or more uplink control channel resources; and
wherein determining the uplink control channel resource based on (a) and (b) comprises selecting one of the two or more uplink control channel resource sets, and
selecting, as the uplink control channel resource to use for transmitting the uplink control information to the network node, one of the two or more uplink control channel resources from the selected uplink control channel resource set based on dynamic signaling from the network node.

Ex. 1001, 45:28–67.

E. Asserted Challenges to Patentability and Evidence of Record

Petitioner challenges the patentability of claims 1–3, 6–8, 11, 12, and 17–19 of the '669 patent based on the following references:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–3, 6–8, 11, 12, and 17–19	103 ¹	Seo ² and ZTE ³
1–3, 6–8, 11, 12, and 17–19	103	Seo, ZTE, Intel ⁴

Petitioner also relies on the Declaration of R. Michael Buehrer, Ph.D. (“Dr. Buehrer”) to support its assertions. *See* Ex. 1003. Petitioner further provides the Declaration of Mr. Friedhelm Rodermund to support its contentions regarding the public availability of the asserted prior art. *See* Ex. 1008.

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the '669 patent was effectively filed after March 16, 2013, the effective date of the relevant amendment, the AIA version of § 103 applies.

² US 2013/0208692 A1, published, August 15, 2013 (“Seo,” Ex. 1005).

³ R1-1715527, RAN WG1 meeting NR#3, September 18–21, 2017, Nagoya, Japan (“ZTE,” Ex. 1006).

⁴ R1-1700369), RAN WG1 NR ad hoc meeting, January 16–20, 2017, Spokane, Washington, USA (“Intel,” Ex. 1007).

II. PRELIMINARY MATTERS

A. Claim Construction

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).” 37 C.F.R. § 42.100(b). Under that standard, the “words of a claim ‘are generally given their ordinary and customary meaning.’” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). The ordinary and customary meaning of a claim term applies “unless the patentee demonstrated an intent to deviate from [it] . . . by redefining the term or by characterizing the invention in the intrinsic record using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.” *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1327 (Fed. Cir. 2002); *see Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). Thus, although we “look to the specification and prosecution history to interpret what a patentee meant by a word or phrase in a claim,” we do not read “extraneous limitations . . . into the claims from the specification or prosecution history” absent an express definition or clear disavowal of claim scope. *Bayer AG v. Biovail Corp.*, 279 F.3d 1340, 1348 (Fed. Cir. 2002).

Petitioner states that the Board does not need to construe any terms to resolve the arguments presented in this Petition. Pet. 2. Patent Owner indicates it does not believe any terms require construction to resolve any dispute at this stage. Prelim. Resp. 10. Based on our preliminary analysis of the matter, we agree with the parties that no express construction is needed to resolve any dispute in this proceeding at this time. Accordingly, we do not construe any of the claim limitations, except as otherwise provided herein. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid*

Techs., Inc. v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 “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.” 35 U.S.C. § 103; *see KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, objective evidence of non-obviousness.⁵ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b). The burden of persuasion

⁵ At this stage of the proceeding, the parties have not presented objective evidence of non-obviousness.

never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art at the time of the alleged invention, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation marks omitted). Further, the prior art itself can reflect the appropriate level of ordinary skill in the art. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Here, Petitioner asserts, a person of ordinary skill in the art at the time of the critical date would “have had at least a Bachelor’s Degree (or higher degree) in an academic area emphasizing telecommunications systems with two or more years of work experience in telecommunications systems.” Pet. 9 (citing Ex. 1003 ¶ 21). Petitioner asserts that in the alternative, an ordinarily skilled artisan “would have had a Master of Science Degree in an academic area emphasizing telecommunications systems, or an equivalent field (or a similar technical Master’s Degree, or higher degree) with a concentration in telecommunications systems.” *Id.* According to Petitioner, “[a]dditional education in a relevant field, or relevant industry experience may compensate for a deficit in one of the other aspects of the requirements stated above. *Id.*

At this stage of the proceeding, Patent Owner does not contest Petitioner’s definition of a person of ordinary skill in the art. *See generally* Prelim. Resp. For

the purposes of this Decision, we adopt Petitioner’s proposed level of ordinary skill in the art, which is not opposed substantively by Patent Owner and appears to comport with the teachings of the ’669 patent and the asserted prior art.

D. Objective Indicia of Non-Obviousness

Neither party presents any evidence or argument regarding objective indicia of non-obviousness relating to any challenged claim. Thus, we do not address any such considerations in this Decision.

