

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CONTINENTAL AUTOMOTIVE SYSTEMS, INC.,
Petitioner,

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*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background and Summary*

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

We concluded that Petitioners satisfied the burden, under 35 U.S.C. § 314(a), to show that there was a reasonable likelihood that Petitioners would prevail with respect to at least one of the challenged claims. Accordingly, on behalf of the Director (37 C.F.R. § 42.4(a)), and in accordance with *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1353 (2018), we instituted an *inter partes* review of all the challenged claims, on all of the asserted grounds. Paper 13 (“Decision” or “Dec. Inst.”).

Following institution, Toyota and Intellectual Ventures filed a Joint Motion to Terminate proceedings based on their settlement agreement that resolved all disputes between them in this proceeding and a related district court action. Paper 21; Ex. 1018. We granted the Joint Motion to Terminate and terminated proceedings as to Petitioner Toyota Motor Corp. Paper 25, 4.

Thereafter, Patent Owner filed a Response. Paper 26 (“PO Resp.”). Continental (“Petitioner”) filed a Reply. Paper 28 (“Reply”). Patent Owner filed a Sur-reply. Paper 33 (“Sur-reply”).

Patent Owner filed a Motion to Exclude. Paper 34. Petitioner filed an Opposition. Paper 35. Patent Owner filed a Reply. Paper 37.

A hearing was held on August 28, 2023. Paper 40 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. We enter this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner Continental has the burden of proving the unpatentability of a claim by a preponderance of the evidence. 35 U.S.C. § 316(e).

Based on the findings and conclusions below, we determine that Petitioner has proven that claims 1–7, 22–28, and 43–46, which comprise all of the claims challenged in this proceeding, are unpatentable.

We also deny Patent Owner’s Motion to Exclude.

B. Real Parties in Interest

Petitioner identifies Continental Automotive Systems, Inc., Continental Automotive GmbH, Continental Automotive Technologies GmbH, Continental Automotive, Inc., and Continental AG (the parent of Continental Automotive, Inc.) as real parties-in-interest. Pet. 83. Patent Owner identifies Intellectual Ventures II LLC as the patent owner and the sole real party-in-interest. Paper 5, 2.

C. 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. The parties also indicate that the related district court proceeding in *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) was resolved by their settlement agreement. Paper 21, 2.

D. The '356 Patent (Ex. 1001)

The '356 patent addresses the problem of uplink control when channel reciprocity is lost.¹ It introduces a new uplink channel control technique that uses a feedback scheme as a substitute for channel reciprocity with minimal impact on the ability of the air interface to support uplink channels. Ex. 1001, 2:11–16. In one embodiment,

an uplink beacon function (for power control) and a modified random access process substitute for the information lost due to the lack of channel reciprocity in paired operation. Embodiments of the invention allow a terminal to transmit the uplink physical channel control signal (UL_Beacon) independently from the uplink physical channel. Therefore, the implementation of closed loop feedback may operate in the absence of an uplink physical channel. In one embodiment, a UE allocates a time slot for a beacon signal separated from the time slots for data in a frame. A second time slot is allocated within the frame for the base station to transmit a control signal in response to the beacon signal. The control signal instructs the UE to adjust a transmission parameter.

Ex. 1001, 2:21–34; *id.* at 4:35–60.

The closed loop feedback allocates a timeslot in an uplink frame to send a control signal from a 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 UL_Beacon signal separated from timeslots used to send data in an uplink frame. *Id.* at 2:20–42, 4:35–55, 5:15–20. Base stations respond to the UL_Beacon signal on a downlink Physical Layer Common Control Channel (PLCCH) with control commands to adjust power. *Id.* at 2:31–60, 4:49–5:60.

¹ Channel reciprocity exists when the same radio channel is used for uplink and downlink communications so information about uplink channel conditions such as pathloss can be derived from downlink channel conditions based on signals received by user equipment (UE). Ex. 1001, 1:17–29.

A dedicated timeslot can group UL_Beacon signals from multiple UEs into a specific uplink timeslot to “obtain separation between the UL_Beacon signals and the standard uplink physical channels.” Ex. 1001, 2:35–42. A downlink PLCCH carries feedback information (power, control commands) to UEs that transmit UL_Beacon signals. *Id.* at 2:45–46; 4:35–5:41, 5:50–60. Figure 2 of the ’356 patent, reproduced below, depicts this feedback system.

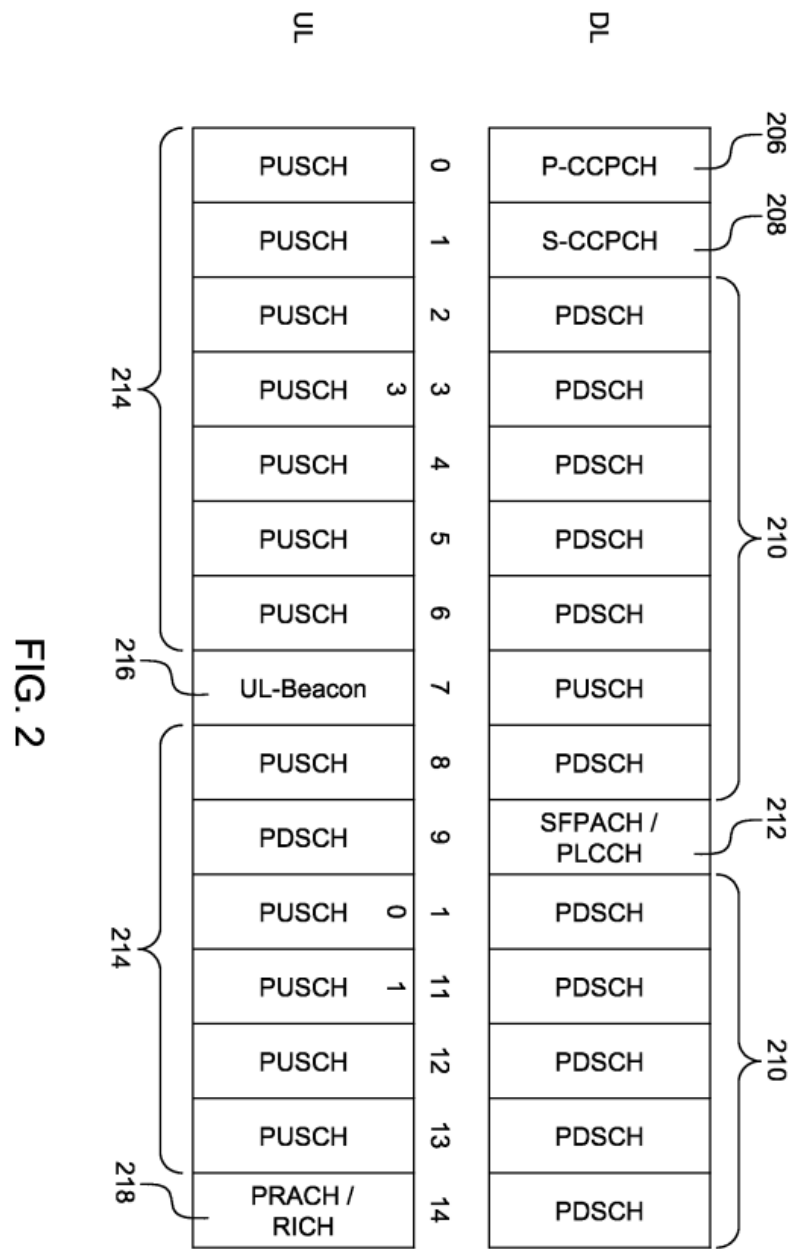


Figure 2 depicts an uplink (UL) frame with timeslot 216 allocated to transmit UL_Beacons *separate* from timeslots 214 used to transmit data. A base station allocates timeslot 212 in a downlink (DL) frame to send PLCCCH control commands to UEs to control their uplink transmissions separate from DL timeslots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

By separating the uplink physical channel control signal (UL_Beacon) from the uplink physical data channel, the closed loop feedback system may operate without an uplink physical channel for data. Ex. 1001, 2:24–28. The uplink physical control channel and downlink control channel “may not need an associated data physical channel to be operational.” *Id.* at 4:24–27. This separation “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.

More than one UL_Beacon and its associated PLCCCH timeslot may be allocated per frame 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 provides a large number of possibilities to arrange a UL_Beacon and its associated PLCCCH in frames. *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).

If a slower update rate is tolerable, UL_Beacon and PLCCH timeslots can be fractionated as shown in Figure 3, reproduced below. *Id.* at 5:38–41.

