

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORP. and
CONTINENTAL AUTOMOTIVE SYSTEMS, INC.,
Petitioners,

v.

INTELLECTUAL VENTURES II LLC,
Patent Owner.

IPR2022-01130
U.S. Patent No. 8,811,356 B2

Before JAMES P. CALVE, SCOTT A. DANIELS, and
FREDERICK C. LANEY, *Administrative Patent Judges*.

CALVE, *Administrative Patent Judge*.

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

I. INTRODUCTION

Toyota Motor Corporation (“Toyota” or “Petitioner”) and Continental Automotive Systems, Inc. (“Continental” or “Petitioner”) (also collectively “Petitioners”) filed a Petition requesting *inter partes* review (“IPR”) of claims 1–7, 22–28, and 43–46 of U.S. Patent No. 8,811,356 B2 (Ex. 1001, “the ’356 patent”). Paper 1 (“Pet.”). Intellectual Ventures II LLC (“Intellectual Ventures” or “Patent Owner”) filed a Preliminary Response to the Petition. Paper 10 (“Prelim. Resp.”).

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted “unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” Upon consideration of the arguments and evidence presented by Petitioners and Patent Owner, we are persuaded that Petitioners demonstrated a reasonable likelihood that they would prevail in showing the unpatentability of at least one of the challenged claims. *See* 35 U.S.C. § 314(a). Accordingly, we institute an *inter partes* review of the challenged claims.

A. *Real Parties in Interest*

Petitioners state that Toyota Motor Corp., Toyota Motor North America, Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Sales, U.S.A., Inc., Continental Automotive Systems, Inc., Continental Automotive GmbH, Continental Automotive Technologies GmbH, Continental Automotive, Inc., and Continental AG (identified as the parent of Continental Automotive, Inc.) are the real parties in interest. Pet. 83. Patent Owner states that Intellectual Ventures II LLC is the patent owner and the sole real party in interest. Paper 5, 2.

B. Related Matters

The parties indicate that the '356 patent is at issue in the district court litigations of *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Toyota Motor Corp. et al.*, Case No. 2:21-cv-00389 (E.D. Tex. October 19, 2021), *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Honda Motor Co., Ltd. et al.*, Case No. 3:22-cv-00761 (N.D. Tex. April 4, 2022), and *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. General Motors Company*, Case No. 6:21-cv-01088 (W.D. Tex. October 19, 2021). Pet. 84; Paper 5, 2.

C. The '356 Patent (Ex. 1001)

The '356 patent is titled “Communications in a Wireless Network” and describes closed loop feedback by allocating a timeslot¹ in an uplink frame to send a control signal from user equipment (UE) to a base station, which sends controls back to the UE. Ex. 1001, 2:6–48, 4:35–5:41, 5:50–6:4. Each UE allocates a timeslot to send a beacon signal (UL_Beacon) in an uplink frame separated from timeslots to send data. *Id.* at 2:20–42, 4:35–55, 5:15–20. Base stations respond to UL_Beacon signals on a downlink Physical Layer Control Channel (PLCCH) with power control commands. *Id.* at 2:31–60, 4:49–5:60.

This technique provides active feedback control between a base station and UE terminals. *Id.* at 2:17–18. An Uplink Beacon (UL_Beacon) signal is received by a base station, which determines power and channel information from it and sends power and other control commands to the UE terminal on the PLCCH to control uplink transmission parameters of the UE. *Id.* at 2:20–61, 4:35–5:41, 5:50–60. Figure 2 of the '356 patent is reproduced below to illustrate the allocation of a separate timeslot for a UL_Beacon and a PLCCH.

¹ The '356 Patent uses “timeslot” and “time slot” interchangeably. We do too.

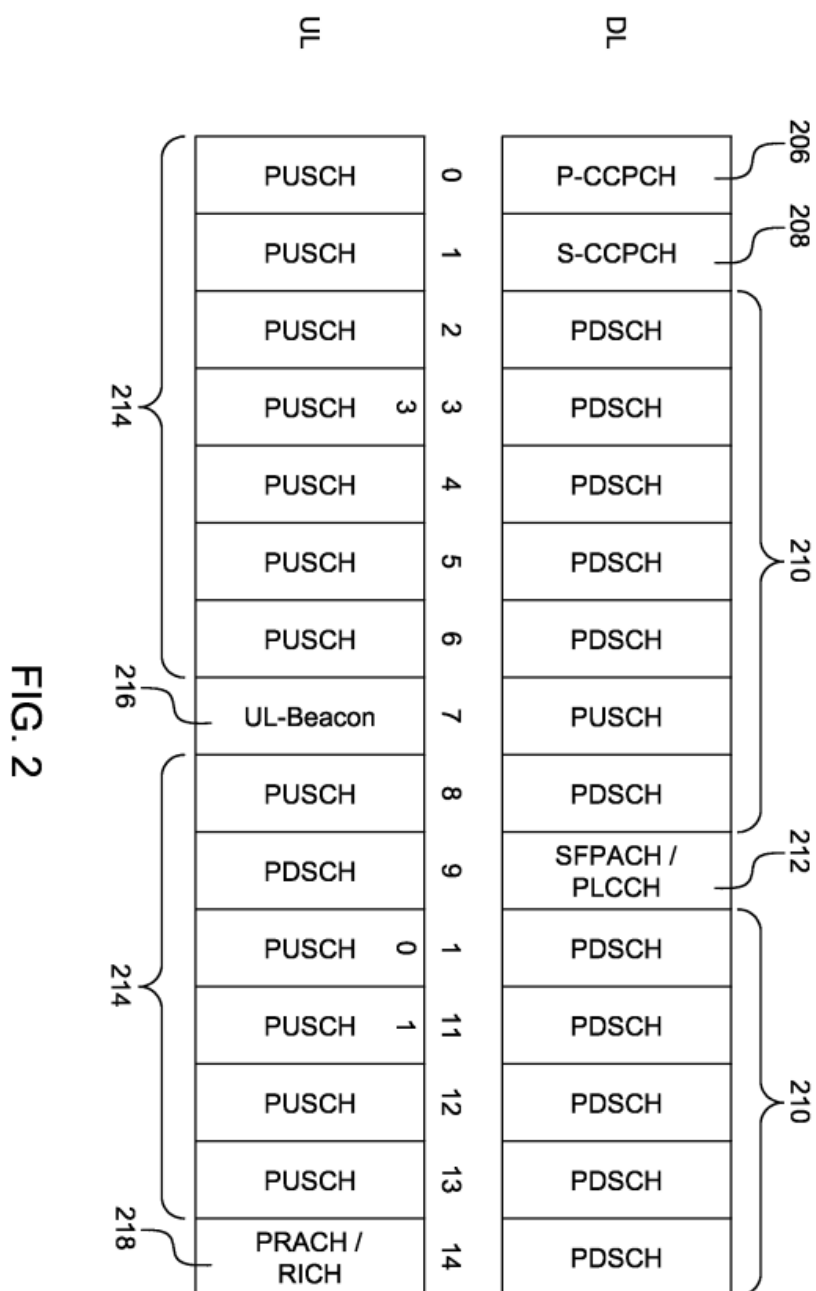


Figure 2 depicts an uplink (UL) frame with a timeslot 216 allocated to transmit a UL_Beacon *separate* from timeslots 214 used to transmit data. A base station allocates a timeslot 212 in a downlink (DL) frame to transmit PLCCH control commands to control uplink transmissions of the UE *separate* from timeslots 210 used to transmit data. *Id.* at 2:11–48, 4:35–5:20, 5:50–60.

Because “a UE allocates a time slot for a beacon signal *separated from* the time slots for data in a frame,” the UE may “transmit the uplink physical channel control signal (UL_Beacon) independently from the uplink physical channel.” *Id.* at 2:24–30 (emphasis added).

Separating uplink control channel and UL_Beacon timeslot 216 from uplink physical traffic timeslots 214 “allows the control feedback to operate even when the terminal does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency.” *Id.* at 6:33–37. If a slower update rate is desired, UL_Beacon and PLCCH timeslots can be fractionated as illustrated in Figure 3, which is reproduced below. *Id.* at 5:38–41.