E. Overview of Asserted Prior Art of Record

1. Seo (Ex. 1005)

Seo is a printed U.S. patent application, published on August 15, 2013, titled “Method and Apparatus for Transmitting ACK/NACK for Downlink Transmission in Wireless Communication System.” Ex. 1005, codes (12), (43), (54). According to Seo, “[i]n a wireless communication system, in order to determine whether data transmitted by a transmitter is successfully received by a receiver, the receiver may feed acknowledgement (ACK)/negativeACK (NACK) back to the transmitter.” *Id.* ¶ 2. Seo discloses that “[t]he transmitter performs an operation such as retransmission of previously transmitted data or transmission of new data based on the ACK/NACK feedback.” *Id.*

Seo states “in case of downlink transmission from a base station to a user equipment (UE), the UE which receives a physical downlink shared channel (PDSCH) in downlink subframe(s) may feed ACK/NACK information indicating whether or not the PDSCH is successfully received back to the base station after a predetermined time has elapsed, and the base station may receive the ACK/NACK information in one uplink subframe.” *Id.* ¶ 3. Seo discloses that “[i]n order to enable the base station to accurately receive the ACK/NACK information transmitted by the UE, resources used to transmit the ACK/NACK information in

one uplink subframe need to be determined.” *Id.* Seo teaches a method “for determining ACK/NACK resources used to transmit ACK/NACK for downlink transmission in an evolved wireless communication system” where conventional predetermined rules may not apply. *Id.* ¶¶ 4, 5.

Seo further discloses “[a] method for transmitting ACK/NACK information for a downlink transmission in a receiver of a wireless communication system includes being configured with N physical uplink control channel (PUCCH) resources respectively having indexes 0, 1, 2, ... , and N-1 by a higher layer, receiving the downlink transmission from a transmitter in a downlink subframe set including M ($1 < M < N$) downlink subframes, and transmitting the ACK/NACK information for the downlink transmission in the downlink subframe set to the transmitter in one uplink subframe associated with the downlink subframe set.” *Id.* at code (57). Seo’s method uses “a Physical Downlink Control Channel (PDCCH)” to transmit “Downlink Control Information (DCI)” that “includes uplink or downlink scheduling information.” *Id.* ¶¶ 51, 13, 14. Seo’s scheduling information schedules data transmissions on “a Physical Downlink Shared Channel (PDSCH)” and Seo’s UE provides HARQ feedback related to the PDSCH data transmissions. *Id.* ¶¶ 51, 52, 6, 7, 11–13.

One embodiment of Seo is shown in Figures 1(a) and 1(b), reproduced below.