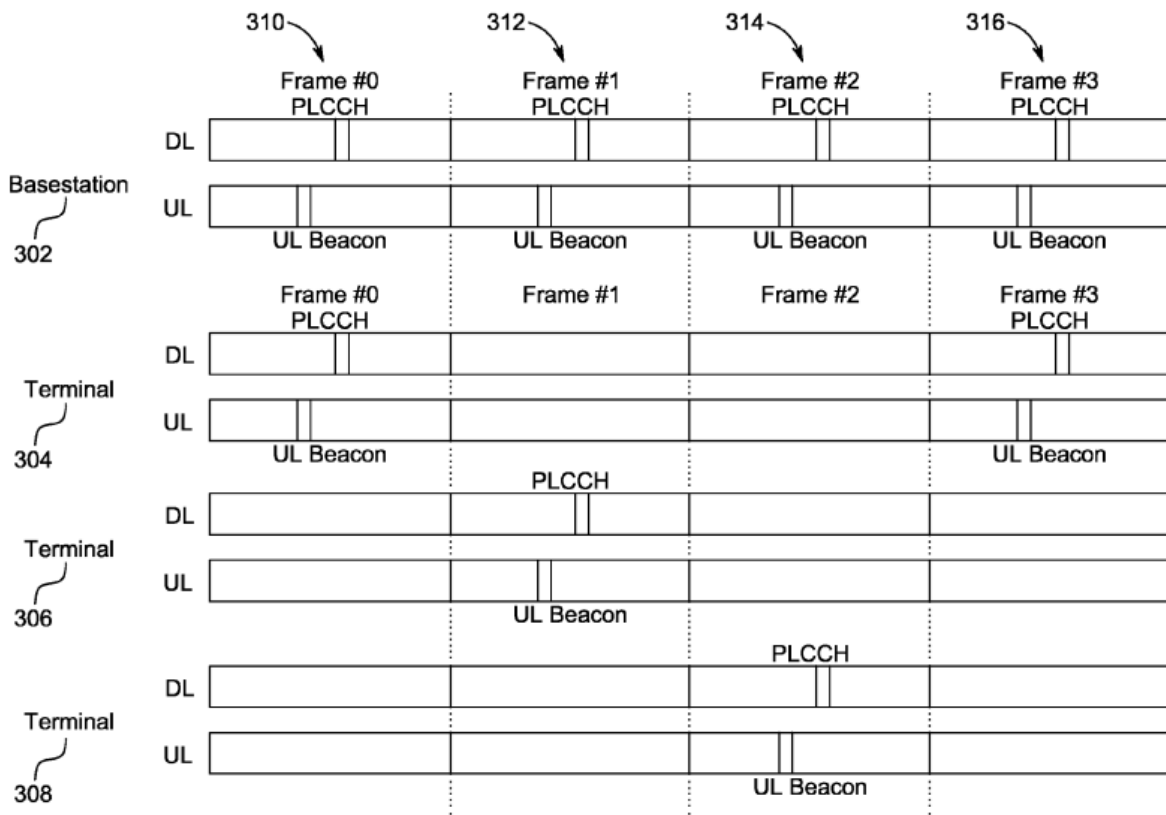


FIG. 3

Figure 3 illustrates a fractionation phase of 3 that updates a terminal in every third frame. Terminal 304 receives feedback in frames #0 310, #3 316. Terminal 306 receives an update in frame #1 312. Terminal 308 receives an update in frame #2 314. *Id.* at 5:65–6:4. Fractionation supports more UEs at a slower feedback rate when a slower update rate meets performance targets. *Id.* at 5:38–49. If a faster feedback update rate is required than the frame rate, more than one UL_Beacon and PLCCH timeslot can be supported in a frame at the expense of system capacity. *Id.* at 5:32–38. A UL_Beacon can be sent even when no data is sent in a frame. *Id.* at 2:24–28, 6:33–37.

E. Illustrative Claims

Of the 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 illustrate the claimed subject matter and are reproduced below with Petitioners’ annotations in italics to identify each element. 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. *1[p]* 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, 67–73.

22. *22[p]* 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.

F. Instituted Grounds of Unpatentability

Petitioner contends that the challenged claims 1–7, 22–28, and 43–46 of the '356 patent are unpatentable based on the following grounds, all of which are grounds that have been instituted in this proceeding (*see* Pet. 1–3):

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

Petitioner also relies on the declaration testimony of Dr. Robert Akl.

Ex. 1003. Patent Owner relies on the declaration testimony of Dr. Gary Lomp. Ex. 2005. We have reviewed the credentials of Petitioner's declarant, Dr. Akl, and Patent Owner's declarant, Dr. Lomp, and consider both to be qualified to provide the opinions for which their testimony has been submitted. Neither party has challenged their qualifications.

² The Leahy-Smith America Invents Act ("AIA") revised 35 U.S.C. §§ 102 and 103 effective on March 16, 2013. Because the '356 patent has an effective filing date before March 16, 2013, we use the pre-AIA versions of §§ 102 and 103.

³ 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, dated Oct. 1, 2004 ("the Standard").

⁴ Ex. 1009, US 2007/0105600 A1, published May 10, 2007 ("Mohanty").

II. MOTION TO EXCLUDE EVIDENCE

Patent Owner filed a motion to exclude Exhibit 1005 from evidence. Paper 34 (“Motion”). Exhibit 1005 is the Standard. Patent Owner’s objections are based on (1) Petitioner’s objection to the admissibility of the Standard in IPR2022-00974 as lacking authentication under Fed. R. Evid. (“FRE”) § 901, irrelevant or prejudicial, confusing, and a waste of time under FRE 401, 402, and 403, and inadmissible hearsay under FRE 801 and 802, (2) alleged lack of authentication of the date of public availability or public accessibility of the Standard, (3) a reliance on a copyright notice as evidence of a publication date of a printed publication as inadmissible hearsay, and (4) irrelevance because the publication date of the Standard is not established to qualify it as prior art. *Id.*; see Paper 15 (Patent Owner’s Objections to Evidence), 1. Petitioner filed an Opposition to the Motion. Paper 35 (“Opp.”). Patent Owner filed a Reply in Support of its Motion to Exclude Evidence. Paper 37 (“Reply”).

A. *Petitioner’s Alleged Admissions in IPR2022-00974*

Petitioner asserts that “Petitioner has not admitted that the Standard is not admissible evidence in the instant proceeding.” Opp. 11. Petitioner also asserts that it objected to Patent Owner’s reliance on the Standard in IPR2022-00974, which challenged claims of U.S. Patent No. 8,953,641 (“the ’641 patent”), because “the Standard’s publication date is *after* the critical date of the ’641 patent,” which is not at issue in the instant proceeding. *Id.* at 11–12. Petitioner asserts that the Standard is relevant to the patentability of the ’356 patent in this proceeding because Petitioner “relies upon the Standard as a primary prior art invalidity reference [and the] public availability/accessibility date of the Standard is *before* the effective filing date of the ’356 patent.” *Id.* at 11.

Patent Owner replies that “Petitioner’s objections based on lack of authentication and hearsay to the admissibility of the Standard as evidence in IPR2022-00974 are not contingent upon the critical date of the challenged patent, which is extrinsic to the proffered evidence at issue.” Reply 1.

We find that Petitioner objected to the Standard in IPR2022-00974 because its publication date is *after* the critical date of the ’641 patent, which was at issue in that proceeding. Opp. 11. Those objections are not relevant in this proceeding because the Standard was published before the critical date of the ’356 patent. *Id.* In IPR2022-00974, Petitioner objected that the Standard (Ex. 2019) *lacked authentication* because “sufficient evidence has not been provided to establish authenticity, dates, or public accessibility *prior to the critical date of the ’641 patent.*” IPR2022-00974, Paper 23, 1 (emphasis added). Petitioner also objected to the Standard (Ex. 2019) as *irrelevant, prejudicial, confusing, and a waste of time* because “there is not sufficient evidence establishing public accessibility *prior to the critical date of the ’641 patent,*” and the October 1, 2004 date printed on the first page of the Standard is later than the critical date of the ’641 patent. *Id.* (emphasis added). And, in this proceeding, Petitioner has proffered evidence to address potential hearsay objections asserted by Patent Owner to the Standard, as discussed below.

B. Authenticity of the Standard (Ex. 1005)

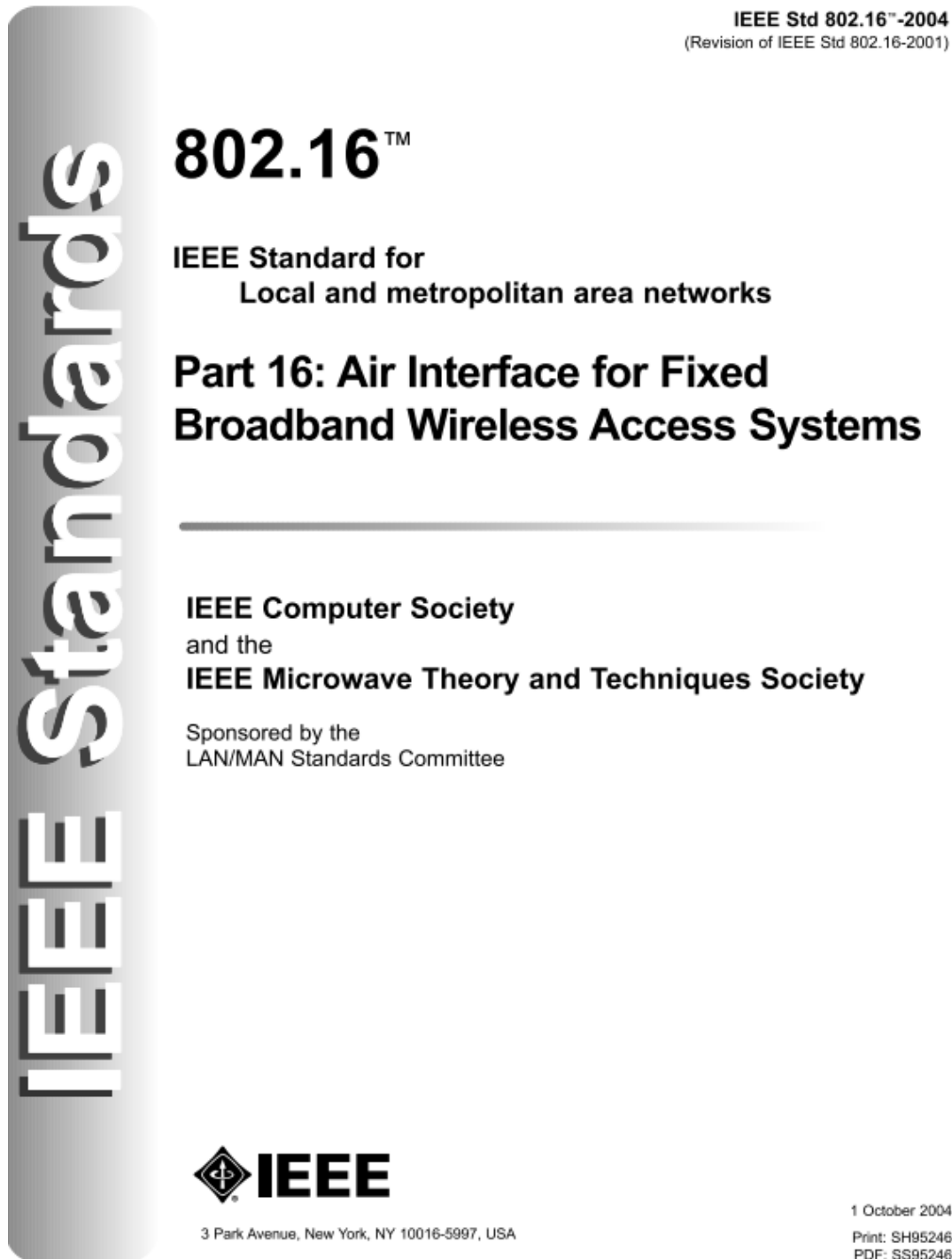
Petitioner asserts that Exhibit 1005 is an authentic copy of the Standard under Fed. R. Evid. (“FRE”) 901(b)(4) because it bears distinctive indicia of authenticity recognized by the scientific and technical communities, and the distinctive indicia include an IEEE copyright line with a publication date, IEEE trade inscriptions, IEEE product numbers, and an International Standard Book Number (ISBN). Opp. 1–5.