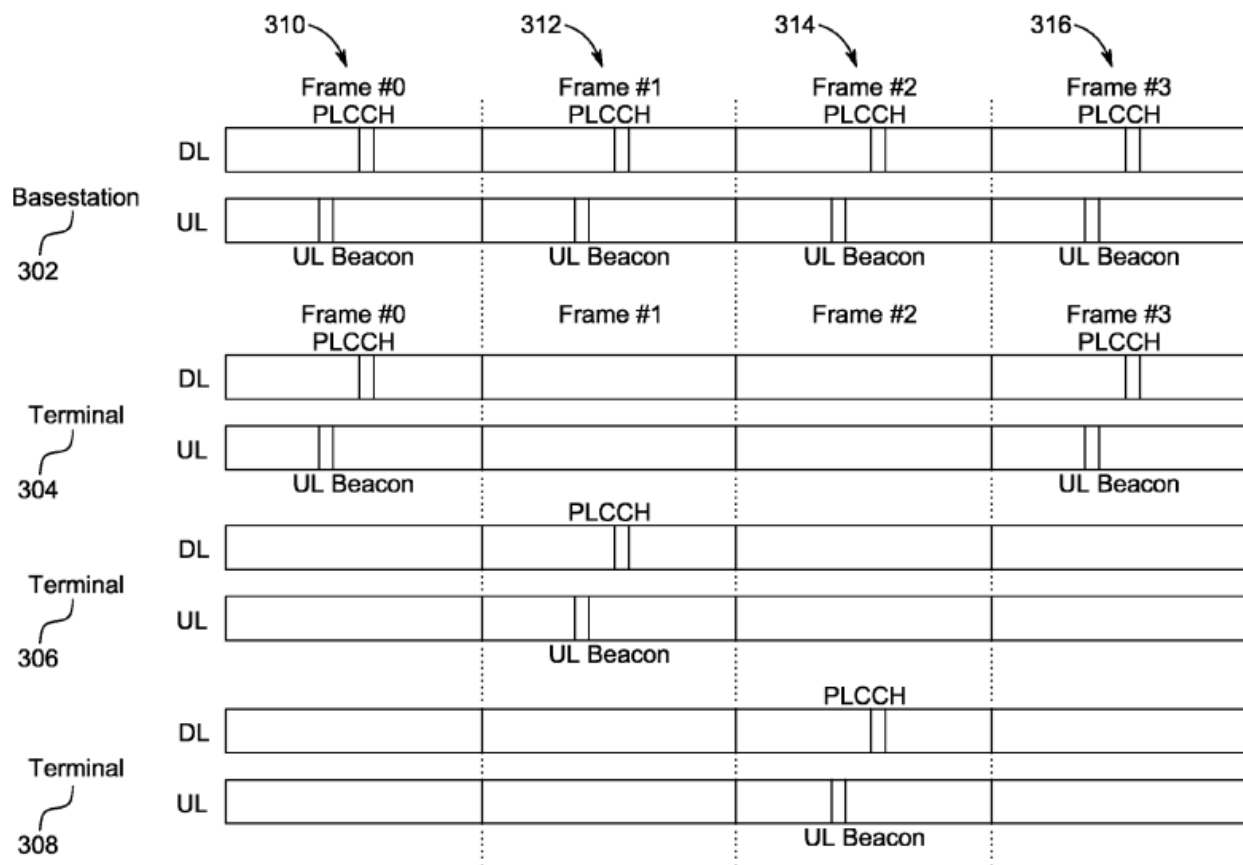


FIG. 3

Figure 3 illustrates a fractionation that provides updates in every third frame. Terminal 304 receives feedback in frames #0 310, #3 316. Terminal 306 receives an update in frame #1 312, and terminal 308 receives an update in frame #2 314. *Id.* at 5:65–6:4. The fractionation phase is 3. *Id.* at 6:3.

As a result of allocating at least one separate timeslot per uplink frame to send a UL_Beacon control signal 216 separated from normal data physical channels 214, a TDMA frame structure may be adapted to provide separation between the UL_Beacon and the normal physical channels as illustrated in Figure 2. *Id.* at 5:15–20. Alternatively, this use of an allocated, separated timeslot for sending control signals such as a UL_Beacon may be used to send at least one signal per multiple uplink frames by allocating a separate timeslot every two, three, or more uplink frames as illustrated in Figure 3 for system applications that can tolerate a slower feedback rate. *Id.* at 5:21–41.

More than one UL_Beacon and its associated PLCCH timeslot may be allocated within a frame structure if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). *Id.* at 5:35–38. Allocating a separate timeslot to send a UL_Beacon allows a large number of possibilities to arrange a UL_Beacon and PLCCH in a frame. *Id.* at 5:32–35.

By placing UL_Beacon signals in a dedicated timeslot, a dedicated detection scheme can be applied which may include performance enhancing features such as intra-cell cancelling (for alleviating the effects of cross-correlation interference between UL_Beacon signals transmitted by multiple terminals in the same cell), or inter-cell cancelling (for reducing the interference from neighboring cells in the case where the UL_Beacon timeslots are time synchronized). Cross-interference between UL_Beacon and normal uplink bursts is avoided by the separation obtained from the use of separate time slots.

Id. at 5:21–31 (emphasis added).

This description of the closed loop feedback control in the '356 Patent makes clear that allocation of a separate timeslot for sending a UL_Beacon control signal in an uplink frame or uplink channel with the allocated timeslot for the UL_Beacon *separated from* timeslots used to send data in the uplink frame is a key feature. As a result, feedback control can operate “even when the terminal does not have data to send” so that the separated “uplink shared channels can be used with maximum efficiency.” *Id.* at 6:33–37.

D. Illustrative Claims

Of challenged claims 1–7, 22–28, and 43–46, claims 1, 22, 43, and 45 are independent. Claims 2–7 depend from claim 1. Claims 23–28 depend from claim 22. Claim 44 depends from claim 43, and claim 46 depends from claim 45. Claims 1 and 22, which illustrate the claimed subject matter, are reproduced below with Petitioners’ alphanumeric annotations to indicate each limitation. Claim 1 is directed to user equipment while claim 22 is directed to a method performed by a UE similar in scope to claim 1 as indicated below.

1. [1p] A user equipment (UE) comprising:

1[a] a processor configured to receive resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

1[b] the processor is further configured to send data over the physical uplink shared channel in assigned time intervals;

1[c] the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information; and

1[d] the processor is further configured to receive feedback information from a downlink control channel.

Ex. 1001, 9:40–54; *see* Pet. iv, 67–71.

22. [22p] A method performed by a user equipment (UE), the method comprising:

22[a] receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

22[b] sending, by the UE, data over the physical uplink shared channel in assigned time intervals;

22[c] sending, by the UE in a time interval that it is not sending information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and

22[d] receiving, by the UE, feedback information from a downlink control channel.

Ex. 1001, 11:25–38; *see* Pet. i–ii, 33–42.

D. Prior Art and Asserted Grounds

Petitioners challenge the claims on the following grounds:²

Ground	Claim(s) Challenged	35 U.S.C. § ³	Reference(s)/Basis
1	22, 23, 25–28, 45, 46	102(a), (b)	802.16 Standard ⁴
2	1–7, 24, 43, 44	103(a)	802.16 Standard
3	1–7, 43, 44	103(a)	802.16 Standard, Mohanty ⁵

² Petitioners support their challenge with a Declaration of Dr. Robert Akl, D.Sc. (Ex. 1003). *See infra*.

³ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, is effective March 16, 2013. Because the application from which the ’356 patent issued has an effective filing date prior to March 16, 2013, the pre-AIA version of § 103 applies. *See* Ex. 1001, code (63).

⁴ Ex 1005, IEEE Std 802.16-2004, IEEE Standard for Local and metropolitan area networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems, publicly available Nov. 23, 2004 (“the Standard”).

⁵ Ex. 1009, US 2007/0105600 A1, published May 10, 2007 (“Mohanty”).

II. ANALYSIS

A. Legal Standards

A “prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). “A single prior art reference may anticipate without disclosing a feature of the claimed invention if such feature is necessarily present, or inherent, in that reference.” *Allergan, Inc. v. Apotex Inc.*, 754 F.3d 952, 958 (Fed. Cir. 2014).

A patent claim is unpatentable under 35 U.S.C. § 103 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; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). “[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.” *KSR*, 550 U.S. at 416 (citing *United States v. Adams*, 383 U.S. 39, 50–51 (1966)). The question of obviousness is resolved based on underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioners assert that a person of ordinary skill in the art at the time of the '356 patent

would have had at least a Bachelor's degree in Electrical Engineering, Computer Engineering, or related field, with at least three to four years of experience in wireless communication technology, or a Master's degree in electrical engineering, computer engineering, or equivalent. Akl, ¶ 19. Additional education could substitute for professional experience and vice versa. *Id.*

Pet. 32 (citing Ex. 1003 ¶ 19). Petitioners also assert that “[t]he level of ordinary skill in the art may be reflected by the prior art of record.” *Id.*

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

On this record, Petitioners' proposed level of ordinary skill in the art is not disputed and is consistent with our review and understanding of the technology and descriptions in the '356 patent and the asserted prior art references. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). For purposes of this Decision, we rely on Petitioners' proposed level of ordinary skill in the art.

C. Claim Construction

We interpret a claim “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) (2020). Under this standard, we construe 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.” *Id.* Furthermore, at this stage in the proceeding, we expressly construe the claims only to the extent necessary to determine whether to institute *inter partes* review. *See Nidec Motor Corp. v. Zhongshan*

Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

Petitioners do not assert any particular claim constructions, stating that “no terms need construction because the claims read on the prior art under any construction consistent with *Phillips*.” Pet. 33 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc)).

Patent Owner proposes the following construction of “time interval”:

Claim Term	Proposed Construction
“the processor is further configured, <u>in a time interval that it is not sending information over the physical uplink shared channel</u> , to send a signal over the uplink physical control channel	The processor is further configured to send a signal over the uplink physical control channel <u>between transmissions of information over the physical uplink shared channel</u>

Prelim. Resp. 10.