FIG. 1

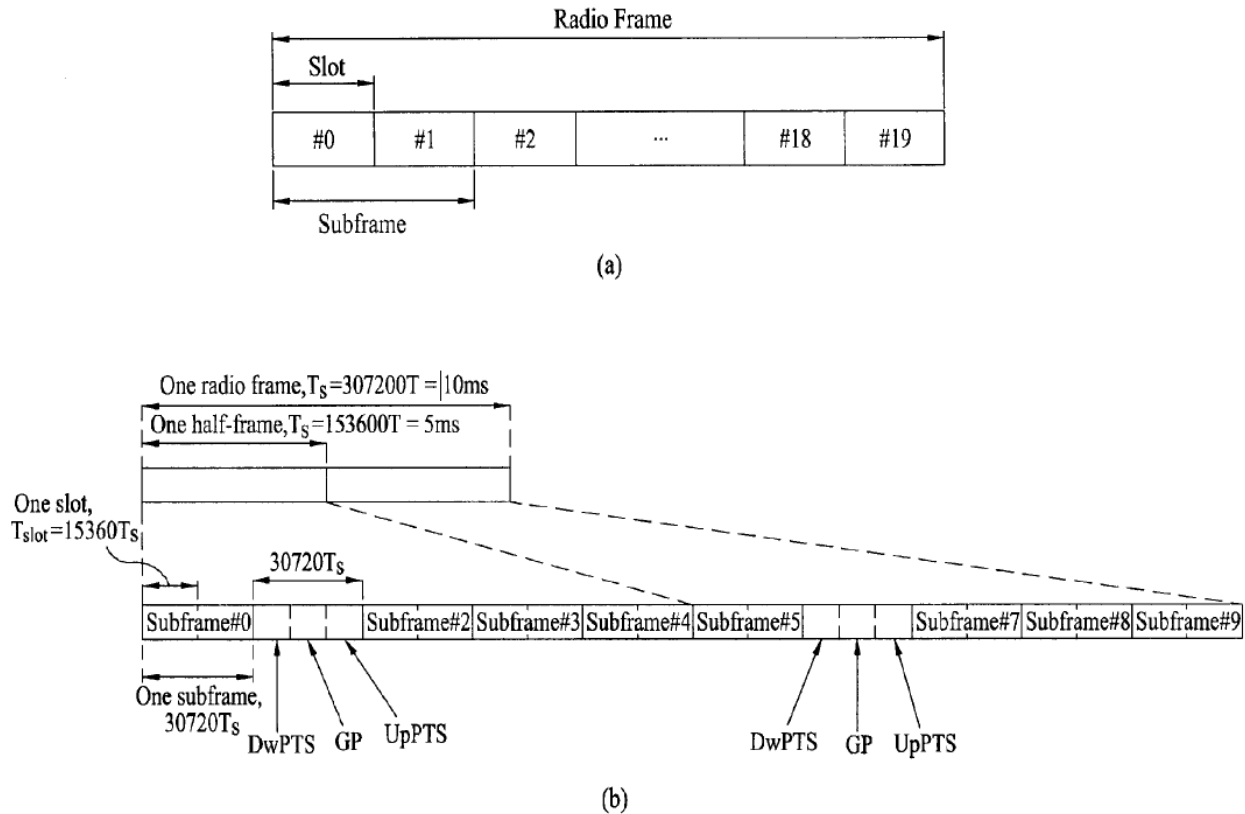


Figure 1(a), above, is a diagram showing the structure of a type 1 downlink radio frame, while Figure 1(b), above, is a diagram showing the structure of a type 2 radio frame. *Id.* ¶¶ 23, 45, 48. Seo teaches that “[i]n a cellular Orthogonal Frequency Division Multiplexing (OFDM) radio packet communication system, uplink/downlink data packet transmission is performed in subframe units” and “[o]ne subframe is defined as a predetermined time interval including a plurality of OFDM symbols.” *Id.* ¶ 44. According to Seo, “[t]he 3GPP LTE standard supports a type 1 radio frame structure applicable to Frequency Division Duplex (FDD) and a type 2 radio frame structure applicable to Time Division Duplex (TDD).” *Id.*

Seo discloses that a downlink radio frame such as the one shown in Figure 1(a), above, “includes 10 subframes, and one subframe includes two slots in time domain.” *Id.* ¶ 45. According to Seo, the “type 2 radio frame includes two half frames, each of which includes five subframes, a downlink pilot time slot (DwPTS), a guard period (GP), and an uplink pilot time slot (UpPTS)” and “[o]ne of these subframes includes two slots.” *Id.* ¶ 48. Seo discloses that the “DwPTS is used for initial cell search, synchronization and channel estimation at a user equipment.” *Id.*

Another embodiment of Seo is shown in Figure 3, reproduced below.

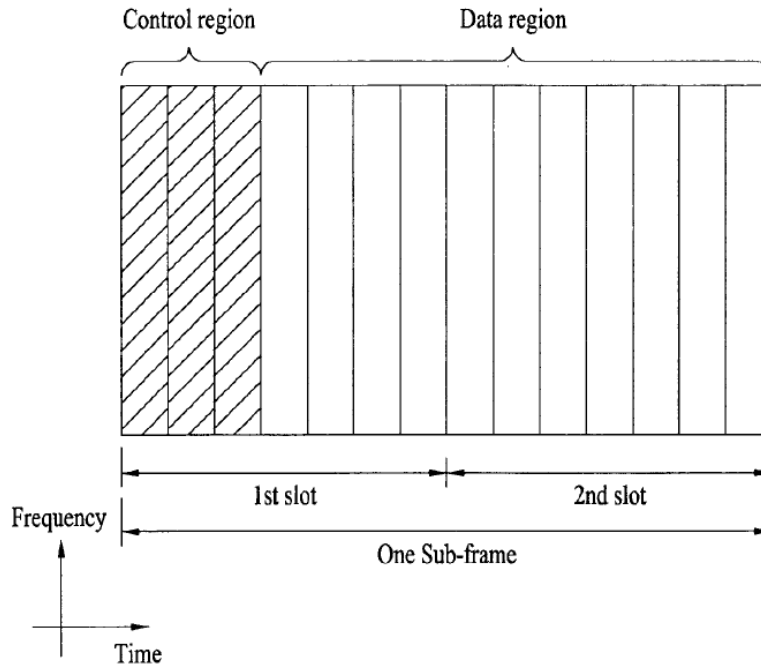


Figure 3, above, is a diagram showing the structure of a downlink subframe. *Id.* ¶¶ 25, 51. Seo discloses that a “maximum of three OFDM symbols of a front portion of a first slot within one subframe corresponds to a control region to which a control channel is allocated,” while the “remaining OFDM symbols correspond to a data region to which a Physical Downlink Shared Channel (PDSCH) is allocated.” *Id.* ¶ 51. Seo further discloses that the “control information transmitted

through the PDCCH is referred to as Downlink Control Information (DCI)” and “includes uplink or downlink scheduling information or an uplink transmit power control command for a certain UE group.” *Id.* According to Seo, the “PDCCH may include resource allocation and transmission format of a Downlink Shared Channel (DL-SCH), resource allocation information of an Uplink Shared Channel (UL-SCH),” and others. *Id.*

Another embodiment of Seo is shown in Figure 10, reproduced below.