Patent Owner asserts “a document is not self-authenticated or otherwise automatically authenticated just because it was released or published by IEEE or a working group associated with IEEE.” Motion 6. Patent Owner argues that *TRW Automotive U.S. LLC v. Magna Elecs. Inc.*, IPR2014-01348 (PTAB Jan. 15, 2016) held that an IEEE copyright notice and ISBN number did not establish that a document was an IEEE *publication* from an IEEE *periodical*. *Id.* Patent Owner also asserts that the Standard is not published in a periodical and, therefore, is not self-authenticating. Reply 2–3.

The holding in *TRW* is distinguishable from our facts here because the Board in *TRW* held that TRW did not cite sufficient evidence to establish that the non-patent literature printed publication at issue in that proceeding was “an article from an IEEE periodical” or published in an IEEE periodical called *Intelligent Transportation Systems*. *TRW*, IPR2014-01348, Paper 25 at 7–8. TRW failed to link the IEEE copyright notice to a particular IEEE publication. *Id.* at 8. In that case, TRW failed to establish that the number at the bottom of the paper, “0-7803-4975-X,” was an ISBN or that the paper was published in an IEEE periodical such that it was self-authenticating. *Id.* at 9.

Here, the Standard bears distinctive indicia of authenticity that were not present in the paper at issue in *TRW*. Opp. 2–4. The distinctive indicia are an IEEE copyright notice and publication date, IEEE logo and trade inscription, IEEE product numbers, and an ISBN. *Id.* Such indicia have been found to be sufficient to support authentication. *See Intel Corp. v. FG SRC LLC*, IPR2020-01449, Paper 53 at 33 (PTAB Mar. 1, 2022); *Microsoft Corp. v. FG SRC LLC*, IPR2018-01604, Paper 76 at 15 (PTAB Apr. 30, 2020); *Ericsson, Inc. v. Intellectual Ventures I LLC*, IPR2014-00527, Paper 41 at 11 (PTAB May 18, 2015); *see* Opp. 3–4 (citing these decisions). Patent Owner does not dispute the distinctiveness of the indicia. *See* Reply 2–3; Mot. 6.

The cover page of the Standard is reproduced below to show its indicia.



The cover page of the Standard includes an IEEE Std 802.16 trademark, IEEE's logo, mark, address, product numbers (print, PDF), and a date of "1 October 2004." Ex. 1005, 1. We reproduce other distinctive indicia below.

IEEE Standard for
Local and metropolitan area networks

Part 16: Air Interface for Fixed
Broadband Wireless Access Systems

Sponsor
LAN/MAN Standards Committee
of the
IEEE Computer Society

and the
IEEE Microwave Theory and Techniques Society

Approved 24 June 2004
IEEE-SA Standards Board



This page of the Standard includes the IEEE Std 802.16™ trademark and the IEEE Wireless MAN® 802.16 registered mark. Ex. 1005, 3; Opp. 3.

We reproduce indicia from another page of the Standard below.

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

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Print: ISBN 0-7381-4069-4 SH95246
PDF: ISBN 0-7381-4070-8 SS95246

This page includes a 2004 IEEE copyright notice and a *publication date* of the Standard, an ISBN, catalog numbers, and trademark notices. Ex. 1005, 4.

Under FRE 901(b)(4), “[t]he appearance, contents, substance, internal patterns, or other distinctive characteristics of the item, taken together with all the circumstances” can authenticate an item of evidence. Under FRE 902(7), an inscription, signs, tag, or label affixed in the course of business to indicate origin, ownership, or control can establish an item’s authenticity.

The Board has found such distinctive indicia sufficient to establish the authenticity of IEEE publications. *See Ericsson*, IPR2014-00527, Paper 41 at 12; Opp. 3–4 (discussing Board decisions that relied on copyright lines, trade inscriptions, ISBN and IEEE catalog order numbers for authentication); *Microsoft Corp. v. FG SRC LLC*, IPR2018-01604, Paper 76 at 15–16 (PTAB Apr. 30, 2020) (finding an IEEE trade inscription, copyright symbol, and ISBN provided evidence to self-authenticate documents under FRE 902(6) and 902(7)); *see also Intel Corp. v. FG SRC LLC*, IPR2020-01449, Paper 53 at 32–34 (PTAB Mar. 1, 2022) (finding printed publications at issue included “conventional indicia of publication” such as an IEEE copyright notice and date, ISBN numbers, IEEE order plan catalog numbers, and addresses where additional copies of the publication may be ordered provided evidence that these documents were publicly accessible publications of IEEE).

Such distinctive indicia were lacking in *TRW* where Petitioner cited only an IEEE copyright notice of “©1999 IEEE” without a publication date, publication information, and other indicia found in the Standard here. Opp. 4.

In this case, we find Exhibit 1005 bears sufficient distinctive indicia of public dissemination (publication) to authenticate it as a copy of the IEEE Std 802.16-2004, IEEE Standard for Local and Metropolitan area networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems published 1 October 2004, printed in the United States, and available at ISBN 0-7381-4069-4, ISBN 0-7381-4070-8, and IEEE Product # SH95246. *See* Opp. 1–5.

C. Hearsay

We agree with Petitioner that the indicia of publication and authenticity indicate the Standard satisfies an exception to the hearsay rule in FRE 803(17) as a commercial publication relied on by persons in particular occupations and also has sufficient guarantees of trustworthiness to satisfy FRE 807. Opp. 12.

Patent Owner argues that the Standard is not a periodical. Reply, 3.

However, IEEE is a well-known, reputable compiler and publisher of scientific and technical publications used by members in the scientific and technical research and publication communities in reliance on such indicia. *See Ericsson*, IPR2014-00527, Paper 41, 10–11. These indicia also provide sufficient guarantees of trustworthiness under a totality of circumstances, are more probative than other evidence, and are supported by Mr. Schwartz’s testimony that the Standard was published by IEEE WirelessMAN for use by members of these communities. Ex. 1006 ¶¶ 14–17; Ex. 1005, 3–4.

D. Public Availability and Public Accessibility

Patent Owner asserts that Petitioner failed to prove a date of public availability or public accessibility of the Standard. Motion 2–7. This issue is a substantive merits issue related to the sufficiency of evidence to show that the Standard is a prior art printed publication under 35 U.S.C. § 102, rather than to its admissibility into evidence. The Consolidated Trial Practice Guide makes clear that a motion to exclude “may not be used to challenge the sufficiency of the evidence to prove a particular fact.” Patent Trial and Appeal Board Consolidated Trial Practice Guide at 79 (Nov. 2019);⁵ *see Xactware Sols., Inc. v. Pictometry Int’l Corp.*, IPR2016-00594, Paper 46 at 7 (PTAB Aug. 24, 2017).

⁵ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

III. UNPATENTABILITY ANALYSIS

A. *Legal Standards*

1. *Anticipation*

To anticipate, a prior art reference must disclose all the elements of the claim within the four corners of the document, arranged as in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). “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).

2. *Obviousness*

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). The question of obviousness is resolved based upon underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.⁶ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

⁶ In this proceeding, neither party has presented evidence or made arguments regarding any objective criteria of nonobviousness.

B. Level of Ordinary Skill in the Art

Relying on the declaration testimony of Dr. Akl, Petitioner asserts that a person of ordinary skill in the art “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.” Pet. 32 (citing Ex. 1003 ¶ 19). Petitioner asserts that additional education could substitute for professional experience and “[t]he level of ordinary skill in the art may be reflected by the prior art of record.” *Id.*

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

Petitioner’s 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). We adopt Petitioner’s proposed level of ordinary skill in the art for this Decision.

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). This standard includes construing a 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.* Petitioner does not argue claim constructions, stating that “no terms need construction because the claims read on the prior art under any construction consistent with *Phillips*.” Pet. 32–33 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc)). Patent Owner does not argue any claim constructions. *See generally* PO Resp.

Other than our construction of “time interval,” which is set forth below, we determine that we do not need to provide any express claim constructions of limitations to reach our Decision.

Patent Owner proposed the following construction of “time interval” in the Preliminary Response (Prelim. Resp. 10):

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>

Patent Owner argued, “[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 cited the Declaration of Dr. Lomp, who testified 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 argued, “[t]his interpretation aligns with the description in the ’356 Patent’s specification.” Prelim. Resp. 10.

In our Decision, we interpreted “time interval” as a “timeslot.” 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.” Dec. Inst. 12.

Although Patent Owner does not reassert this claim interpretation in its Response (*see generally* PO Resp.), Patent Owner argues that “[a]s explained in the Summary of the Invention, the solution includes a closed loop feedback scheme, where a timeslot for transmission of a control signal (referred to as ‘UL-Beacon’) is inserted in the uplink frame between time slots used for transmitting data.” PO Resp. 7 (citing Ex. 2005 ¶ 28); *id.* at 9 (“the ’356 patent teaches that each UE transmits the physical uplink control channel signal in a dedicated timeslot of the uplink frame, between timeslots used for sending data to the base station.”); *id.* at 9–10 (same); *id.* at 11 (same).

As discussed below, we interpret this claim language in light of the ’356 patent specification to require a dedicated timeslot for a UL_Beacon. The dedicated time interval/timeslot used for the UL_Beacon signal does not have to be *between* timeslots that are used to send data in a frame, contrary to Patent Owner’s arguments. Portions of the ’356 patent cited by Patent Owner only require a “dedicated timeslot” without regard to its location vis-à-vis any timeslots used to send data. *See* PO Resp. 11 (citing Ex. 1001, 5:21–28).

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.” Thus, the processor sends a signal in a dedicated timeslot of a frame that is not used to send information (data) 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 allocated and used to send data in a frame.

This interpretation is consistent with the '356 patent specification, which describes the UL_Beacon signal sent in a dedicated timeslot that is separate from timeslots used to send data, as Patent Owner has asserted.

“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 . . .” Ex. 1001, 2:29–33 (emphasis added).

“FIG. 2 illustrates a timeslot arrangement for uplink and downlink messages supporting the UL_Beacon and its corresponding PLCCCH within a TD-CDMA frame structure . . .” *Id.* at 3:9–11 (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. *Id.* at 5:16–20 (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 PLCCCH within the frame structure according to embodiments of the invention. More than one UL_Beacon and PLCCCH 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). . . .” *Id.* at 5:32–41 (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. . . .” *Id.* at 5:42–45 (emphasis added).

“FIG. 2 illustrates an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCCH 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. *Id.* at 5:50–60 (emphasis added).

See Prelim. Resp. 11–12.

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 sent in timeslot 216 *separate* from timeslots 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 timeslot allocated to send control signals also 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, Abstr.