Patent Owner argues, “[t]he plain meaning of an ‘interval’ is ‘a period of time between events or states’” and “[i]n the context of the ’356 Patent, the recited ‘interval’ is the period of time between transmissions over the physical uplink shared channel.” *Id.* (citing a definition of “interval” from *Merriam-Webster.com Dictionary*, at <https://www.merriam-webster.com/dictionary/interval>, captured on October 4, 2022 (Ex. 2003)). Patent Owner also cites the Declaration of Dr. Lomp, who testifies that “[a] person of ordinary skill in the art, reading the ’356 Patent, would understand that the recited ‘interval’ is the period of time between transmissions over the physical uplink shared channel.” Ex. 2001 ¶ 38. Patent Owner argues, “[t]his interpretation aligns with the description in the ’356 Patent’s specification.” Prelim. Resp. 10.

As discussed below, we interpret “time interval” to mean a “timeslot” and the processor sends a signal over an uplink physical control channel “in a timeslot that is not sending information over the physical uplink shared channel, e.g., a timeslot separated from timeslots used to send data.”

Patent Owner contends, “[t]he term ‘time interval’ and ‘time slot’ are used synonymously in the ’356 Patent.” Prelim. Resp. 11. Patent Owner’s expert, Dr. Lomp, testifies, “[i]n the ’356 Patent, the term ‘time interval’ and ‘time slot’ are used synonymously. In every instance, the term refers to a time slot within a frame, e.g., a TD-CDMA frame.” Ex. 2001 ¶ 41.

According to the plain meaning of the claim language, the processor is configured “to send a signal over the uplink physical control channel” “in a time interval that is not sending information over the physical uplink shared channel.” Ex. 1001, 9:48–52 (claim 1). According to Patent Owner’s own interpretation of a timeslot as synonymous with time interval, the processor sends a signal over the uplink physical control channel “in a *timeslot* that is not sending information over the physical uplink shared channel.” In other words, the processor may send a signal in any timeslot of a frame as long as that timeslot is not used to send information over the physical uplink shared channel. A “time interval” is allocated as a *timeslot* to send control signals, not data. It is *separate from* timeslots used to send data in a frame.

According to dependent claim 6, “a plurality of UEs each transmit on respective uplink physical control channels in the time interval.” Ex. 1001, 10:1–2. Multiple UEs may transmit signals on the uplink physical control channel in the same timeslot. However, this separate timeslot is not used to transmit data over the physical uplink shared channel.

A UE allocates (dedicates) a timeslot for transmitting a beacon signal separated from timeslots used to send data in a frame. *Id.* at 2:29–30.

This interpretation is consistent with the '356 Patent specification, which, as Patent Owner asserts (Prelim. Resp. 11–12; Ex. 2001 ¶ 41), states:

“a UE allocates a time slot for a beacon signal [UL_Beacon] separated from the time slots for data in a frame. A second time slot is allocated within the frame for . . .” '356 Patent, Col. 2, Ll. 29–33 (emphasis added).

“FIG. 2 illustrates a timeslot arrangement for uplink and downlink messages supporting the UL_Beacon and its corresponding PLCCH within a TD-CDMA frame structure . . .” [’356 Patent], Col. 3, Ll. 9–11 (emphasis added).

“[I]t is possible to adapt the TDMA frame structure to provide separation between the UL_Beacon and the normal physical channels by dedicating at least one uplink time slot per frame . . . to carrying UL_Beacon signals. [’356 Patent], Col. 5, Ll. 15–19 (emphasis added).

“Those skilled in the art will recognize that there are a large number of possibilities for the arrangement of a UL_Beacon and its associated PLCCH within the frame structure according to embodiments of the invention. More than one UL_Beacon and PLCCH per frame could be supported if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). . . .” [’356 Patent], Col. 5, Ll. 32–41 (emphasis added).

“When fractionation is employed, the RNC or other controller may allocate the UL_Beacon timeslot in a given frame to a group of terminals. . . .” [’356 Patent], Col. 5, Ll. 42–45 (emphasis added).

“FIG. 2 illustrates an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCH within a TD-CDMA frame structure . . . The uplink frame comprises a UL_Beacon control timeslot 216, an access control timeslot 218, and normal traffic carrying timeslots 214. [’356 Patent], Col. 5, Ll. 50–60 (emphasis added).

These descriptions indicate a UE allocates a timeslot for a UL_Beacon signal in an uplink frame. This timeslot is *separated from* time slots used to transmit data in the frame over a shared physical channel. Ex. 1001, 2:29–33, 4:49–60. “Cross-interference between UL_Beacon and normal uplink bursts is avoided by the *separation* obtained from the use of *separate* time slots.” *Id.* at 5:29–31 (emphasis added). Figure 2 of the ’356 Patent depicts UL_Beacon in time slot 216 *separate* from time slots 214 (PUSCH) that carry normal traffic. *Id.* at 5:58–60. Because the signal timeslot only needs to be *separated from* data timeslots, a large number of possibilities exist to arrange a timeslot for a UL_Beacon signal and its PLCCH in a frame. *Id.* at 5:32–35. *The UE allocates a timeslot to send control signals separated from data timeslots.*

A dedicated timeslot for a UL_Beacon is *separated* from timeslots used to transmit data in a frame. *Id.* at 2:29–33, 5:15–19. “Embodiments of this invention *separate* uplink control from the uplink physical traffic. This allows the control feedback to operate even when the terminal does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency.” *Id.* at 6:33–37 (emphasis added). As a result, *a UE processor might configure a UL_Beacon timeslot for a frame where no other timeslots are used to transmit data by that UE in that frame. See id.* at 6:33–37. Neither the claims nor written description requires a time slot allocated to send control signals to be allocated between timeslots used to send data.

The term “interval” is not used in the Specification of the ’356 Patent. It appears only in the claims and Abstract, which states: “Data may be sent over the physical uplink shared channel in assigned time intervals. A signal may be sent over the uplink physical control channel based on the received resource allocation information in a time interval that the UE is not sending data over the physical uplink shared channel.” Ex. 1001, Abstract.

The claimed time interval is an assigned timeslot in which a signal (e.g., a UL_Beacon) is sent and in which timeslot the UE is not also sending data over the physical uplink shared channel in that same timeslot that has been allocated to send the UL_Beacon signal. *See id.*

Nor do we view the use of “time *interval*” in the claims as an intent by Patent Owner to limit the claim scope to embodiments where a UL_Beacon timeslot is placed between timeslots for data transmissions given Patent Owner’s and Dr. Lomp’s contention that the ’356 Patent uses “time interval” and “time slot” synonymously (Prelim. Resp. 11; Ex. 2001 ¶ 41), and the only feature claimed (and described) for the time interval is its *separation* from other timeslots used to transmit data in a frame. As claimed, the time interval can be allocated anywhere in a frame. *See* Ex. 1001, 5:32–41; *see also Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1369 (Fed. Cir. 2012) (“Appellees cannot overcome the plain meaning of claim 1 by pointing to an embodiment disclosed in the specification or prosecution history.”).

During prosecution of the application that issued as the ’356 Patent, Patent Owner argued, “in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information” in claim 45 “may mean that a user equipment (UE) is configured to send a signal on an uplink physical control channel **using allocated resources** in the same time interval it is not sending information on a physical uplink shared channel.” Ex. 1002, 244–45 (Reply Pursuant to 37 C.F.R. § 1.111, Oct. 24, 2013), *id.* at 246 (arguing that the prior art does not teach or suggest the feature of “in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information”).

Dr. Lomp testifies that “[i]n every instance, the term [time interval] refers to a time slot within a frame, e.g., a TD-CDMA frame, where data is sent by a UE ‘over the physical uplink shared channel in assigned time intervals within a frame,’ while another time interval between the data slots – i.e., ‘a time interval that it is not sending information over the physical uplink shared channel’ – is used by the UE to send control information over the uplink physical control channel.” Ex. 2001 ¶ 41. Dr. Lomp thus describes a “time interval” as “a time interval that it is not sending information over the physical uplink shared channel.” *Id.* Dr. Lomp does not explain why the time interval must be allocated *between* data slots in a frame to transmit a signal.

Yet, Dr. Lomp also avers that “[t]he specification makes clear that the timeslot used by the UE for the UL-Beacon is interposed in a frame structure between data time slots.” *Id.* Dr. Lomp testifies that a skilled artisan would interpret this limitation in light of the specification to mean “the processor is further configured to send a signal over the uplink physical control channel between transmissions of information over the physical uplink shared channel.” *Id.* ¶ 42. Dr. Lomp testifies that this construction is supported by the plain meaning of interval, and it aligns with operation of the feedback control system taught by the specification and comports with the stated goal of the ’356 Patent to “find a substitute for channel reciprocity” “where the correlation between the uplink and downlink path loss is not guaranteed.” *Id.* (quoting Ex. 1001, 1:66–2:2).

Patent Owner’s arguments and Dr. Lomp’s testimony that the plain meaning of time interval requires the time slot for the signal to be *between* time slots for transmission of information is undermined by their contentions that “time interval” is synonymous with a “time slot,” which the ’356 Patent describes as being *separated from*, rather than *between*, data timeslots.