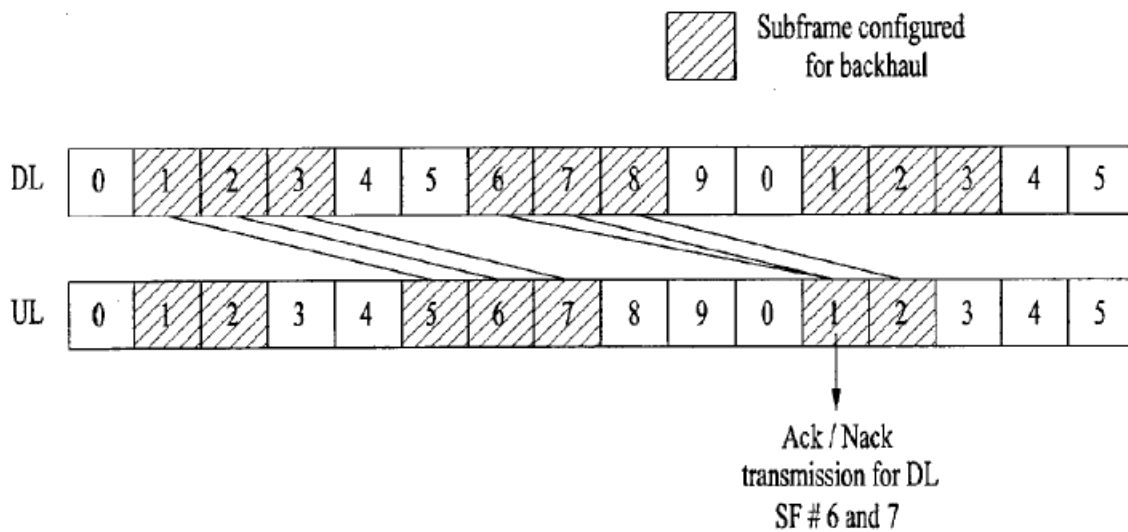


Figure 10, above, is a diagram showing the case where the number of DL subframes associated with one UL subframe is changed over time. Ex. 1005 ¶¶ 32, 167. Referring to Figure 10, Seo discloses a “method of semistatically allocating/setting an ACK/NACK resource set to a downlink receiver by a higher layer and a method of determining a DL subframe associated with an ACK/NACK resource set to be used in each UL subframe if the number of DL subframes associated with each UL subframe is changed.” *Id.* ¶ 170. Seo’s method applies to systems where multiple downlink subframes may be mapped to a single uplink subframe. *Id.* ¶¶ 173–175. Seo describes that in such a situation, a number of uplink resources equal to the number of associated downlink subframes needs to be

available during the associated uplink subframe. *Id.* For example, Seo teaches that if a single uplink subframe is associated with four downlink subframes, that uplink subframe needs access to a set of four uplink resources so that it can acknowledge all four downlinks within the span of the uplink subframe. *Id.* It is possible for a wireless device to miss one or more downlink subframes, according to Seo. *Id.*

¶ 188. Seo's subframe mapping system can account for these possibilities by tying the selected uplink resource set to the latest associated downlink subframe. *Id.* If a downlink subframe in the middle of a set is missed, Seo describes sending a "not acknowledged" signal to inform the transmitter. *Id.* ¶ 188. Therefore, Seo disclose that if a downlink subframe at the end of a set is missed, the transmitter can recognize the error because the acknowledge signal came from a different resource set than expected. *Id.* ¶ 185.

2. ZTE (Ex. 1006)

ZTE is a white paper titled "NR PUCCH Resource Allocation" from the 3rd Generation Project Partnership (3GPP) RAN WG1 meeting NR#3 held on September 18-21, 2017, in Nagoya, Japan. Ex. 1006, 1. ZTE is directed to an "ARI-based PUCCH resource allocation for HARQ-ACK transmission." *Id.* at 2. ZTE describes the existence of several predefined PUCCH formats, some using 2 or fewer bits, others using more than 2 bits. *Id.* ZTE describes predefining two PUCCH resource sets, one for PUCCH formats using 2 or fewer bits, the other for PUCCH formats using more than 2 bits. *Id.* at 2–3. ZTE also describes an "enhanced ARI mechanism" (*id.* at 4–5), which "assume[s]" that four candidate PUCCH resource candidates are in a set, and the specific resource to use is then explicitly indicated by "physical layer signaling" (*id.* at 5).

One embodiment of ZTE is illustrated in Table 1, reproduced below:

Table 1– PUCCH resource set for formats carrying up to 2 bits

PUCCH format	PUCCH length	PUCCH resource value	Time domain OCC	Cyclic shift index	PUCCH resource group index
Short Format 0	1	a0	-	CS set #0	0
		a1	-	CS set #1	1
	1	a2	-	CS set #2	2
		a3	-	CS set #3	3
	2	a4	-	CS set #4	4
		a5	-	CS set #5	5
	2	a6	-	CS set #6	6
		a7	-	CS set #7	7
Long Format 0	4	a8	OCC #0	CS set #8	8
		a9	OCC #1	CS set #9	9
	8	a10	OCC #0	CS set #10	10
		a11	OCC #1	CS set #11	11
	8	a12	OCC #0	CS set #12	12
		a13	OCC #1	CS set #13	13
	14	a14	OCC #0	CS set #14	14
		a15	OCC #1	CS set #15	15