The claimed time interval is an assigned timeslot in which a signal (e.g., a UL_Beacon) is sent. The UE does not use this timeslot to send data over the physical uplink shared channel because this timeslot is allocated by the UE to send the UL_Beacon signal over the uplink physical control channel. *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 that are used to transmit data 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 that it is *separate from* timeslots used to transmit data in a frame. As claimed, the time interval can be allocated/located anywhere in a frame. *See* Ex. 1001, 5:21–49; *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.

At his deposition, Dr. Lomp testified, “I would imagine that there’s -- some latitude would be available into where the UL-Beacon is” and “I could imagine it also not being in the center” as in Figure 2 and “I suppose in principle it could” be in the first timeslot. Ex. 1019, 23:1–19.

We give more weight to the ’356 patent’s description of a time interval as a timeslot than to a 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. A *dedicated* timeslot groups all UL_Beacon signals from multiple UEs into 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.

Indeed, “[e]mbodiments of this invention *separate* uplink control from the uplink physical traffic [so that] control feedback [can] operate even when the terminal does not have data to send [for] maximum efficiency.” Ex. 1001, 6:33–37 (emphasis added). Therefore, a UL_Beacon may be sent in a time interval of a frame in which no data is sent by the UE.⁷ *See id.* at 2:24–28 (a terminal can transmit a control signal without an uplink physical channel), 4:20–27 (explaining that the uplink and downlink physical control channels do not need an associated data physical channel to be operational).

⁷ A 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. Placing UL_Beacon signals between data channel timeslots would appear to increase the risk of cross interference.

D. Ground 1: Alleged Anticipation of Claims 22, 23, 25–28, 45, and 46 by the Standard

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 send a Ranging Code to a base station (BS), and receives a Ranging Response with control commands to adjust timing and power settings as shown in Figure 218, reproduced below. Ex. 1005, 48–51, 174–81, 205–06, 577, 620.⁸

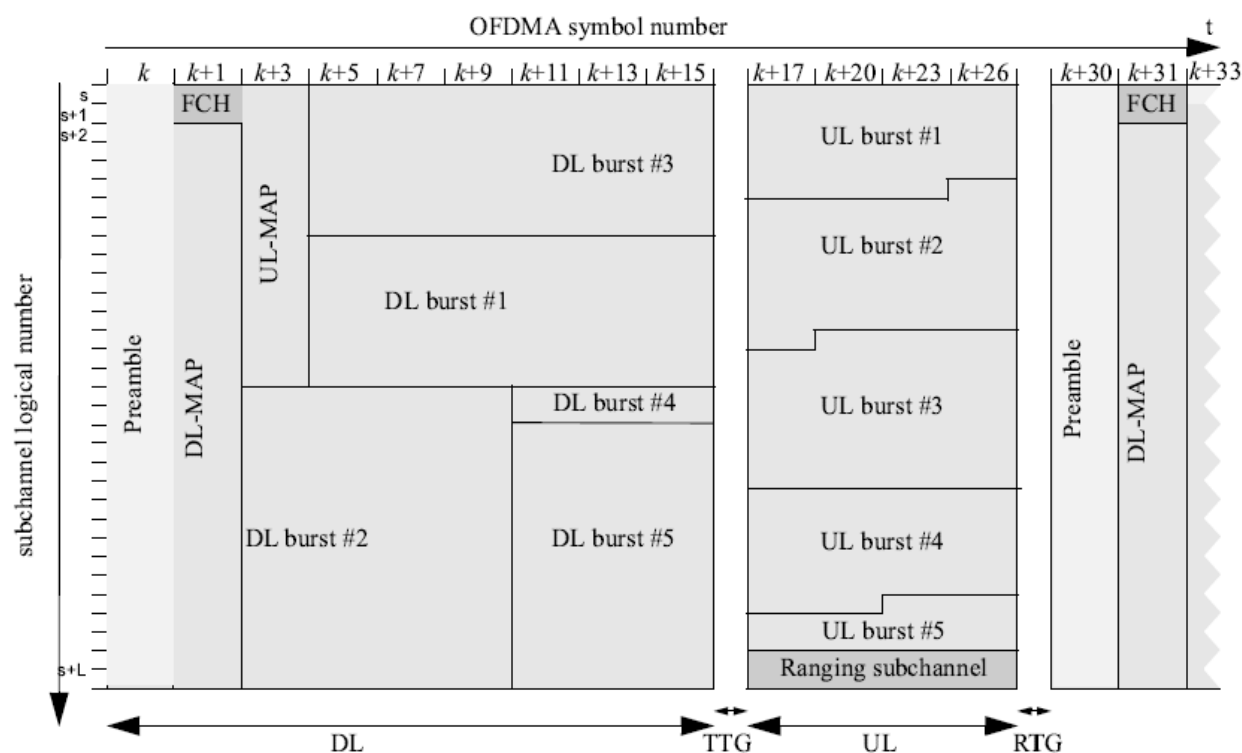


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 depicts a time division duplex (TDD) frame structure where an SS sends a ranging code in an allocated “Ranging subchannel” region separated from a region that is allocated to send data (UL Bursts ##1–5) in an uplink (UL) frame. Ex. 1005, 49–51, 154, 167, 174–76, 500, 577–78, 620, 666.

⁸ Citations are to pages of the Standard rather than pages added by Petitioner.

Table 121 is reproduced below to illustrate the ranging process.

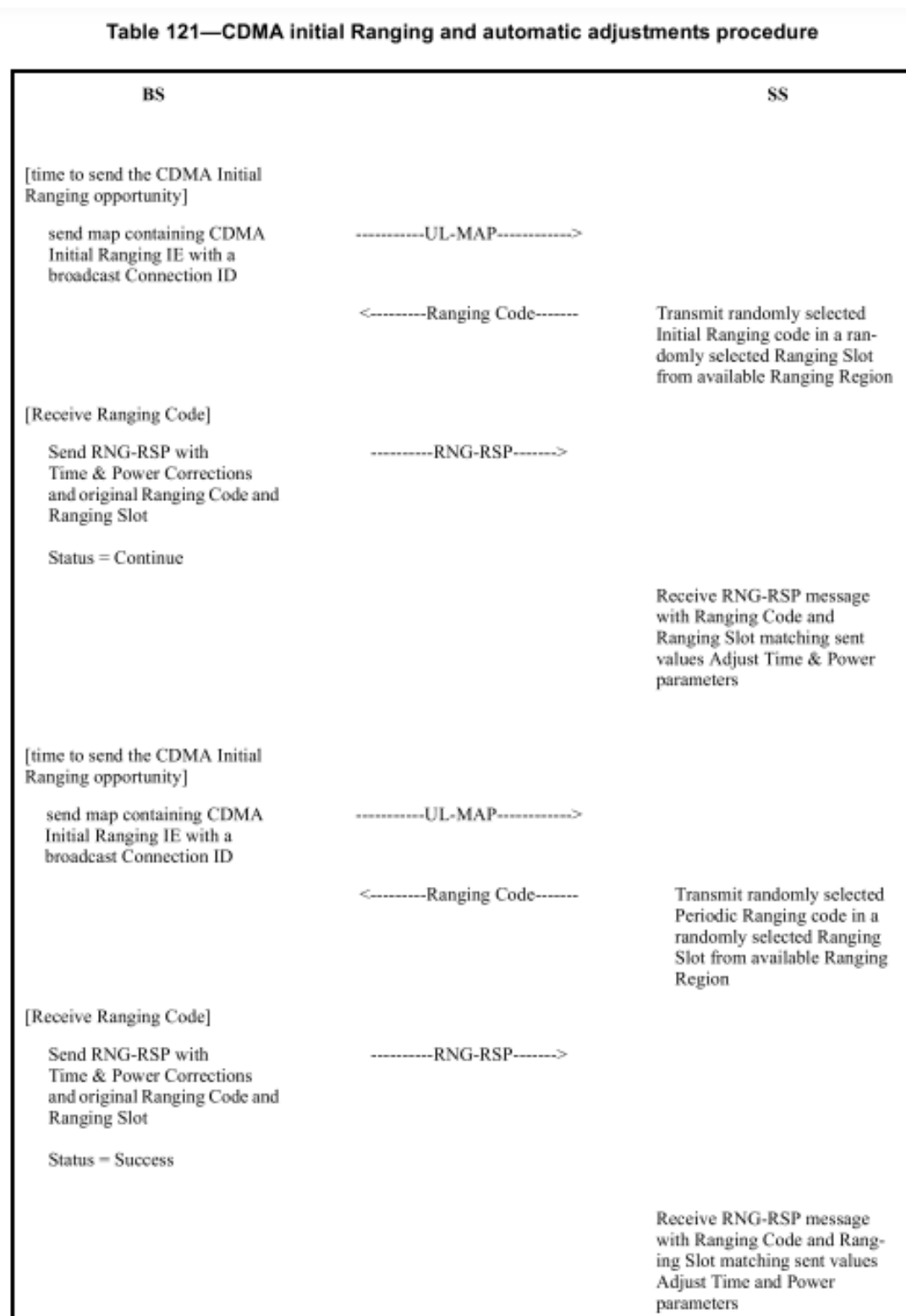


Table 121 describes an initial ranging process between an SS and a BS.

An SS performs initial ranging to obtain power and timing adjustments used to send data transmissions to the BS over a network. Ex. 1005, 48–51, 154, 174–77, 205–06, 212. To join the network, the SS scans a UL-MAP message to select 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 randomly selects an allocated Ranging Slot from the Initial Ranging IE to transmit a Ranging Code or a Ranging Request (RNG-REQ) to the BS to request power, timing, and other control parameters from the BS. *Id.* at 48–51, 174–78, 205–06, 212–13. The SS performs this process at registration as a new subscriber. *Id.* at 620.

In response to receiving a Ranging Code/RNG-REQ, the BS transmits a ranging response (RNG-RSP) message. *Id.* at 50, 176, 205–06. The RNG-RSP message provides timing and power adjust parameters to control uplink communication of the SS. *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. The Ranging Subchannel is allocated in the uplink frame. *Id.* at 666, Fig. 218.