We give more weight to Patent Owner’s and Dr. Lomp’s contention that a time interval is used in the ’356 Patent to mean a timeslot than to a nontechnical dictionary definition of “interval.” A timeslot *allocated* for a UL_Beacon is “separated from the time slots for data in a frame.” Ex. 1001, 2:29–33. The UL_Beacon channel is *independent* from the uplink physical channel. *Id.* at 2:24–27. A *dedicated* timeslot groups all UL_Beacon signals from many UEs in a *specific* uplink timeslot to “obtain separation from the UL_Beacon signals and the standard uplink physical channels.” *Id.* at 2:35–42. A UE “allocates resources so that the physical channel control signal is separate from the uplink (shared) physical channel.” *Id.* at 4:49–60. TDMA frame structure *separates* a UL_Beacon from normal channels by dedicating an uplink timeslot per frame. *Id.* at 5:15–41. Many arrangements may be used to achieve this separation of the UL_Beacon signal. *Id.* at 5:32–41.

We have no persuasive evidence that a “time interval” must be allotted *between* data transmission timeslots to provide closed loop feedback control.

The ’356 Patent indicates: “Embodiments of this invention *separate* uplink control from the uplink physical traffic. This allows the control feedback to operate even when a UE does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency.” Ex. 1001, 6:33–37 (emphasis added). This capability exists if a UL_Beacon is sent in a timeslot *separated from* timeslots used to send data in the uplink frame.⁶

⁶ Patent Owner asserts that the feedback control system is “a substitute for channel reciprocity” “where the correlation between the uplink and downlink path loss is not guaranteed.” Prelim. Resp. 14; Ex. 2001 ¶ 42. An allocated, separate timeslot allows UL_Beacons from multiple UEs to be grouped into a single timeslot to avoid cross interference with uplink physical channels. Ex. 1001, 2:36–61, 5:21–49. If anything, placing a UL_Beacon timeslot between data channels would appear to increase the risk of such cross interference.

D. Ground 1: Claims 22, 23, 25–28, 45, and 46 — Alleged Anticipation by the Standard (Ex. 1005)

1. The Standard (Ex. 1005)

The Standard specifies an air interface for wireless systems in which a subscriber station (SS) receives uplink parameters, chooses a Ranging Slot to perform ranging, sends a Ranging Code to a base station (BS), and receives a Ranging Response with adjustments to its time and power settings. Ex. 1005, 48–51, 174–81, 205–06, 577, 620. Ranging requests are sent over an uplink frame separate from data bursts as shown in Figure 218, reproduced below.

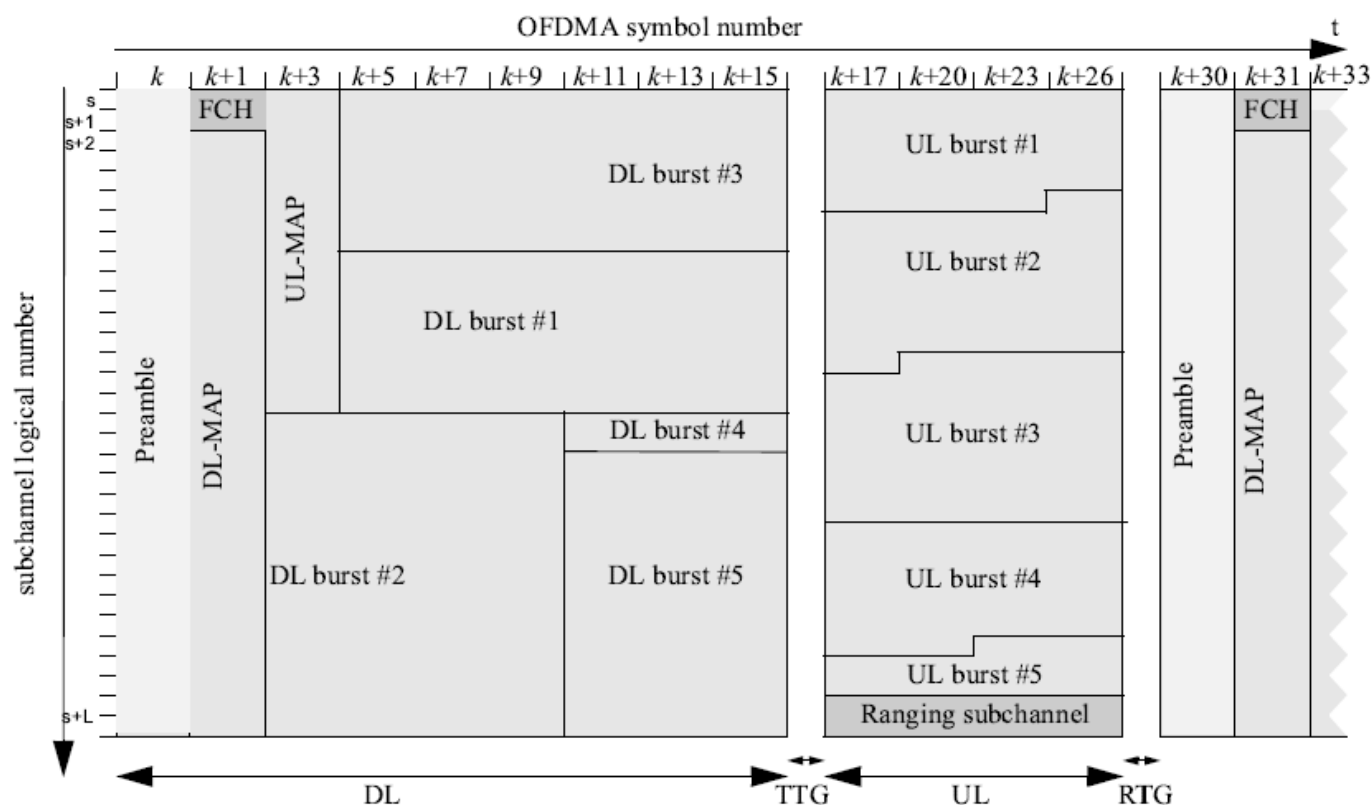
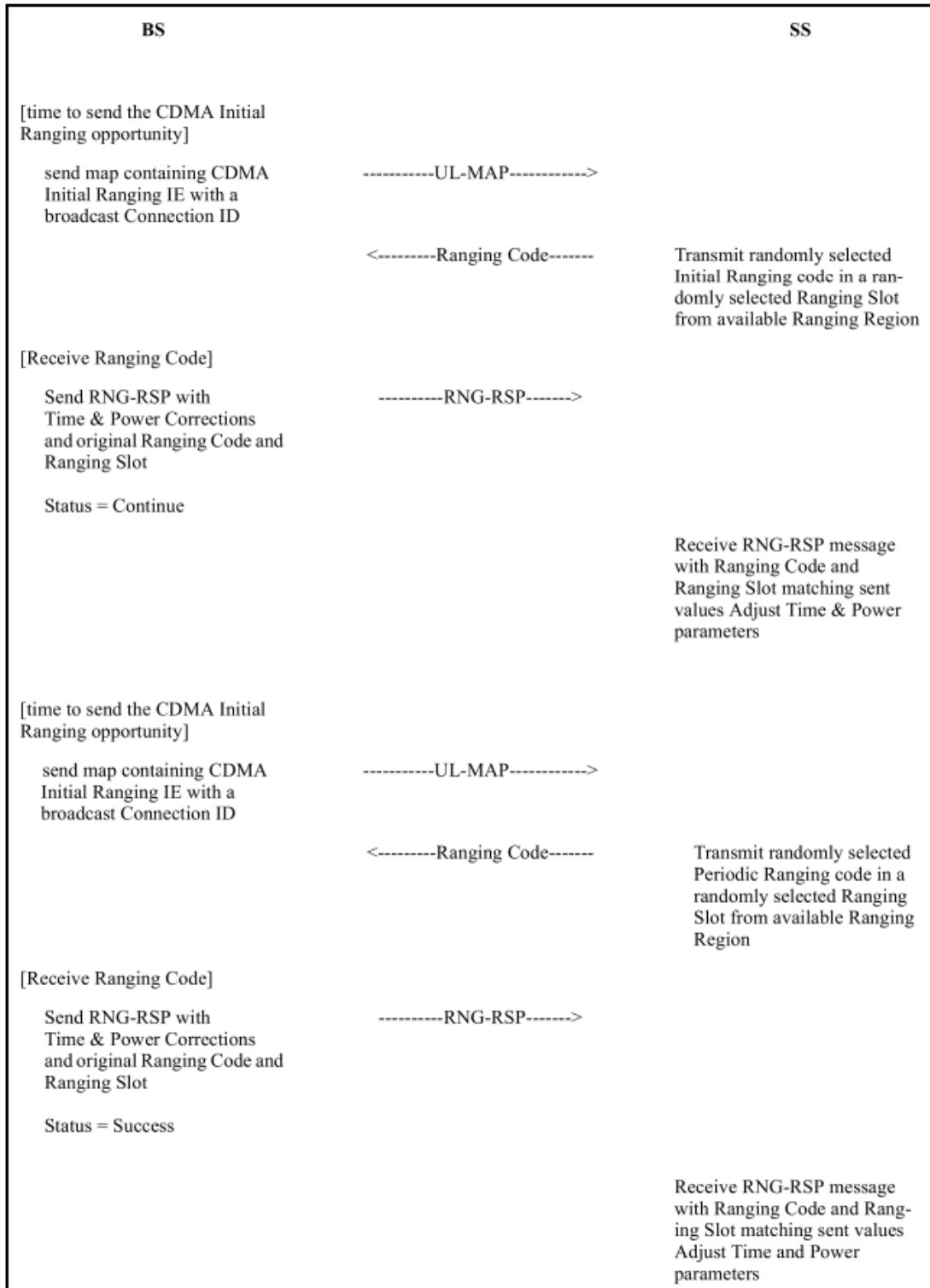


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 depicts a time division duplex TDD time frame in which a SS sends a ranging code over an allocated “Ranging subchannel” timeslot that is separated from timeslots used to send data (UL Bursts #1–5) in an uplink frame. *Id.* 49–51, 154, 167, 174–76, 500, 577, 578, 620, 666.