Table 1 of ZTE, above, indicates that a PUCCH resource set includes multiple PUCCH resources. *Id.* at 3. ZTE discloses that “[i]n LTE, a combination of a semi-static configuration and dynamic signaling is used to determine the PUCCH resource for ACK/NACK in the frequency domain” and “[a] similar concept could be envisioned for NR.” *Id.* at 4. In particular, “[a] set containing four PUCCH candidate resources is configured through semi-static signaling, and then the specific PUCCH resources to be used are indicated via the physical layer DCI.” *Id.* at 5. ZTE proposed “a new method to achieve semi-static + dynamic PUCCH frequency resource allocation” with “an enhanced ARI mechanism.” *Id.* Specifically, in ZTE’s enhanced ARI mechanism:

The base station always configures 3 candidate PUCCH resources for the UE through higher layer signaling and implicitly assumes that 1 candidate PUCCH resource is located within the frequency domain of the PUSCH / PDSCH of the UE. Then, physical layer signaling is used

to indicate the specific PUCCH resource to be used out of the set from the four PUCCH candidate resources.

Id. ZTE describes that this “enhanced ARI mechanism (dynamic + semi-static method) can promptly adjust at least one PUCCH candidate frequency resource to immediately follow the channel quality” and, therefore, “make full use of channel quality to transmit PUCCH.” *Id.* at 6. And, ZTE explains that its enhanced ARI mechanism applies to multiple PUCCH sets based on PUCCH format, as “dynamic frequency resource allocation and the enhanced ARI mechanism can be used simultaneously for long/short PUCCHs.” *Id.*

3. *Intel (Ex. 1007)*

Intel (R1-1700369) is a white paper titled “Resource Allocation for NR Uplink Control Channel.” Ex. 1007, 1. Intel refers to a 3GPP TSG RAN WG1 NR ad hoc meeting held on January 16–20, 2017, in Spokane, Washington. *Id.* Intel is directed to UL control channel formats and resource allocation for NR (new radio) uplink control channel for HARQ ACK/NACK feedback. *Id.* at 1. Intel discloses that in “LTE, multiple PUCCH formats are specified to support various UCI payload sizes.” *Id.* at 1–2. Intel proposed that “[f]or NR, similar design principle can be considered, i.e., multiple NR PUCCH formats can be supported in order to accommodate various UCI types and payload sizes.” *Id.* at 2. Intel discusses techniques for choosing among available uplink resources, whether “explicitly signaled or implicitly derived.” *Id.* at 2–3. Intel discloses configuring “[a] set of resource indexes,” and choosing one resource from among the set when it is “explicitly signaled in the DCI.” *Id.* at 3.

III. ANALYSIS

A. Alleged Obviousness of Claims 1–3, 6–8, 11, 12, and 17–19 in View of Seo and ZTE

Petitioner contends claims 1–3, 6–8, 11, 12, and 17–19 of the '669 patent would have been unpatentable under 35 U.S.C. § 103 as obvious in view of Seo and ZTE. Pet. 26–58. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 10–27. For reasons that follow, we determine Petitioner has not demonstrated a reasonable likelihood of demonstrating that the challenged claims would have been obvious under 35 U.S.C. § 103 in view of Seo and ZTE.

1. Alleged Qualifications of Seo and ZTE as Prior Art

The parties do not dispute whether Seo or ZTE qualify as prior art to the '669 patent. Based on the current record, we are satisfied for purposes of institution that Petitioner has shown Seo and ZTE were published and available publicly prior to the priority date of the '669 patent. Therefore, we determine at this stage that Seo and ZTE are likely prior art to the '669 patent under 35 U.S.C. §§ 102(a)(2) and 102(d).

2. Analysis of Independent Claim 1

Petitioner contends every limitation of claim 1 in the '669 patent is taught by the combined teachings of Seo and ZTE. Pet. 26–43 (citing Ex. 1003 ¶¶ 79–110). Petitioner further contends a person of ordinary skill in the art at the critical date would have had reason to combine the teachings of Seo and ZTE. Pet. 19–25 (citing Ex. 1003 ¶¶ 57–67).

Patent Owner disputes Petitioner's contentions, specifically arguing that Petitioner fails to meet its burden in demonstrating that Seo and ZTE meet the following limitations: (1) receiving a first downlink control channel message that schedules a first downlink shared channel transmission; (2) receiving a second

downlink control channel message that schedules a second downlink shared channel transmission; (3) determining an uplink control channel resource to use for transmitting uplink control information to a network node on an uplink control channel; (4) determining the uplink control channel resource based on [] signaling received from the network node; (5) the signaling received from the network node comprises information that provides a semi-static configuration; and (6) selecting, as the uplink control channel resource . . . , one of the two or more uplink control channel resources . . . based on dynamic signaling from the network node. Prelim. Resp. 11–24.

Having reviewed the current record, including the testimony of Dr. Buehrer, we are persuaded Petitioner has shown sufficiently for the purposes of institution that the combined teachings of Seo and ZTE teach or at least suggest each of these challenged limitations of claim 1. However, for reasons set forth in the next section below, we determine that Petitioner has not sufficiently met its institution burden for all of the limitations of claim 1.