When the SS receives the requested RNG-RSP, it adjusts its parameters specified in the RNG-RSP, such as transmit power, and it increases or reduces transmit power by the amount specified in the RNG-RSP message. *Id.* at 178, 205, 206 (“Adjust Time & Power parameters”). An SS does not transmit until it adjusts the RF signal to meet the RNG-RSP. *Id.* at 205. The BS may send another RNG-RSP message to the SS with any additional required fine tuning. *Id.* at 176. Once successfully ranged (RNG-REQ is within the tolerance of the BS), the SS may join the normal data traffic in the uplink. *Id.*

After initial ranging, a BS sends a second UL-MAP to allocate regions for an SS to send data. Ex. 1005, Table 121. The second UL-MAP “allocates access to the uplink channel” (*id.* at 47) and includes a Map IE that “define[s] uplink bandwidth allocations” for sending data bursts (*id.* at 48). Table 287, reproduced below, illustrates a BS’s allocation of subchannels for data bursts.

Table 287—OFDMA UL-MAP IE format

Syntax	Size	Notes
UL-MAP_IE() {		
CID	16 bits	
UIUC	4 bits	
if (UIUC == 12) {		
OFDMA Symbol offset	8 bits	
Subchannel offset	7 bits	
No. OFDMA Symbols	7 bits	
No. Subchannels	7 bits	
Ranging Method	2 bits	0b00 – Initial Ranging over two symbols 0b01 – Initial Ranging over four symbols 0b10 – BW Request/Periodic Ranging over one symbol 0b11 – BW Request/Periodic Ranging over three symbols
<i>reserved</i>	1 bit	Shall be set to zero
} else if (UIUC == 14) {		
CDMA_Allocation_IE()	32 bits	
else if (UIUC == 15) {		
Extended UIUC dependent IE	<i>variable</i>	See subclauses following 8.4.5.4.3
} else {		
Duration	10 bits	In OFDMA slots (see 8.4.3.1)
Repetition coding indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
}		
Padding nibble, if needed	4 bits	Completing to nearest byte, shall be set to 0.
}		

Table 287 depicts a UL-Map IE that allocates uplink regions. Ex. 1005, 531–532. “OFDMA⁹ Symbol offset” sets the time that an uplink burst starts. *Id.* at 533. “Subchannel offset” is the lowest subchannel used to carry a burst. *Id.* “No. OFDMA Symbols” is the number of symbols (time) used to carry the uplink burst. *Id.* “No. subchannels” is the allocated frequency region. *Id.* “Duration” allocates OFDMA timeslots. *Id.* An OFDMA slot is defined by time and subchannel frequency. *Id.* at 496. A data region is an allocation of subchannels (frequencies) and OFDMA symbols (time intervals). *Id.*

Figure 218 above shows an allocation of resources (OFDMA symbols (time), subchannels (frequency)) for uplink data transmissions in UL Bursts #1–#5 regions and for uplink physical channel control signals in a Ranging Subchannel region. Ex. 1005, 500. Different resources (time, frequency) are allocated for the UL Burst and Ranging Subchannel regions of the UL frame.

The downlink map (DL-MAP) message defines access to the downlink (DL) frame. Ex. 1005, 46, Table 16. The DL-MAP defines burst start times to an SS on the DL frame. *Id.* at 8, 500. It includes a “DL-MAP_IE()” that defines “OFDMA Symbol offset” as “the OFDMA symbol in which the burst starts, measured in OFDMA symbols from beginning of the downlink frame in which the DL-MAP is transmitted.” *Id.* at 521–22, Table 275. The DL-MAP IE defines a “Subchannel offset,” which is the “lowest index subchannel used for carrying the burst, starting from subchannel 0.” *Id.* It defines the “No. OFDMA Symbols,” which are the number of symbols (time intervals) used to carry the downlink PHY Burst. *Id.* “No. of Subchannels” allocates a number of frequency subchannels that are used to carry the data burst. *Id.*

⁹ “OFDMA” is an abbreviation for “orthogonal frequency division multiple access.” Ex. 1005, 15.

2. *Public Accessibility of the Standard*

“A reference is deemed publicly available if it has been ‘disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it.’” *Telefonaktiebolaget LM Ericsson v. TCL Corp.*, 941 F.3d 1341, 1346 (Fed. Cir. 2019) (quoting *Jazz Pharm., Inc. v. Amneal Pharm., LLC*, 895 F.3d 1347, 1355 (Fed. Cir. 2018)). “Because there are many ways in which a reference may be disseminated to the interested public, ‘public accessibility’ has been called the touchstone in determining whether a reference constitutes a ‘printed publication.’” *Id.* (quoting *In re Hall*, 781 F.2d 897, 898–99 (Fed. Cir. 1986)).

A reference is considered publicly accessible if “persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it.” *Samsung Elecs. Co., Ltd. v. Infobridge Pte. Ltd.*, 929 F.3d 1363, 1369 (Fed. Cir. 2019) (quoting *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 772 (Fed. Cir. 2018)). “If accessibility is proved, there is no requirement to show that particular members of the public actually received the information.” *Jazz Pharm.*, 895 F.3d at 1355–56 (quoted in *Samsung Elecs.*, 929 F.3d at 1374 (citing *In re Lister*, 583 F.3d 1307, 1314 (Fed. Cir. 2009) (“[O]ur cases have held that once accessibility is shown, it is unnecessary to show that anyone actually inspected the reference.”))) and *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1569 (Fed. Cir. 1988) (“If accessibility is proved, there is no requirement to show that particular members of the public actually received the information.”)) As a result, a petitioner need not establish that specific persons actually accessed or received a work to show that the work was publicly accessible. *Samsung Elecs.*, 929 F.3d at 1374.

Petitioner introduces a declaration of Randall Schwartz who avers that “[t]he final version of the Standard received approval on October 1, 2004, and was, to the best of my recollection, published on the www.WirelessMAN.org website by 2005.” Ex. 1006 ¶ 14. Mr. Schwartz also testifies that five drafts were submitted for review, and he voted to approve the Standard. *Id.*

Mr. Schwartz testifies that anyone “interested in accessing and reading the Standard could do so.” Ex. 1006 ¶ 15. Mr. Schwartz states “[t]he whole purpose of the Standard was to guide the development and implementation of cellular networks and devices,” and “the whole purpose of IEEE’s online database hosting and making the Standard and related documents available was so that engineers and other individuals would have ready access to them when developing and implementing cellular networks and devices.” *Id.*

To show the Standard was publicly accessible more than one year before the December 27, 2006, priority date of the ’356 patent (Pet. 25–27; Opp. 9 n.3), Mr. Schwartz searched the Wayback Machine for webpages at www.wirelessman.org that made the Standard publicly accessible by 2005. Ex. 1006 ¶ 16. Mr. Schwartz found a webpage from www.wirelessman.org that was archived by November 23, 2004, and included a hyperlink that made the final version of the Standard available for interested persons to order. *Id.* Mr. Schwartz testified that the Standard was published by November 2004, and a webpage with a link that made it available to interested persons was archived on *November 23, 2005*, by the Wayback Machine. Ex. 2008, 10:16–23. Mr. Schwartz’s testimony indicates the Standard was publicly accessible at www.wirelessman.org at least by *November 23, 2005*, as indicated by a webpage archived from that site by the Wayback Machine on that date. *Id.*; Ex. 1006 ¶ 16.

Publication of the final version of the Standard (Ex. 1005), whether by the end of 2004 or by November 23, 2005, predates the December 27, 2006, priority date of the '356 patent by more than one year. *See* Opp. 9 n.3.

The Standard was publicly available and publicly accessible to skilled artisans and the interested public at www.wirelessman.org more than one year before the December 27, 2006, priority date of the '356 patent.

Mr. Schwartz's testimony is corroborated by indicia that the Standard was published "1 October 2004" with IEEE catalog order numbers for Print (SH95246) and PDF (SH95246) copies of the Standard. Ex. 1005, 1, 4. The 2004 IEEE Copyright notice indicates the Standard was "Published 1 October 2004" and "Printed in the United States." *Id.* at 4. ISBN numbers are given for print (ISBN 0-7381-4069-4) and PDF (ISBN 0-7381-4070-8) copies of the Standard. *Id.* Mr. Schwartz has personal knowledge because he served on the committee that prepared the Standard, and he accessed archived copies of www.wirelessman.org webpages that provided copies of the Standard at least by November 23, 2005. Ex. 1006 ¶¶ 11–17; Ex. 2008, 10:1–15:4.

After considering the arguments and weighing the evidence presented by the parties, we determine that Petitioner has shown by a preponderance of the evidence that the Standard was publicly accessible to the interested public more than one year before the priority date of the '356 patent, and therefore qualifies as prior art under 35 U.S.C. § 102(b).¹⁰

¹⁰ To the extent our determination of admissibility or accessibility of Ex. 1005 could be viewed as based, in whole or in part, on taking judicial notice of facts relating to IEEE indicia of authenticity and publication procedures, including publication of five drafts (*see* Ex. 1006 ¶ 14), we add Ex. 3001 to the record to demonstrate that such facts are capable of instant and unquestionable proof. *See In re Ahlert*, 424 F.2d 1088, 1027 (CCPA 1970). Our determination does not rely on this evidence, however.

3. *Independent Claim 22*

- a) 22[p]: *“A method performed by a user equipment (UE), the method comprising:”*

Petitioner asserts that the Standard discloses “[a] method performed by a user equipment” as a subscriber station. Pet. 33 (citing Ex. 1003 ¶ 72 (the Standard defines “subscriber station (SS)” as “[a] generalized equipment set providing connectivity between subscriber equipment and a base station (BS)” (citing Ex. 1005, 11)). Patent Owner does not contest these contentions. *See generally* PO Resp. Based on Petitioner’s arguments and evidence, as summarized above, regardless of whether the preamble is limiting, we determine that Petitioner has shown that the Standard discloses element 22[p].

- b) 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;”*

Petitioner contends that the Standard discloses “receiving, by the UE, resource allocation information associated with an uplink physical control channel” as an SS receiving a UL-MAP from a BS with an “Initial Ranging IE” that specifies an “Initial Ranging Interval” (“Initial Ranging opportunity”) that allocates a region of an uplink subframe for an SS to transmit a Ranging Code message to a BS over a Ranging subchannel. Petitioner asserts that an “uplink physical control channel” is an allocated region of an uplink subframe that has different resources than a physical uplink shared channel that is used to send the uplink data bursts. Figure 218 of the Standard is reproduced below with Petitioner’s annotations of these regions. Pet. 33–37 (citing Ex. 1005, 51, 154, 167, 174, 178, 493, 500, 577–78, 666, Table 121, Fig. 218; Ex. 1003 ¶¶ 73–77; Pet. §§ IV, V.A.1., V.A.2, V.A.4 contentions).