Table 121 is reproduced below to illustrate a ranging process.

Table 121—CDMA initial Ranging and automatic adjustments procedure



As indicated by its title, Table 121 describes steps that a SS performs in an initial ranging to obtain power and timing adjustments for its transmissions to communicate with the BS. Ex. 1005, 48–51, 154, 174–77, 205–06, 212. If a SS wants to join a network, it scans a UL-MAP message to find an Initial Ranging Interval/Ranging Slot allocated by a BS to access the uplink channel to transmit a Ranging Code to the BS. *Id.* at 48–51, 174–77, 205–06. An Initial Ranging IE (Information Element) in a UL-MAP specifies intervals (Ranging Slots) for the SS to send a Ranging Code. *Id.* at 48, 154, 167, 205–06. The SS chooses an allocated Ranging Slot from the Initial Ranging IE to transmit a Ranging Code or a Ranging Request (RNG-REQ) at prescribed power levels to determine network delay and request power, timing, and other control parameters from the BS. *Id.* at 48–51, 174–78, 205–06, 212–13.

In response to successful receipt of a Ranging Code/RNG-REQ, a BS transmits a ranging response (RNG-RSP). *Id.* at 50, 176, 205–06. The RNG-RSP provides parameters to control uplink communication of the SS such as timing and power adjust information. *Id.* In the RNG-RSP, the BS includes the Ranging subchannel and code attributes of the received Ranging Code to identify the Ranging Code/RNG-REQ to which the BS is responding. *Id.* at 51–52. An uplink Ranging subchannel is illustrated in Figure 218. *Id.* at 666.

When the SS receives the requested RNG-RSP, it adjusts its parameters specified in the RNG-RSP such as transmit power and increases or reduces its transmit power by the amount specified in the RNG-RSP message. *Id.* at 178, 205, 206 (“Adjust Time & Power parameters”). A SS does not transmit until it adjusts the RF signal to meet the RNG-RSP. *Id.* at 205. A power control algorithm is used on the uplink channel for initial calibration and periodic adjustments to prevent data loss. *Id.* 620. The BS should be able capable of providing accurate power measurements of received burst signals of a SS. *Id.*

2. *Independent Claim 22*

On this record, based on following analysis, we find that Petitioners have established a reasonable likelihood of establishing that at least claim 22 would be anticipated by the Standard for the reasons explained below.

a) *Petitioners' Arguments*

(1) *Preamble – 22[p] A method performed by a user equipment (UE), the method comprising:*

To the extent the preamble is limiting, Petitioners argue the Standard discloses “[a] method performed by a user equipment,” which the Standard refers to as a “subscriber station” or a “SS.” Pet. 33 (quoting Dr. Akl’s testimony at Ex. 1003 ¶ 72 and citing the Standard at Ex. 1005, 11).

(2) *Limitation 22[a] –receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;*

Petitioners argue that the Standard discloses an uplink physical control channel as a ranging subchannel used by a SS to transmit a Ranging Code message, which is control information, not data. Pet. 33–34 (citing Ex. 1005, 500, Fig. 218), Ex. 1003 ¶¶ 73–77, and Pet. 16–17). Petitioners argue that a BS sends UL-MAP messages that include “Initial Ranging IE” that specifies an “Initial Ranging Interval” in which new stations may join the network and the SS selects an allocated interval to send a Ranging Code, which is control information, over the Ranging subchannel, which is a different region than is allocated for uplink bursts. *Id.* at 33–37 (citing Ex. 1003 ¶¶ 73–77; Ex. 1005, 51, 154, 167, 174, 178, 493, 500, 577, 578, 666, Fig. 218). Dr. Akl testifies that a UL-MAP provides the Initial Ranging IE to a SS with different time slots to send a Ranging Code than to send data bursts. Ex. 1003 ¶¶ 73–77.

Petitioners also contend that the ranging subchannel is an uplink control channel because it is part of the uplink subframe and is used by the SS to transmit the Ranging Code message, which a person of ordinary skill in the art (POSA) would have recognized is control information, not data. Pet. 34 (citing Section V.A.2. of the Pet. and Ex. 1003 ¶ 73). Section V.A.2. of the Petition asserts that the SS transmits a Ranging Code message in an Initial Ranging opportunity such as on a Ranging Subchannel that is identified in the UL-MAP (illustrated in Table 121) as allocated resource information for the SS to send the Ranging Code message. Pet. 14–16 (citing Ex. 1005, 51, 154, 167, 174, 178, 500, 577, 578, 666, Table 121, Fig. 218; Ex. 1003 ¶¶ 52, 54). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 52–54.

Section V.A.2. of the Petition is part of Petitioners’ explanation of the way that the Standard provides control information from a BS to a SS. In particular, the next section of the Petition, Section V.A.3. explains that after a SS sends the Ranging Code message to the BS, the BS transmits a Ranging Response (RNG-RSP) message to the SS with Power Adjust Information and other parameters to control the uplink transmissions of the SS. Pet. 17–18 (citing Ex. 1005, 50–51, 178, 205–06, Table 121; Ex. 1003 ¶ 56). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶ 56.

(3) Limitation 22[b] –sending, by the UE, data over the physical uplink shared channel in assigned time intervals;

Petitioners argue that the Standard discloses the SS sending data in allocated burst time slots of the uplink subframe, which are time intervals that a BS assigns to the SS in a second UL-MAP message. Pet. 37–40 (citing Ex. 1003 ¶¶ 78–80, 83; Ex. 1005, 8, 11, 103, 176, 500, 533, Fig. 218, Table 287). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 78–83.

(4) Limitation 22[c] – sending, by the UE in a time interval that it is not sending information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and

Petitioners argue that the Standard discloses this limitation by the SS sending a Ranging Code over the Ranging subchannel based on the Initial Ranging opportunity in a time interval that the SS is not sending uplink data bursts as claimed. Pet. 40–42 (citing Ex. 1003 ¶¶ 84–87 and Ex. 1005, 7, 48–51, 154, 174, 175, 178, 205–06, 666, Table 121). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 84–87. In particular, Petitioner asserts that the Ranging Code is sent over the Ranging subchannel based on the received Initial Ranging opportunity, which provides resource allocation information for the SS to select a Ranging subchannel over which to send the Ranging Code message from the Initial Ranging opportunity sent by the BS without sending data over that subchannel. Pet. 40–42; Ex. 1003 ¶¶ 84–87.

(5) Limitation 22[d] –receiving, by the UE, feedback information from a downlink control channel.

Petitioners argue that a SS receives a RNG-RSP message in response to sending a Ranging code message to a BS, and the RNG-RSP provides control parameters like “Power Adjust Information” for a SS to adjust transmissions. Pet. 42–52 (citing Ex. 1003 ¶¶ 88–97, Ex. 1005, 9, 31, 46–48, 50–51, 123, 178, 205, 497, 500, 522–23, 532–33, 547, 620, Table 121, Fig. 218). Petitioner asserts that upon receiving a CDMA Ranging Code, a BS sends a RNG-RSP message with needed time, power, and frequency corrections for the SS to control its transmission. Pet. 43–47 (citing § V.A.3.; Ex. 1005, 178, 205, 620). Dr. Akl provides testimony to the same effect. Ex. 1003 ¶¶ 88–97.

b) Patent Owner's Arguments

Patent Owner argues that the '356 Patent provides an active feedback control system in which user equipment (UE) such as a cell phone transmits an uplink physical control signal referred to as a UL_Beacon. Prelim. Resp. 15 (citing Ex. 1001, 4:35–40 (“The uplink physical control signal is referred to herein as an ‘Uplink Beacon’ (UL_Beacon).”). Patent Owner asserts that “[t]he UL_Beacon is a control channel signal, because it is used to control the uplink channel as conditions change.” *Id.* (citing Ex. 1001, 4:56–60 (“the base station detects the received power and/or other channel information from the UL_Beacon, and sends controlling commands back to each terminal to keep the terminal informed of the channel conditions observed at the base station.” (emphasis in original))).

Patent Owner contends that this feature is recited in the claims as “the processor is further configured to send a signal over the uplink physical control channel.” Prelim. Resp. 15. Patent Owner asserts that the Petition identifies the “Ranging Code” sent over the “ranging subchannel” as the claimed “uplink control channel signal.” *Id.* at 15–16 (citing Pet. 16–17, 34, 40). Patent Owner asserts, “[t]he Petition does not provide any support for how a randomly selected Ranging Code transmitted in a randomly selected slot constitutes the claimed ‘uplink control channel signal.’” *Id.* at 16.