Specifically, we are persuaded Seo teaches use of “a Physical Downlink Control Channel (PDCCH)” to transmit “Downlink Control Information (DCI)” that “includes uplink or downlink scheduling information.” *See* Ex. 1005 ¶¶ 51, 13, 14. Petitioner cites to Seo at paragraph 138, which explicitly discloses that the user equipment receives data scheduled via the PDCCH. *See* Pet. 27. We also are persuaded Seo teaches the use of a network node because Seo discloses that “control information for downlink data transmission of an eNB is sent to a UE via a PDCCH. *See* Ex. 1005 ¶ 138; *see also* Pet. 28 (citing to Ex. 1005 ¶ 138). Petitioner relies on the testimony of Dr. Buehrer to support its position regarding the network node. Pet. 28 (citing Ex. 1003 ¶ 85). Dr. Buehrer testifies that eNB is a network node. *See* Ex. 1003 ¶ 85.

Additionally, we are persuaded that Seo and ZTE render obvious the use of a semi-static configuration of two or more uplink control channel resources because (1) Seo discloses use of ACK/NACK resource sets and Seo's PUCCH resources are semi-statically configured by higher layer signaling (e.g., RRC signaling) and (2) ZTE's PUCCH resource set include multiple PUCCH resources and the "PUCCH resource set is configured by high layer signaling," which is a semi-static configuration. *See* Ex. 1006, 2–3; *see* Ex. 1003 ¶ 99. Similarly, we are persuaded that Seo and ZTE render dynamic signaling from the network node obvious because ZTE explicitly states "[i]n LTE, a combination of a semi-static configuration and *dynamic signaling* is used to determine the PUCCH resource for ACK/NACK in the frequency domain." *See* Ex. 1006, 4.

At this stage of the proceeding and based on the record before us, we determine Petitioner has shown sufficiently for purposes of institution that the combined teachings of Seo and ZTE render obvious each of the above challenged limitations in claim 1 of the '669 patent.

- a) *"wherein determining the uplink control channel resource to use for transmitting the uplink control information comprises determining the uplink control channel resource based on (a) signaling received from the network node and (b) resource determination performed by the wireless device based on a latest received one of the first downlink control channel message and the second downlink control channel message"*

In addition to the limitations discussed above, claim 1 also recites "wherein determining the uplink control channel resource to use for transmitting the uplink control information comprises determining the uplink control channel resource based on (a) signaling received from the network node and (b) resource determination performed by the wireless device based on a latest received one of

the first downlink control channel message and the second downlink control channel message.” Ex. 1001, 43:30–38.

Petitioner contends this limitation of claim 1 in the ’669 patent is rendered obvious by the combined teachings of Seo and ZTE. Pet. 32–35 (citing Ex. 1003 ¶¶ 92–95). Specifically, Petitioner argues Seo’s uplink scheduling information schedules resources on a “Physical Uplink Control Channel (PUCCH)” for the PDSCH data transmissions. *Id.* at 32–33 (citing Ex. 1005 ¶¶ 6, 11, 12, 51, 52). Petitioner then notes that Seo provides more details in a section titled “Determination of Resources Used to Transmit ACK/NACK Information.” *Id.* at 33 (citing Ex. 1005 ¶¶ 133–216). Petitioner cites to Seo’s Figure 12 and argues that Seo’s UE receives “semi-statically configured . . . PUCCH resources.” *Id.* (citing Ex. 1005 ¶¶ 204, 205, 208, 211; Ex. 1003 ¶ 93). Petitioner asserts that because “Seo’s PUCCH resources are semi-statically configured by higher layer signaling (e.g., RRC signaling), Seo determines the uplink control channel resource based on signaling received from the network node.” *Id.*

Petitioner further asserts that in Seo the “ACK/NACK bundling result may be transmitted via an ACK/NACK resource set mapped to a last DL subframe in which the PDSCH is transmitted (a latest DL subframe, in which the PDSCH is received, from among *m* DL subframes).” Pet. 34 (citing Ex. 1005 ¶ 183; *see also* ¶¶ 184–188 (“the PUCCH resource set 0 mapped to the last DL subframe (that is, the DL subframe #9) in which the PDSCH is received.”)). According to Petitioner, by “mapping the PUCCH resource to the last DL subframe, Seo’s resource determination performed by the wireless device is based on a latest received one of the first downlink control channel message (first PDCCH) and the second downlink control channel message (second PDCCH).” *Id.* (citing Ex. 1003 ¶ 94).

Petitioner relies on the testimony of Dr. Buehrer to support its position. Dr. Buehrer testifies that “Seo’s ACK/NACK feedback for a PDSCH depends on detection of a corresponding PDCCH (i.e., the ‘downlink control channel message’ of the ’669 patent).” Ex. 1003 ¶ 94 (citing Ex. 1005 ¶¶ 51, 94, 135, 138).