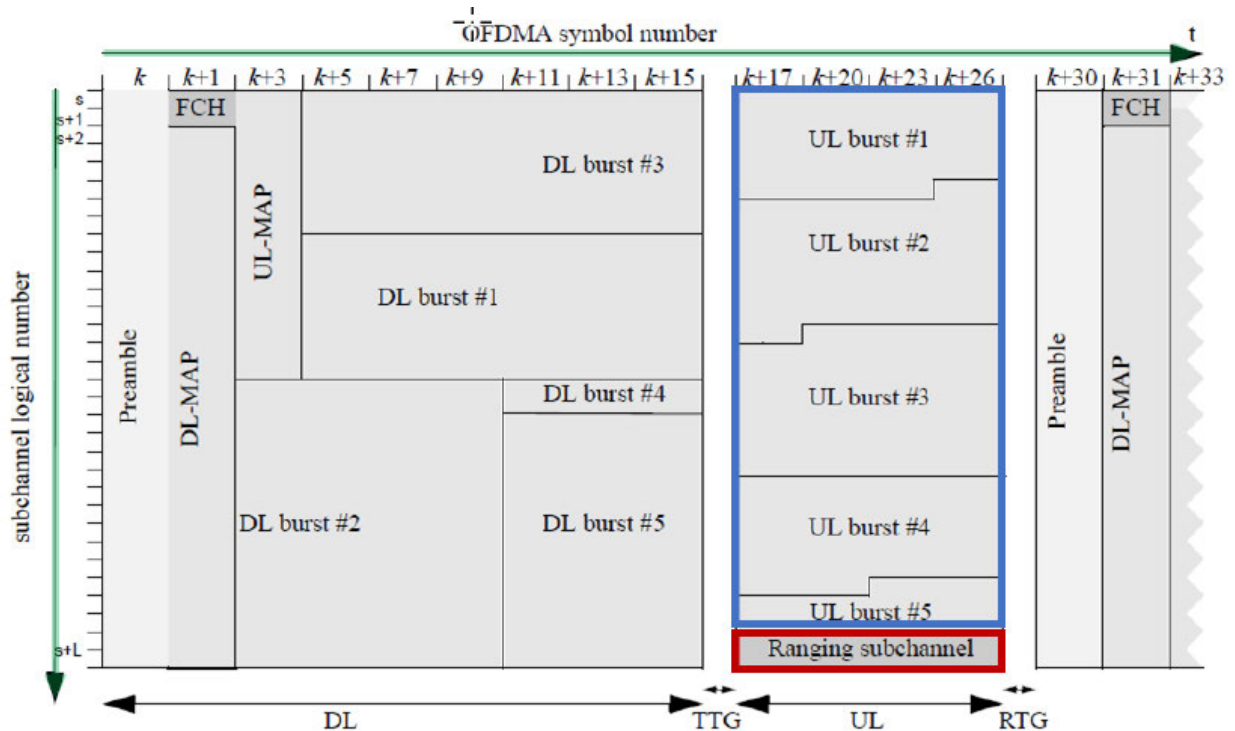


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 shows a resource allocation in a TDD frame with Petitioner's annotation of regions allocated in a UL subframe for a Ranging Subchannel as an uplink physical control channel for signals, and for UL Bursts ##1–5 in a physical uplink shared channel for data. Pet. 33–35; Ex. 1005 500. The regions are defined by OFDMA symbols (time) and subchannels (frequency).

Dr. Akl testifies that a skilled artisan would recognize that a Ranging Code message sent by the SS to the BS over the Ranging Subchannel is control information, not data, because the BS transmits a RNG-RSP message with Power Adjust Information and other control parameters in response to the Ranging Code message, and the SS adjusts uplink transmissions to the BS according to parameters provided in the RNG-RSP message. Ex. 1003 ¶¶ 55 (citing Ex. 1005, 49, 154, 175, 666, Table 121), 56 (citing *id.* 50, 51, 178, 205–06, Table 121), 73 (citing *id.* 15, 493, 500, Fig. 218; Ex. 1008, 45), 76 (citing Ex. 1005, 51, 154, 176, 500, 577–78, 666, Fig. 218); see Pet. 36.

Dr. Akl testifies that the Ranging Subchannel and uplink data bursts are physical channels for transmissions made at actual frequencies and times.

Dr. Akl testifies that the Standard describes a ranging subchannel and uplink bursts as a “PHY” implementation of OFDMA where “PHY” is the physical layer, and the channels use different frequency and time resources as shown in Figure 218. Ex. 1003 ¶¶ 73, 74 (citing Ex. 1005, Fig. 215 (an OFDMA data region is an allocation of time and frequency subchannels); Ex. 1008, 39, 40).

Petitioner contends that the BS allocates different resources to the SS for the Ranging Subchannel (uplink physical control channel) and UL Bursts (physical uplink shared channel) in the first and second UL-MAP messages. Pet. 14–17 (first UL-MAP), 18–22 (second UL-MAP), 34–37 (the ranging subchannel and uplink bursts are allocated as different regions).

c) Do the claims recite a frame structure?

Patent Owner argues that the Standard does not disclose “channels” of the ’356 patent because it discloses a different frame structure than the ’356 patent. PO Resp. 20. Patent Owner argues that the Standard’s frames are dynamic with variable duration of 2 ms to 20 ms, a variable split between the DL and UL subframes, and varying numbers, shapes, and sizes of DL and UL bursts in contrast to the FDD frames *illustrated in* Figure 2 of the ’356 patent. *Id.* at 21–22. Dr. Lomp provides similar testimony. Ex. 2005 ¶¶ 50–52.

These arguments are not commensurate with claim 22 or claims 1, 43, and 45, which do not recite a frame structure, frame size, or frame duration. Nor do they require a fixed number of time intervals to send data or signals. The ’356 patent describes embodiments that send more than one signal per frame, no signals in fractionated frames, and signals in frames with no data. Ex. 1001, 2:24–28, 4:20–27, 4:49–55, 5:15–60, 6:33–37, Figs. 2, 3. Frame structure varies as time intervals are allocated for data and signals in a frame.

Petitioner argues that “IV points to no support for [its] construction in the plain language of the claims” and could not “because the claims do not recite any ‘frame,’ let alone **multiple** frames across which the ‘channels’ remain unchanged.” Pet. Reply 9. Petitioner asserts that Figure 2 of the ’356 Patent shows a timeslot arrangement that cannot be used to limit the scope of the claims, as it is merely an example of a structural arrangement. *Id.*

Claims are not limited to particular embodiments when the claim language is broader than those embodiments absent express definition or a disclaimer, neither of which are asserted by Patent Owner. *See* Sur-reply 2–9; Reply 8–10; *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 771 (Fed. Cir. 2018) (“Acceleration again attempts to import structural limitations into claims lacking those limitations. . . . While the specifications discuss a broadcast channel overlaying a network, the claims at issue are not so limited.”); *see also Evolusion Concepts, Inc. v. HOC Events, Inc.*, 22 F.4th 1361, 1367 (Fed. Cir. 2022) (“We have repeatedly held that ‘it is not enough that the only embodiments, or all of the embodiments, contain a particular limitation to limit claims beyond their plain meaning.’”) (citation omitted); *Howmedica Osteonics Corp. v. Wright Med. Tech., Inc.*, 540 F.3d 1337, 1345 (Fed. Cir. 2008) (“[W]e have repeatedly held that the fact that the specification describes only a single embodiment, standing alone, is insufficient to limit otherwise broad claim language.”); *Phillips*, 415 F.3d at 1316, 1323 (claim terms are not limited to embodiments disclosed in the specification absent redefinition or disclaimer). Here, the intrinsic evidence does not limit the claims to particular cellular networks/protocols, and the claim language itself is not so limited. *See Sisvel Int’l S.A. v. Sierra Wireless, Inc.*, 81 F.4th 1231, 1236 (Fed. Cir. 2023) (the invention is described as applying to many different cellular telecommunications systems); Ex. 1001, 2:6–4:27, 11:54–61.

d) Are the channels limited to FDD schemes?

Essentially, Patent Owner asks us to limit claim 22 to a frame structure of a frequency division duplex (FDD) scheme. *See* PO Resp. 24; Sur-reply 2–7. As discussed above, claim 22 is not so limited. In addition, claim 28, which depends from claim 22, recites that the claimed channels can be TDD, FDD, TDMA, CDMA, and other schemes (Ex. 1001, 11:54–61):

28. The method of claim 22 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

Claiming TDD channels in dependent claim 28 means that claim 22 includes this subject matter. The “uplink physical control channel,” “physical uplink shared channel,” and “downlink control channel” recited in claim 22 can be TDD, FDD, CDMA, TDMA, or other channels. *See Littelfuse, Inc. v. Mersen USA EP Corp.*, 29 F.4th 1376, 1380 (Fed. Cir. 2022) (“By definition, an independent claim is broader than a claim that depends from it, so if a dependent claim reads on a particular embodiment of the claimed invention, the corresponding independent claim must cover that embodiment as well.”).

Because channels can be TDD or FDD, Patent Owner’s distinction of the Standard’s TDD regions/channels from the claimed channels because they are not FDD is unavailing. *See* Sur-reply 2–8; PO Resp. 20–27. Dr. Lomp’s distinction of the claimed channels from the Standard because they have different frames in Figure 2 is likewise unsupported by the claim language. Ex. 2005 ¶¶ 50–59 (testifying that the Standard has an entirely different frame structure from the frame structure *shown in Figure 2* of the ’356 patent).

- e) *The Standard's "regions" and claimed "channels" are delineated by allocations of time and frequency*

Petitioner asserts that the Standard divides frames into *regions* that are delineated by frequency (subchannels) and time (OFDMA symbols) like the claimed channels. Pet. 10–25 (citing Ex. 1003 ¶¶ 45–63), 33–55; Reply 5–8. Petitioner asserts that Figure 215 of the Standard, reproduced below, depicts a typical *region* delineated by frequency-timeslots allocated by a BS. *Id.* at 11.

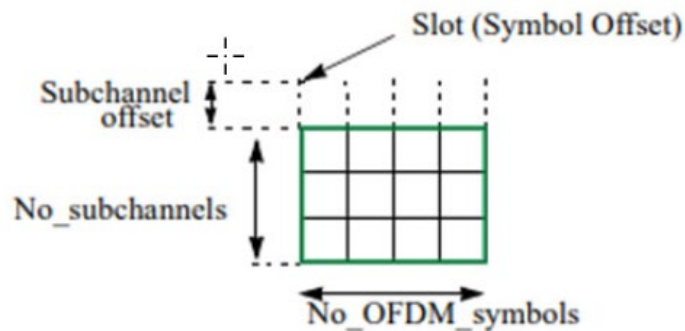


Figure 215—Example of the data region which defines the OFDMA allocation

Figure 215 of the Standard depicts a data *region* allocated as contiguous frequency subchannels and OFDMA time symbols in a 4 x 3 rectangle of slots annotated by Petitioner. Ex. 1005, 496; Pet. 10–11; Ex. 1003 ¶¶ 43–46.