Patent Owner argues that the Petition and Dr. Akl make conclusory remarks that the Ranging Code is an uplink control channel signal by stating, “[t]he ranging subchannel is an ‘uplink . . . control channel’ because it is part of the uplink subframe and is used by the SS to transmit the Ranging Code Message, which a POSA would have recognized is control information, not data.” *Id.* at 19 (quoting Pet. 34); *id.* at 20 (citing Ex. 1003 ¶ 73 as making the same allegedly conclusory remark that is entitled to no weight).

c) *Analysis (Claim 22)*

(1) *Alleged failure to establish a ranging code is an uplink control channel signal (Limitation 22[c])*

Claim 22 recites, “sending . . . a signal over the uplink physical control channel.” Ex. 1001, 11:33–35. Patent Owner asserts, “[i]nterpreted in light of the Specification, this limitation requires, at a minimum, the transmission of a signal that is used in at least some way to control the uplink channel.” Prelim. Resp. 15. According to Patent Owner, “[t]he UL_Beacon is a control channel signal, because it is used to control the uplink channel as conditions change. . . ‘the base station detects the received power and/or other channel information from the UL_Beacon, and sends controlling commands back to each terminal to keep the terminal informed of the channel conditions observed at the base station.’” *Id.* at 15 (quoting Ex. 1001, 4:56–60); *id.* (“This aspect of the ’356 Patent is captured in the limitation of Claim 1 which recites that ‘the processor is further configured to send a signal over the uplink physical channel.’”).

Petitioners have shown that a SS sends a Ranging Code over an allotted Ranging subchannel to a BS, which uses the Ranging Code to control the SS’s uplink transmissions. Pet. 14–18, 33–47; *id.* at 17 (a BS uses a Ranging Code received from a SS to transmit a RNG-RSP message to provide the SS with control parameters, e.g., Power Adjust Information, that the SS uses to adjust its uplink transmissions), 43–44 (a BS sends a RNG-RSP message to a SS in response to receiving a Ranging Code message, and the RNG-RSP provides the SS with time, power, and other control parameters including Power Adjust Information that a SS uses to adjust uplink transmissions). Dr. Akl testifies to the same facts and process under the Standard. Ex. 1003 ¶¶ 52–56, 72–92.

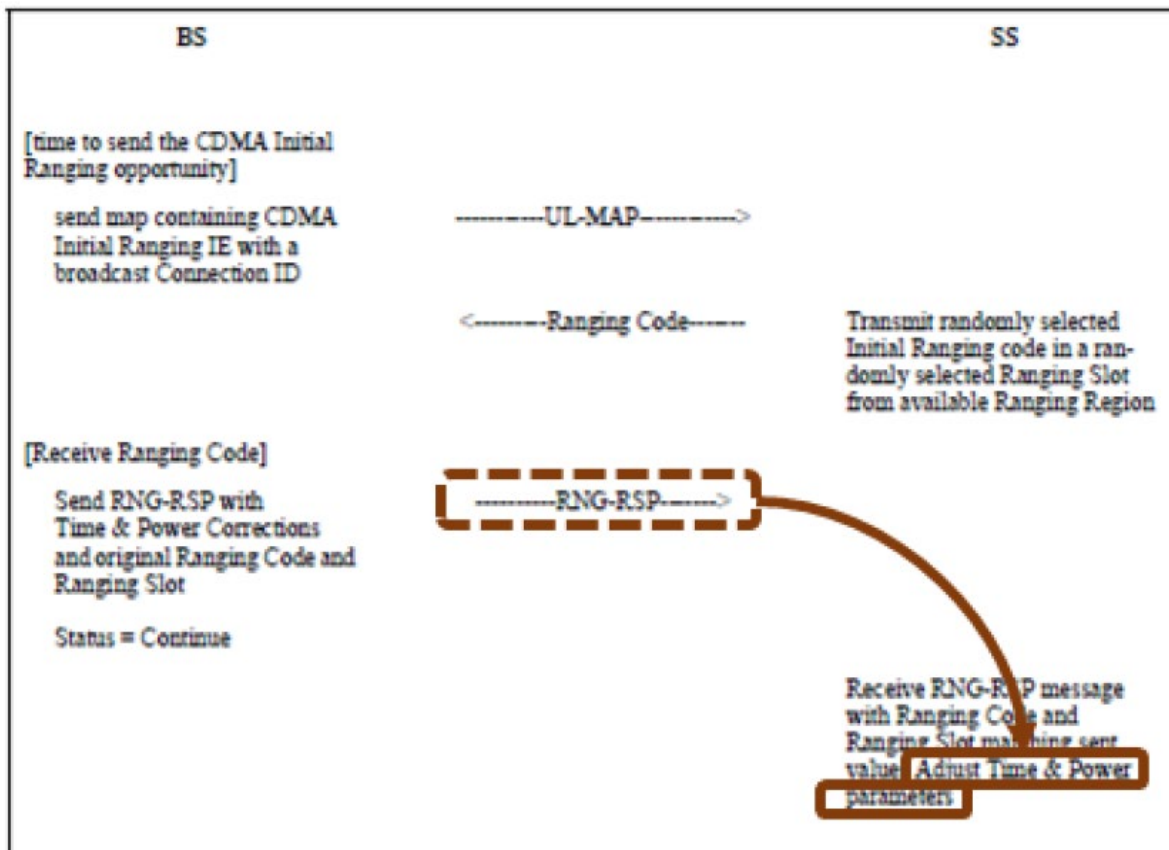
Petitioners annotate two cropped portions of Table 121 to support their contentions. We reproduce both annotated portions of Table 121 below.

Table 121—CDMA initial Ranging and automatic adjustments procedure



The first portion of Table 121 shows a SS sending a Ranging Code on a selected Ranging Slot to a BS. Pet. 17, 41; Ex. 1003 ¶¶ 55, 85; Ex. 1005, 206.

Table 121—CDMA initial Ranging and automatic adjustments procedure



The second annotated portion of Table 121 illustrates a BS responding to a Ranging Code from a SS by sending a Ranging Response (RNG-RSP) to provide the SS with controls to Adjust Time & Power parameters. Ex. 1005, 206. Thus, a Ranging Code is used by a BS to transmit control parameters to control a SS's uplink transmissions. Pet. 17–18, 42–45; Ex. 1003 ¶¶ 56, 89.

Petitioners assert that a SS transmits a Ranging Code over an allocated Ranging Subchannel, which is a “physical uplink control channel” of an Initial Ranging Interval, and a BS responds to this signal by sending power and time adjustments to control the SS's uplink transmissions as in Table 121. Pet. 16–18, 33–36, 40–47; Ex. 1003 ¶¶ 55–56, 73–77, 84–87. We reproduce Figure 218 below to depict a Ranging subchannel in a TDD frame. See Pet. 34–35.

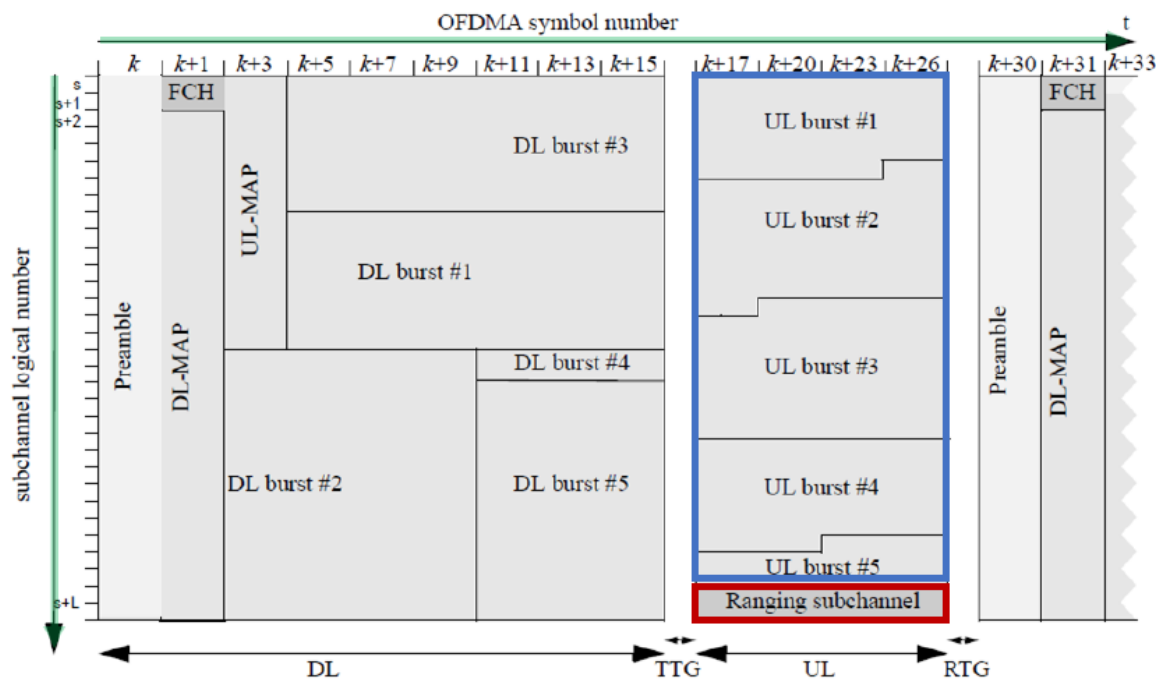


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 of the Standard depicts a TDD time frame with annotated uplink data channels for UL bursts and a separated Ranging subchannel for sending Ranging codes to a BS to obtain time and power settings to control a SS's uplink transmissions. See Pet. 33–47; Ex. 1003 ¶ 74; Ex. 1005, 500.