Petitioner further contends that that Seo’s dynamic signaling sent within the last of multiple control messages may be used to select the PUCCH resource. Pet. 34 (citing Ex. 1005 ¶¶ 185–186). Petitioner specifically argues that the “control channel transmitted from the transmitter may include a control channel number count value,” which “gradually increases for each control channel” and is “similar to a downlink assignment index (DAI) field included in a PDCCH.” *Id.* (citing Ex. 1005 ¶¶ 187–189, 196–202). According to Petitioner, when the control channel number count value is used, Seo’s ACK/NACK resources are “mapped to the last (or highest) control channel number count value of the DL subframes associated with one UL subframe.” *Id.* (citing Ex. 1005 ¶ 202). Petitioner asserts that by “using the control channel number count value (e.g., within the PDCCH, a type of DCI) to select the PUCCH resource associated with the latest received PDCCH,” Seo alone teaches the recited claim limitation. *Id.* (citing Ex. 1003 ¶ 95). Petitioner does not cite to or appear to reply on the teachings of ZTE for this claim limitation. *Id.*

Patent Owner disputes Petitioner’s contentions for several reason. Prelim. Resp. 19–21. Patent Owner first complains that the Petition improperly relies on different embodiments of Seo. *Id.* at 20. Patent Owner then argues the Petition is deficient because it relies on “a last DL subframe in which the PDSCH is transmitted.” *Id.* (citing Pet. 34). According to Patent Owner, Petitioner’s reliance on the downlink *shared* channel does not tie Seo to the claim language reciting a “latest received downlink *control* channel message.” *Id.* at 20–21 (citing Ex. 1005

¶ 51). Patent Owner contends it is a fatal flaw to map the claim limitation to the downlink shared channel, because the control and shared channels are distinct. *Id.* at 21. We agree with Patent Owner.

Seo teaches that if PDSCH transmission is actually performed in *m* DL subframes of *M* associated DL subframes, then “ACK/NACK information for transmission of *m* PDSCHs may be fed back through ACK/NACK bundling. Ex. 1005 ¶ 183. According to Seo, “[t]he ACK/NACK bundling result may be transmitted via an ACK/NACK resource set mapped to a last DL subframe in which the PDSCH is transmitted.” *Id.* Seo further teaches that

the control channel transmitted from the transmitter may include a control channel number count value. That is, the transmitter may include a field having a value which gradually increases for each control channel. Such a control channel number count field may be configured in a manner similar to a downlink assignment index (DAI) field included in a PDCCH or in a manner of reusing another field of the control channel.

Ex. 1005 ¶ 185. Seo provides several examples of when and how to perform accurate ACK/NACK operations and/or responses for when the receiver misses a downlink transmission for specific DL subframes. *See id.* ¶¶ 183–188. Seo then discloses that “the receiver may generate NACK information and feed the generated NACK information back to the transmitter using the PUCCH resource set 0 mapped to the last DL subframe (that is, the DL subframe #9) in which the PDSCH is received” *Id.* ¶ 188. Based on this, Petitioner contends that “[b]y mapping the PUCCH resource to the last DL subframe, Seo’s resource determination performed by the wireless device is based on a latest received one of the first downlink control channel message (first PDCCH) and the second downlink control channel message (second PDCCH). *See* Pet. 34 (citing Ex. 1005 ¶¶ 183–188; Ex. 1003 ¶ 94). But Petitioner does not explain how generating and

feeding NACK information back to the transmitter using the PUCCH resource set 0 mapped to the last DL subframe in which the PDSCH is received equates to resource determined being based on the latest received one of the first PDCCH message and second PDCCH message. The PDCCH and PDSCH are two distinct channels. Additionally, Petitioner fails to explain how use of the Uplink Control Channel resource equates to Downlink Control Channel messages required by the claim.

Petitioner's reliance on the testimony of Dr. Buehrer is equally unavailing. Dr. Buehrer testifies that "ACK/NACK feedback for a PDSCH depends on detection of a corresponding PDCCH." *See* Ex. 1003 ¶ 94. We understand that to mean that for the generation of ACK/NACK information for a PDSCH there must be detection of a corresponding PDCCH. But Seo discloses at least one case where there is generation of ACK/NACK information for a PDSCH transmitted without PDCCH detection. *See* Ex. 1005 ¶ 135. Thus, Seo appears to conflict with Dr. Buehrer's testimony that ACK/NACK feedback for a PDSCH *depends* on detection of a corresponding PDCCH.