Dr. Akl testifies that a BS allocates “regions” delineated by frequency subchannels and durations of “symbol time” in an uplink frame. A “Ranging subchannel” is allocated to send control transmissions for ranging in a first UL-MAP. Burst regions are allocated to send data transmissions. Ex. 1003 ¶¶ 45–55. Dr. Akl testifies that a BS sends a second UL-MAP to allocate regions in an uplink subframe for SSs to send UL data bursts. *Id.* ¶¶ 57–63. Dr. Akl testifies that the BS allocates regions for an uplink physical control channel, a physical uplink shared channel, a downlink control channel, and a physical downlink shared channel. *Id.* ¶¶ 73–101. Dr. Akl identifies each region with annotations on Figure 218, which is reproduced below.

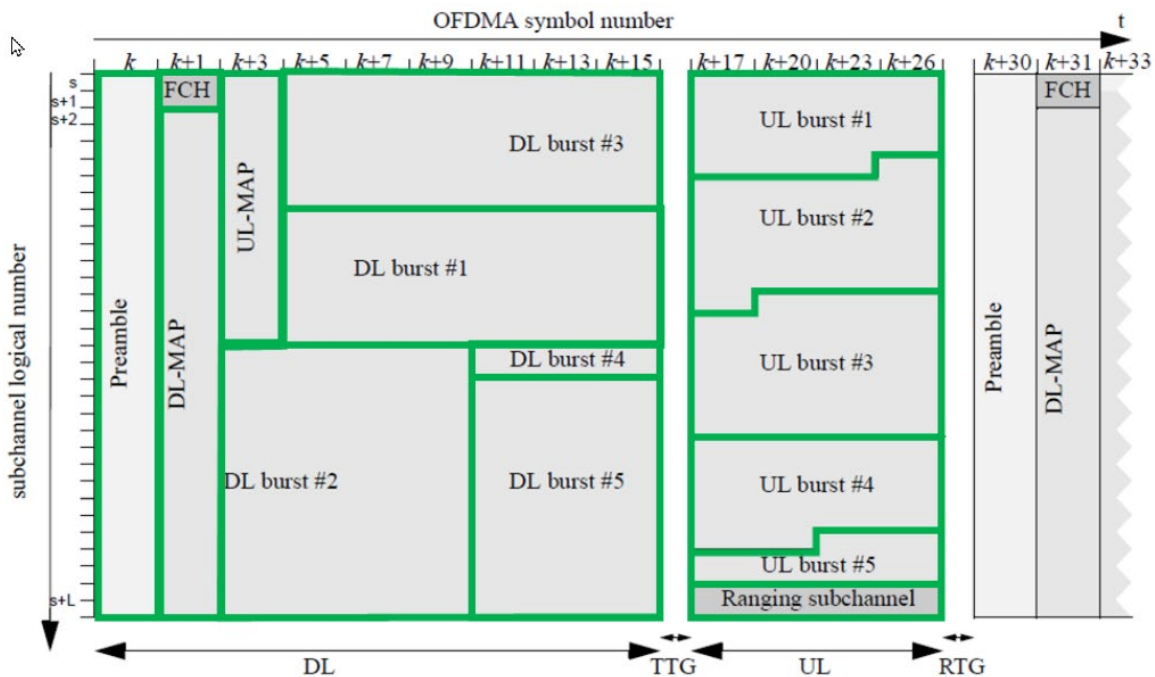


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 illustrates “regions” defined by OFDMA symbols (time (t)) and subchannel numbers (frequency) to send data (UL bursts ##1–5) or controls (Ranging subchannel) in UL subframe and DL bursts ##1–5 and controls (UL-MAP) in the DL subframe as annotated by Dr. Akl. *See* Ex. 1003 ¶¶ 47–63.

Figure 2 of the ’356 patent, reproduced below, shows how the claimed “channels” are defined by time and frequency slots to send data and controls.

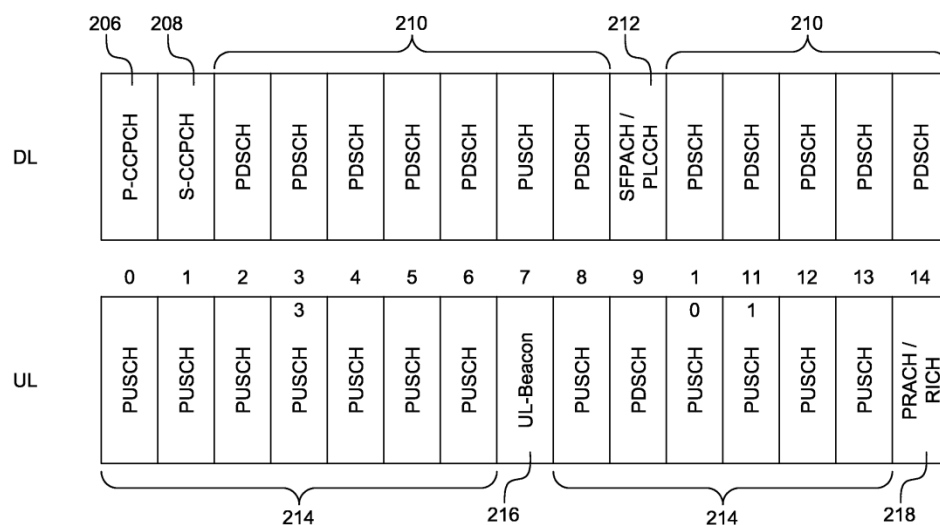


Figure 2 of the '356 patent illustrates uplink physical shared data channels as PUSCH regions 214 of the uplink frame delineated by *timeslots 0–6 and 8–13* in an *uplink (UL) frame frequency*. Figure 2 shows an uplink physical control channel as UL_Beacon region 216 delineated in the *uplink frame frequency* at *timeslot 7* and a downlink control channel as PLCCCH region 212 in *timeslot 9* of the *downlink (DL) frame frequency*. Data is sent on a physical downlink shared channel in PDSCH 210 regions defined by *timeslots 2–8 and 10–14* in the *downlink (DL) frame frequency*. Ex. 1001, 5:50–60, 4:5–7; Reply 6–8 (comparing “regions” shown in Figure 218 of the Standard to the “uplink physical control channel,” “physical uplink shared channel,” downlink control channel,” and “physical downlink shared channel” shown in Fig. 2 of the '356 patent to illustrate that both are defined by UL/DL frequency and time).

The Standard’s *regions* are defined by time and frequency just like the claimed *channels*. Data and controls are sent in delineated frequency and time regions in the Standard. Ex. 1001, 4:5–7, 5:50–60, Fig. 2; Ex. 1005, 500, 532. “The Standard’s regions disclose what the claimed ‘channels’ **are**—namely, delineations of time and frequency within the frame.” Reply 8.

Patent Owner argues that Figure 2 of the '356 patent depicts uplink and downlink channels in an FDD scheme where transmissions occur on different frequencies but within the same time duration, whereas Figure 218 of the Standard transmits at different times in the same frequencies. Sur-reply 5–7.

Claim 22 does not require uplink and downlink channels to be a certain frequency or time frame. Nor are the channels limited to FDD channels when claim 28 indicates that the uplink physical control channel, the physical uplink shared channel, and the downlink control channel of claim 22 may be TDD, FDD, or other schemes. Ex. 1001, 11:54–61; *see Littelfuse*, 29 F.4th at 1380. Thus, the Standard’s disclosure of regions in a TDD frame is not a distinction.

Regions like channels are defined by allocations of time and frequency in an uplink or a downlink frame. “The invention is not the language of the [claim] but the subject matter thereby defined.” Reply 8 (quoting *ADASA Inc. v. Avery Dennison Corp.*, 55 F.4th 900, 913 (Fed. Cir. 2022)). To anticipate a patent, a prior art reference “need not satisfy an *ipsissimis verbis* test.” *Whitserve, LLC v. Comput. Packages, Inc.*, 694 F.3d 10, 21 (Fed. Cir. 2012) (quoting *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009)).

The ’356 patent discloses that a channel is defined by frequency. Thus, *channel reciprocity* exists when a user terminal and base station use the *same frequency* to communicate. Ex. 1001, 1:23–33. Because the uplink physical control channel and the physical uplink shared channel are sent in the same uplink frequency channel, they also are delineated by timeslots. The channels are delineated in different timeslots in the uplink and downlink frame channel frequencies. PO Resp. 24–25; Sur-reply 3–10; Ex. 1001, 5:50–60.

To send data/controls over a *channel* in the ’356 patent, a UE transmits in the *time and frequency domain* allocated for that channel. Ex. 1001, 2:17–48, 4:1–17, 4:34–60, 5:1–6:31, Figs. 2, 3; PO Resp. 24; Sur-reply 5–7; Reply 6–7; Ex. 1003 ¶¶ 68–70; *see* Sur-reply 5 (“FDD simply means that uplink and downlink transmissions operate in different frequency bands.”); 6 (“the downlink and uplink transmissions occur on different frequencies but within the same duration of time”), 7 (“Within each of the timeslots 0, 1, . . . 14 shown in Fig. 2, both uplink and downlink transmissions may occur.”); PO Resp. 24–25 (the ’356 patent describes a frame structure divided into timeslots shown in Fig. 2; “the downlink (DL) and uplink (UL) transmissions are on different frequencies” that include different types of channels), 25 (“The ’356 patent uses a channel structure, such as shown in Fig. 2, to separate, transmit and receive various types of data.”).