Petitioners' contentions that a ranging subchannel is an uplink control channel used to transmit a Ranging Code that a POSA would recognize to be control information (Pet. 34) has sufficient support in this record because a SS sends a Ranging Code over a Ranging subchannel to a BS, which provides controls to the SS to adjust its power and timing. Pet. 33–47; Ex. 1003 ¶¶ 55, 56, 73–77, 84–92. Petitioners assert that an Initial Ranging opportunity is sent by a BS in a UL-MAP as resource allocation information that SSs use to select a Ranging Subchannel/Slot to send a Ranging Code. Pet. 14–17, 40 (citing Ex. 1005, 49, 154, 174, 175, 205–06, 666). Dr. Akl testifies that a Ranging subchannel is a physical layer (Ex. 1003 ¶ 73) and an OFDM subchannel of an Initial Ranging opportunity allocated in a UL-MAP (*id.* ¶ 85 (citing Ex. 1005, 666); *id.* ¶¶ 72–92) to send a Ranging Code. These proofs indicate Ranging Codes are sent over an allotted control channel to obtain BS control feedback.

Patent Owner argues that the Petition cites to pages 49, 154, 175, and 666 of the Standard in connection with its description of the Ranging Code, but these pages of the Standard describe different messages referred to in the Standard as a “Ranging Request (RNG-REQ) message” and the “RNG-RSP message.” Prelim. Resp. 17 & nn. 2, 3. Patent Owner argues that page 19 of the Petition clearly shows the Ranging Code, which the Petition maps to the “uplink control channel signal,” is a different message from the RNG-RSP and RNG-REQ messages, which come later in the sequence. *Id.*

Petitioners and their expert Dr. Akl identify the Ranging Code message as a signal that is sent over an allocated uplink physical control channel (i.e., a Ranging subchannel) as claimed. Pet. 14–17, 33–37, 40–42; Ex. 1003 ¶¶ 52–55, 73–77, 84–87. Petitioners and Dr. Akl also identify a Ranging Response (RNG-RSP) message is provided in response to the Ranging Code to control settings of the SS. Pet. 17–18, 42–47; Ex. 1003 ¶¶ 56, 88–92; Ex. 1005, 206.

Petitioners and Dr. Akl contend that a ranging request (RNG-REQ) message in OFDMA (i.e., orthogonal frequency division multiple access) is a Ranging Code message. Pet. 43 (citing Ex. 1005, 205); Ex. 1003 ¶ 106 (citing Ex. 1005, 50, 51). In the Standard, a Ranging Response (RNG-RSP) message is “transmitted by the BS in response to a received RNG-REQ.” Ex. 1005, 50. The RNG-RSP message includes the uplink channel on which the BS received the RNG-REQ, *Initial Ranging opportunity number* in the frame in which the RNG-REQ message was received, *Ranging subchannel* used for the initial ranging message, and “*Ranging code attributes*” to “[i]ndicate[] the OFDMA time symbols reference, *subchannel reference*, and frame number used to transmit the *ranging code*, and the *ranging code index* that was sent by the SS.” *Id.* at 50–51 (emphasis added). A Ranging Code and RNG-REQ appear to be used for initial ranging to obtain control parameters to control a SS’s uplink transmissions, and both are referenced in the RNG-RSP message.

At this stage, we find sufficient evidence to indicate that a RNG-REQ and/or a Ranging Code are sent over an allotted Ranging subchannel for initial ranging to a BS, which sends Time and Power Adjustments to a SS to control its uplink transmissions based on the received Ranging Code and/or RNG-REQ. Ex. 1005, 48–51, 154, 174–81; *see also id.* at 176–77 (Table 115).

Even disregarding citations in the Petition and Dr. Akl’s testimony to RNG-REQ messages, we find sufficient evidence at this stage of the proceeding to institute *inter partes* review based on the SS transmitting a Ranging Code in an allocated Ranging Slot of a Ranging Subchannel/Initial Ranging Interval to a BS, which returns control parameters (e.g., Power and Time Adjustments) to the SS in a RNG-RSP based on the received Ranging Code as described in Table 121 and related portions of the Standard. Pet. 14–18, 33–47; Ex. 1003 ¶¶ 51–56, 73–92; Ex. 1005, 50–51, 174–76, 205–06.

Table 121 “define[s] the ranging and adjustment process that shall be followed by compliant SSs and BSs.” Ex. 1005, 205. A SS chooses randomly a Ranging Slot to perform ranging and a Ranging Code from the available Ranging Region and sends the Ranging Code to the BS as a CDMA code. *Id.*

In response to the Ranging Code, a BS provides a ranging response. “The Ranging Response message contains all the needed adjustments (e.g., time, power, and possibly frequency corrections) and a status notification.” Ex. 1005, 205. “Power adjustment shall be capable of being reduced or increased by the specified amount in response to RNG-RSP messages.” *Id.*

“[T]he SS shall not transmit until the RF signal has been adjusted in accordance with the RNG-RSP and has stabilized.” *Id.* Table 121 defines a ranging and adjustment process that sends a Ranging Code signal from a SS to a BS and receives commands to control the SS’s power and other parameters as Petitioners contend. *See* Pet. 14–17, 33–47; Ex. 1003 ¶¶ 52–56, 73–89.

Ranging Codes may be transmitted periodically for ranging. *Id.* at 577–78. A SS modulates a ranging code on a ranging subchannel for an OFDMA symbol period as Patent Owner notes. *Id.*; *see* Prelim. Resp. 18–19. This modulation does not undercut a BS’s use of a received Ranging Code to send control commands to a SS as described in the Standard and discussed above.

Ranging for time and power may be performed during FDD or TDD transmissions on a periodic basis. *Id.* at 620. A power control algorithm is supported on the uplink channel for initial calibration and periodic adjustment procedures without data loss with a BS capable of providing accurate power measurements of the received burst signal. *Id.*

Petitioners cite Table 121 and these other portions to describe the UL-MAP, Ranging Code, and Ranging Response used to send control commands to a SS. *See* Pet. 14–18, 33–37, 40–47; Ex. 1003 ¶¶ 52–56, 72–77, 84–92.

The Standard also appears to describe the use of a RNG-REQ message and a CDMA code as alternative ways to send control signals over a dedicated and allocated Ranging Slot (Table 121) or Ranging subchannel at initialization (and periodically) in order for a SS to receive power and timing adjustments from a BS via a RNG-RSP message sent with control commands to a SS in response to a CDMA ranging code or RNG-REQ message. Ex. 1005, 174–77 (cited in Pet. 15–17, 35, 37, 40 and Ex. 1003 ¶¶ 52, 55, 56, 75, 79, 85, 89).

The Standard appears to describe similar ranging procedures for a CDMA ranging code and a RNG-REQ message. For OFDM PHY, the SS shall send the RNG-REQ at a power level below $P_{TX\_IR\_MAX}$ measured at the antenna connector. *Id.* at 175. For OFDMA, the SS shall send a CDMA code at a power level below $P_{TX\_IR\_MAX}$ measured at the antenna connector. *Id.* at 176. If the SS does not receive a response, the SS shall resend the RNG-REQ at the next appropriate Initial Ranging transmission opportunity at one step higher power level. *Id.* at 175. For OFDMA, the SS shall send a new CDMA code at the next appropriate Initial Ranging transmission opportunity at one step higher power level. *Id.* at 176. If the SS receives a response containing its MAC Address, it shall consider the RNG-RSP reception of the RNG-REQ to be successful. *Id.* at 175. If the SS receives a UL-MAP containing a CDMA allocation ID with parameters of the code that it transmitted, it shall consider the RNG-RSP reception successful and send a unicast RNG-REQ on the allocated BW. *Id.* at 176. Once a BS successfully receives the RNG-REQ message, it returns a RNG-RSP message with RF power level and frequency adjustments and timing offsets. *Id.*; see Pet. 40–44; Ex. 1003 ¶¶ 84–89.

A SS randomly chooses a Ranging Slot and sends a CDMA Ranging Code to the BS, which sends a RNG-RSP for power adjustment to the SS as illustrated in Table 121. *Id.* at 205–06; see *id.* at 174–76, 212–13 (Table 122).

Patent Owner also contends, “the Ranging Code is just a code – nothing more.” Prelim. Resp. 18. Patent Owner cites Figure 243 of the Standard to illustrate that a Ranging Code is a code. *Id.* at 19.

Under the Standard, a BS defines uplink bandwidth allocations in IEs of a UL-MAP for a SS to send initial ranging codes. Ex. 1005, 48. For periodic ranging, a SS transmits by *modulating* one or more ranging codes onto the ranging subchannel for a period of one or more OFDMA symbols. *Id.* at 577.