Accordingly, we find Petitioner has failed to explain sufficiently how mapping the PUCCH resource to the last DL subframe means that Seo's resource determination is performed by the wireless device based on a latest received one of the first downlink control channel message (first PDCCH) and the second downlink control channel message (second PDCCH) as required by the challenged claim.

b) Rational to Combine the Cited References

We are persuaded by Petitioner that a person of ordinary skill in the art at the critical date would have had reason to combine the teachings of Seo and ZTE. Specifically, Seo and ZTE are in the same field, each relate to PUCCH resource

allocation for ACK/NACK information, and each relate to uplink control resource allocation in 3GPP systems. *See* Ex. 1005 ¶¶ 1, 133, 138; Ex. 1006, 2. Moreover, Seo explicitly suggests turning to 3GPP documents, such as ZTE. *See* Ex. 1005 ¶¶ 41, 42. As Seo explains, “[e]xemplary embodiments of the present invention are supported by standard documents disclosed for at least one of wireless access systems including . . . a 3rd Generation Project Partnership (3GPP) system, a 3GPP Long Term Evolution (LTE) system, and a 3GPP2 system.” *Id.* Accordingly, we are persuaded a person of ordinary skill in the art at the critical date would have had reason to consult ZTE’s teachings when reviewing Seo.

c) Summary Regarding Claim 1

Having considered carefully all arguments and supporting evidence in light of the limitations recited in challenged claim 1, we are unpersuaded by Petitioner’s analysis that the combination Seo and ZTE teaches all of the claim limitations. Accordingly, we determine Petitioner not met its burden to establish a reasonable likelihood it would prevail in showing that challenged claim 1 would have been obvious to a person of ordinary skill in the art under 35 U.S.C. § 103 in view of Seo and ZTE.

3. Analysis of Claims 2, 3, 6–8, 11, 12, and 17–19

Petitioner contends claims 2, 3, 6–8, 11, 12, and 17–19 of the ’669 patent are unpatentable under 35 U.S.C. § 103 as obvious in view of Seo and ZTE. Pet. 43–58 (citing Ex. 1003 ¶¶ 111–165). Patent Owner does not provide different or argument regarding the additional limitations of claims 2, 3, 6–8, 11, 12, and 17–19. Prelim. Resp. 24–27. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

We have considered carefully all arguments and supporting evidence in light of the limitations recited in challenged claims 2, 3, 6–8, 11, 12, and 17–19. Each

of these claims either depends from independent claim 1 or recites the same or similar limitation as that discussed above in Section III.A.2.a. Therefore, for the same reasons, we were unpersuaded by Petitioner’s analysis with regards to claim 1, we are unpersuaded here.

4. Conclusion Regarding the Challenged based on Seo and ZTE

Based on the current record as a whole, we conclude Petitioner has failed to established a reasonable likelihood it would prevail in showing that challenged claims 1–3, 6–8, 11, 12, and 17–19 would have been obvious to a person of ordinary skill in the art under 35 U.S.C. § 103 in view of Seo and ZTE.

B. Alleged Obviousness of Claims 1–3, 6–8, 11, 12, and 17–19 in View of Seo, ZTE, and Intel

Petitioner contends claims 1–3, 6–8, 11, 12, and 17–19 of the ’669 patent are unpatentable under 35 U.S.C. § 103 as obvious in view of Seo, ZTE, Intel. Pet. 58–68 (citing Ex. 1003 ¶¶ 72–78, 166–184). Petitioner specifically relies on its arguments based on Seo and ZTE for many of the disputed claims, including for the claim 1 limitation reciting “wherein determining the uplink control channel resource to use for transmitting the uplink control information comprises determining the uplink control channel resource based on (a) signaling received from the network node and (b) resource determination performed by the wireless device based on a latest received one of the first downlink control channel message and the second downlink control channel message.” *See id.* at 63 (stating “Intel offers additional disclosure that corroborates the analysis of Seo and ZTE above and further supports obviousness of features [1g], [1h] . . .”). Petitioner does not appear to rely on Intel’s disclosure to meet the limitation recited above. *Id.* at 63–64.

For the same reasons detailed above in Section III.A.2.a., we find Petitioner has failed to explain sufficiently how mapping the PUCCH resource to the last DL subframe means that Seo's resource determination is performed by the wireless device based on a latest received one of the first downlink control channel message (first PDCCH) and the second downlink control channel message (second PDCCH) as required by the challenged claim. Accordingly, we determine Petitioner has not demonstrated a reasonable likelihood of demonstrating that the challenged claim 1 would have been obvious under 35 U.S.C. § 103 in view of Seo, ZTE, and Intel.

We have considered carefully all arguments and supporting evidence in light of the limitations recited in challenged claims 2, 3, 6–8, 11, 12, and 17–19. Each of these claims either depends from independent claim 1 or recites the same or similar limitation as that discussed above in Section III.A.2.a. Therefore, for the same reasons we are unpersuaded by Petitioner's analysis with regards to claim 1, we are unpersuaded here.

Having reviewed the evidence currently of record, we conclude Petitioner has failed to established a reasonable likelihood it would prevail in showing that challenged claims 1–3, 6–8, 11, 12, and 17–19 would have been obvious to a person of ordinary skill in the art under 35 U.S.C. § 103 in view of Seo, ZTE, and Intel.

IV. CONCLUSION

For the foregoing reasons, we determine Petitioner has failed to demonstrate a reasonable likelihood that it would prevail in establishing the unpatentability of all claims challenged in the petition.

V. ORDER

In consideration of the foregoing, it is hereby:

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ORDERED that the Petition is denied and no *inter partes* review is instituted in this proceeding.

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