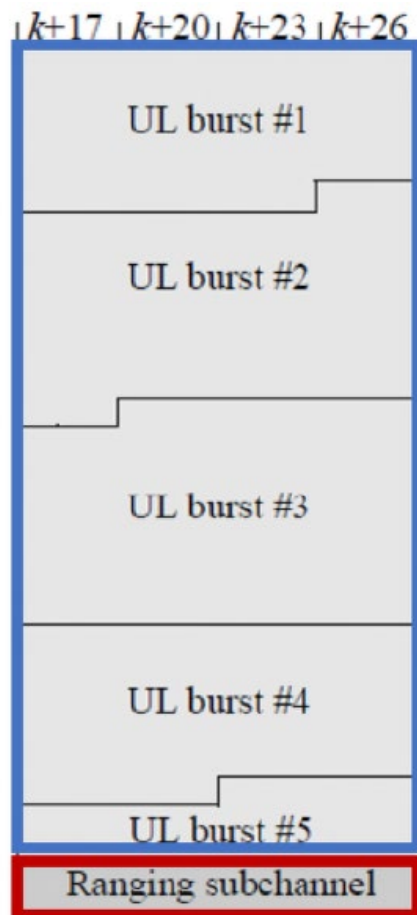
Ranging subchannels are allocated dynamically by the MAC layer and indicated in the UL-MAP. *Id.* at 48; *see* Pet. 14–17 (citing Ex. 1005, 577 as evidence that a Ranging Subchannel is an uplink subframe for Ranging Code messages), 36 (citing Ex. 1005, 577 as evidence a Ranging Code message would be understood by a POSA as control information); Ex. 1003 ¶¶ 52–55 (citing Ex. 1005, 577 as evidence Ranging subchannels are uplink subframes used to transmit ranging code messages), 73–77 (ranging subchannels are sent in a UL-MAP as physical control channels to send a Ranging Code message that a POSA would recognize is control information, not data), 84–87 (same).

Figure 243 discusses ranging codes produced by a pseudo-random noise generator (PRBS) to *modulate subcarriers* in groups of subchannels that form a *ranging subchannel* referenced in *ranging* and *bandwidth request messages*. Ex. 1005, 578. These ranging codes appear to be used to send ranging signals.

At this stage, Petitioners have provided sufficient evidence that the Standard describes sending a Ranging code and/or RNG-REQ message signal over an uplink control channel (Ranging subchannel/Slot) to obtain control commands for a SS as recited in claim 22. *See* Pet. 15–17, 35–37, 40–47; Ex. 1003 ¶¶ 55, 56, 76, 84–86, 88–92; Ex. 1005, 49, 50, 205–06.

The parties are invited to submit additional briefing regarding ranging codes and ranging requests and any other issues discussed herein.

Regarding Patent Owner’s argument that the Standard fails to disclose the transmission of a control signal interposed *between* data transmissions as required by the Challenged Claims (Prelim. Resp. 20–22), our interpretation of “interval” largely resolves this issue. Patent Owner asserts that sending an initial ranging code over a Ranging subchannel as “a signal [sent] over the uplink physical control channel” (as claimed) before the SS device sends data over the uplink channel as UL-bursts) means that the Standard fails to disclose that the signal is interposed *between* transmissions of data over the physical uplink shared channel as claimed. *Id.* at 21–22. Patent Owner reproduces the uplink portion of the Standard from the Petition (Pet. 35) to illustrate this asserted shortcoming. We reproduce this annotated uplink frame below.



This uplink frame is part of a TDD time frame depicted in Figure 218 of the Standard with Petitioners' annotations to illustrate an uplink ranging subchannel as an uplink physical control channel and uplink data channels as UL burst #1–5 over which a SS transmits data to a BS. *See* Ex. 1005, 500; Pet. 35.

Patent Owner's argument is unpersuasive in view of our interpretation of "interval" in the claims as not requiring a signal to be transmitted from a UE *between* data transmissions. The language of claim 22 and the other challenged claims merely require a signal to be sent in a time interval in which a UE is not sending information over the physical uplink shared channel. *See* Ex. 1001, 9:48–52, 11:33–36, 13:13–17, 14:11–14. Patent Owner recognizes that the Standard transmits a Ranging code in an interval (i.e., the Ranging subchannel) in which the SS is not sending data bursts over a physical uplink shared channel during initial ranging and later when UL bursts are sent in different intervals (timeslots) as illustrated in the portion of Figure 218 that is reproduced above and in the Petition and Standard. *See* Prelim. Resp. 16–17 n.2, 20; Pet. 35; Ex. 1005, 500. We invite the parties to submit additional briefing on this issue and our interpretation of time interval set forth above in the claim construction section of this decision.

d) Analysis of Claims 23, 25–28, 45, and 46

Petitioners provide detailed contentions regarding their assertion that claims 23, 25–28, 45, and 46 are anticipated by the Standard. Pet. 52–62. Petitioners support the contentions with citations to supporting disclosures in the Standard and testimony of Dr. Akl. *Id.* (citing Ex. 1003 ¶¶ 98–118). At this stage, we find that these contentions and evidence establish a reasonable likelihood of Petitioners prevailing on at least one of these claims. Patent Owner has not disputed any of these contentions. *See* Prelim. Resp. 15–22.

E. Grounds 2 and 3: Claims 1–7, 24, 43, and 44 — Alleged Obviousness over the Standard Alone (Ex. 1005) or in Combination with Mohanty (Ex. 1009)

1. Petitioners’ Contentions

Petitioners assert that the Standard alone or in combination with Mohanty would have rendered obvious claims 1–7, 24, 43, and 44. Pet. 62. For Ground 2, Petitioners assert that the Standard describes user equipment (UE) as a subscriber station (SS) that performs functions performed by the processor in limitations 1[a]–1[d]. *Id.* Petitioners argue that a skilled artisan would have been motivated and found it obvious based on the Standard to implement the SS with a “processor configured to” perform the SS functions because a skilled artisan would know that SSs like those in the Standard are implemented this way. *Id.* (citing Ex. 1003 ¶¶ 119, 120). Dr. Akl testifies that the Standard describes a UE as a SS that performs functions performed by the processor in limitations 1[a]–1[d] and a skilled artisan would have been motivated to implement a SS with a processor configured to perform the SS’s functions because a skilled artisan would have known that SSs like those in the Standard typically are implemented this way. Ex. ¶¶ 119, 120.

For Ground 3, Petitioners cite Mohanty as evidence that it is known to implement an SS using a predefined computer language, manner, or syntax to instruct a processor to perform a certain function. Pet. 63 (citing Ex. 1009 ¶¶ 18, 19). Petitioners cite Figure 2 of Mohanty and associated description of processor 202-1 connected to memory 202-2 and implemented as various types of processors that implement instruction sets as being consistent with the ’356 patent’s description of a processor configured to carry out functions of a UE in claim 1. *Id.* at 63–64 (citing Ex. 1009 ¶¶ 59–61). Dr. Akl offers supporting testimony to the same effect. Ex. 1003 ¶¶ 120–123.

Petitioners contend that a skilled artisan would have been motivated by Mohanty to implement the SS of the Standard on a processor configured to perform functions described in the Standard to yield predictable results and for technical advantages of processors such as efficient and powerful computing and flexible programming. Pet. 65–67 (citing Ex. 1009 ¶¶ 18–20, 59–61; Ex. 1003 ¶¶ 123–125). Dr. Akl offers supporting testimony to the same effect. Ex. 1003 ¶¶ 123–125 (citing Ex. 1009 ¶¶ 18–20, 59–61).

For claim 1, Petitioners’ contentions for limitations 1[p]–1[d] under Ground 2 rely on the Standard to the same extent as Petitioners did for the similar limitations 22[a]–22[d] of claim 22 for Ground 1 with Mohanty’s teachings also cited to support Ground 3. Pet. 67–73. Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 126–130. For claims 2–7, 24, 43, and 44 under Ground 2, Petitioners provide their contentions with the supporting testimony of Dr. Akl and rely on their contentions for similar limitations in claims 22–28, 45, and 46 under Ground 1 and also cite Mohanty to support Ground 3. Pet. 73–83 (citing Ex. 1003 ¶¶ 131–150).

2. Patent Owner’s Arguments

Patent Owner argues that Grounds 2 and 3 should be denied because Petitioners map the initial ranging code of the Standard to “a signal [sent] over the uplink physical control channel” and UL bursts of the Standard to “data [sent] over the physical uplink shared channel in assigned time intervals” and the mappings fail for the reasons set forth for Ground 1. Prelim. Resp. 22–23.

3. Analysis

Based on the current record, Petitioners’ contentions and evidence establish a reasonable likelihood of prevailing on at least one of these claims asserted to be unpatentable under Grounds 2 and 3. Patent Owner’s argument is not persuasive for the reasons discussed above for Ground 1.

III. CONCLUSION

On this record, we are persuaded that Petitioners have demonstrated a reasonable likelihood of prevailing in showing the unpatentability of at least one of the challenged claims of the '356 patent. We, therefore, institute an *inter partes* review as to all claims and grounds in the Petition. 35 U.S.C. § 314(a); 37 C.F.R. § 42.108(a). Our factual findings and determinations at this stage of the proceeding are preliminary, and based on the evidentiary record developed thus far. This is not a final decision as to the patentability of claims for which *inter partes* review is instituted. Our final decision will be based on the record as fully developed during trial.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review of the '356 patent is hereby instituted as to claims 1–7, 22–28, and 43–46 on all grounds set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial on the grounds of unpatentability authorized above; the trial commences on the entry date of this decision.

IPR2022-01130
Patent 8,811,356 B2

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