To send data/controls over a *region* in the Standard, an SS transmits in the *time and frequency domain* allocated for that region. Ex. 1005, 496–500, 577–78, 666, Fig. 218, Table 287; Pet. 10 (regions are formed by slots in contiguous frequency subchannels and symbol time durations), 12 (“The BS informs SSs of how the regions are mapped so that the SSs may transmit, and expect to receive, certain transmissions in certain regions.”), 13–14 (“As Figure 218 shows, the BS allocates regions of the downlink subframe for both data transmissions . . . and control transmissions” and “the BS allocates regions of the uplink subframe for both data transmissions . . . and control transmissions”), 14 (“The Standard describes the process by which an SS learns the allocated regions on the uplink and downlink subframes from the BS so that the SS can communicate with the BS.”), 14–16 (the UL-MAP “specifies an interval” called the “Initial Ranging Interval” or “Ranging Region” in which new stations join the network by transmitting a Ranging code in a Ranging Slot of the available Ranging Region in an allocated Ranging Subchannel defined by frequency and time); Reply 5–8 (asserting that “regions” and “channels” are delineated by time and frequency); Ex. 1003 ¶¶ 43–63; Ex. 1008, 319–20 (*data regions* are allocated as contiguous slots in the time/frequency domain, and FDD and TDD frames are in this domain).

Even if a channel is defined by data it carries (*see* PO Resp. 24–25; Sur-reply 2–7), the Standard allocates a Ranging subchannel as a region to send control signals in the uplink frame and UL burst regions to send data in the uplink frame just like the uplink physical control channel and physical uplink shared channel. Ex. 1001, 9:40–14:26. *The claimed channels and regions of the Standard are delineated in UL/DL frames in a time/frequency domain to send data or controls. Id.* at 4:49–5:8, 5:50–60, 5:15–20; Ex. 1005, 496–500, 577–578, 666, Fig. 218, Table 287; *see* Pet. 9–25, 33–55; Reply 4–8.

As shown in Figure 218, the BS provides an SS with resource allocation information for an uplink physical control channel, as claimed, by allocating Ranging Slots in an available Ranging Region in a UL-MAP for an SS to send a Ranging code to the BS over the Ranging subchannel. Thus, the Ranging subchannel (and Ranging Slots) is allocated as time and frequency resources shown in Figure 218 and Table 121. It is used by an SS to send a Ranging code signal to a BS that uses the Ranging code signal to generate a RNG-RSP message with values for the SS to Adjust Time & Power Parameters. Ex. 1005, 49–51, 154, 175–87, 205–06, 666, Tables 115, 121; Pet. 14–17, 33–37.

As shown in Figure 218 and Table 287, a BS sends different resource allocation information (OFDMA *time* symbols, *frequency* subchannels) to an SS to send UL data bursts ##1–5 in a UL-MAP IE (information element). A UL-MAP “allocates access to the uplink channel” as a “set of information that defines the entire access for a scheduling interval” and defines an allocation of *timeslots* and *frequency subchannels* to send uplink transmissions. Ex. 1005, 11, 43, 47–48, 494–96, 500, 531–33, Tables 121, 278, Fig. 218; Pet. 18–22, 33–37. UL data burst regions ##1–5 are physical uplink shared channels over which SSs send data transmissions to a BS.

Petitioner has shown by a preponderance of evidence that the Standard provides SSs with resource allocation information that delineates *regions* that correspond to the claimed “channels” in elements 22[a]–[d]. As discussed in more detail in our analysis of each individual limitation, regions are used to send data bursts and ranging control signals used to control transmissions of an SS to a BS in the Standard just as the claimed channels are used to send traffic data and signals by an SS (UE) to a BS to receive commands to control the power of a UE on its uplink transmission to a BS terminal. We address Patent Owner’s other arguments in the context of each limitation.

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

Petitioner asserts that the Standard discloses a UE sending data over a physical uplink shared channel in assigned time intervals as SS sending data in a *region* of an uplink subframe allocated for uplink bursts in time intervals $k+17$ to $k+26$ assigned by a BS via a second UL-MAP message and MAP IE format as shown in Table 287, which is reproduced below. Pet. 18–22, 37–40.

Table 287—OFDMA UL-MAP IE format

Syntax	Size	Notes
UL-MAP_IE() {		
CID	16 bits	
UIUC	4 bits	
if (UIUC == 12) {		
OFDMA Symbol offset	8 bits	
Subchannel offset	7 bits	
No. OFDMA Symbols	7 bits	
No. Subchannels	7 bits	
Ranging Method	2 bits	0b00 – Initial Ranging over two symbols 0b01 – Initial Ranging over four symbols 0b10 – BW Request/Periodic Ranging over one symbol 0b11 – BW Request/Periodic Ranging over three symbols
<i>reserved</i>	1 bit	Shall be set to zero
} else if (UIUC == 14) {		
CDMA_Allocation_IE()	32 bits	
else if (UIUC == 15) {		
Extended UIUC dependent IE	<i>variable</i>	See subclauses following 8.4.5.4.3
} else {		
Duration	10 bits	In OFDMA slots (see 8.4.3.1)
Repetition coding indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
}		
Padding nibble, if needed	4 bits	Completing to nearest byte, shall be set to 0.
}		

Table 287 depicts OFDMA UL-MAP IE that allocates an uplink burst region for SSs to send data to a BS. “OFDMA Symbol offset” sets the burst’s start time. “No. OFDMA Symbols” allocates a time interval. “No. subchannels” allocates a frequency for a burst. Ex. 1005, 532–33; Pet. 37–40 (citing Ex. 1005, 8, 10, 11, 103, 176, 500, 533, Table 287, Fig. 218; Ex. 1003 ¶¶ 78–80, 83; Pet. §§ IV, V.A.4), 10–13, 17–22; Ex. 1003 ¶¶ 78–83. UL Bursts ##1–5 are allocated among SSs that share this region. Reply 11–12.

Petitioner asserts that a second UL-MAP allocates different regions of the UL subframe for SSs to send uplink bursts with a Ranging subchannel as show in Figure 218, reproduced below. Pet. 18–22 (citing Ex. 1005, 11, 43, 47, 48, 500, 532–33, Tables 18, 90, 121, 287; Ex. 1003 ¶¶ 58–60), 34–35 (different resources are allocated for a ranging subchannel and uplink bursts).

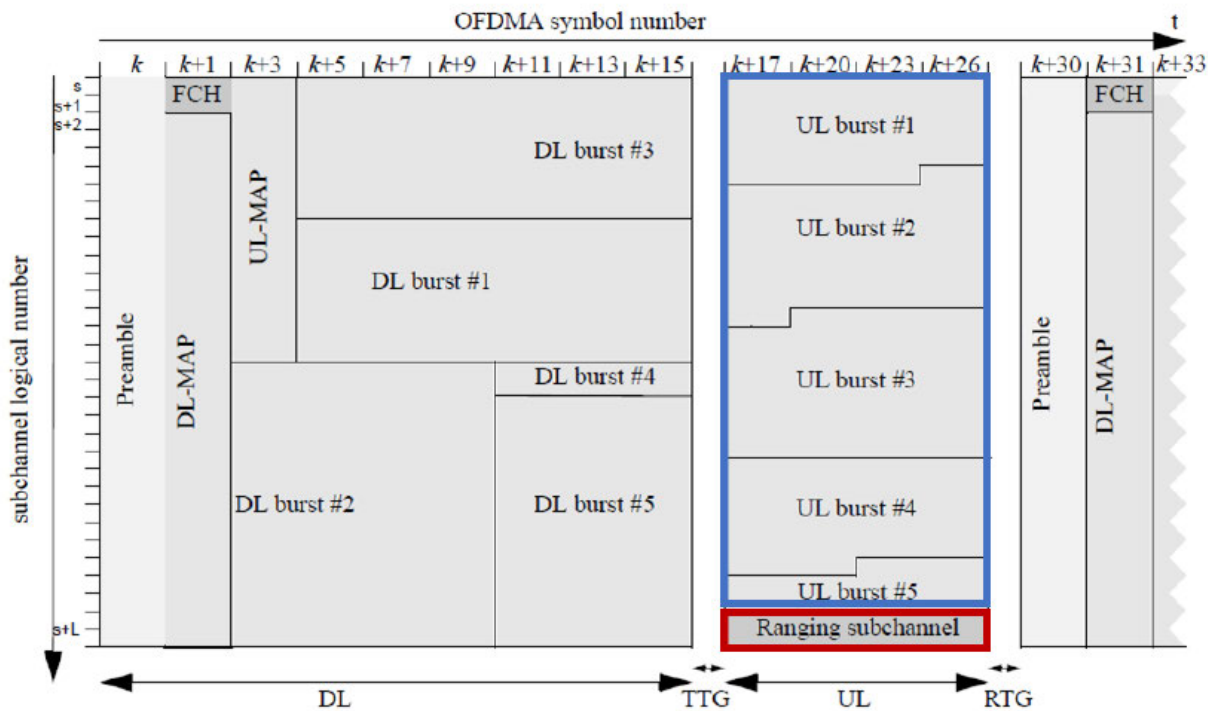


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 illustrates Petitioner’s annotation of UL data burst and Ranging subchannel regions of a UL subframe. Ex. 1005, 500; Pet. 21–22, 34–35.

(1) '356 patent describes a fixed-frame structure

Patent Owner argues that the “standard does not have a ‘physical uplink shared channel’ because it utilizes a frequency channel with a bandwidth from 3.5 MHz to 28 MHz to carry frames which may be variable in size, where the data is mapped to respective regions of the physical channel on a frame-by-frame basis.” PO Resp. 22–25. Patent Owner argues that the ’356 patent *describes* a fixed-duration frame structure divided into timeslots *in Figure 2. Id.* at 24. Patent Owner asserts that the uplink frequency includes a physical uplink shared channel (PUSCH) that carries user data and an uplink physical control channel that carries an uplink beacon (UL_Beacon). *Id.* at 24–25. Patent Owner argues that the downlink frequency has a physical downlink shared channel (PDSCH) that carries user data and a physical logical control channel (PLCCH) for downlink control channel. *Id.*

Claims are interpreted in light of the specification but are not limited to embodiments disclosed therein absent a clear indication in the intrinsic record. *Howmedica*, 540 F.3d at 1345 (“[W]e have repeatedly held that the fact that the specification describes only a single embodiment, standing alone, is insufficient to limit otherwise broad claim language.”); *Liebel–Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004) (“[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited.”);

Claim 22 is not limited to FDD or a fixed frame structure as confirmed by claim 28 and as discussed above. Reply 8–10. The term “frame” is not used in claim 22. Nor does claim 22 specify a fixed number of time intervals for any claimed channel or a fixed number of time intervals in a particular frame structure.

Patent Owner argues that “the ’356 Patent describes a fixed-duration frame structure as shown in Fig. 2.” PO Resp. 24 (citing Ex. 2005 ¶ 57 (same)). Yet, Figure 2 is not described as having a fixed frame structure.

FIG. 2 illustrates an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCH within a TD-CDMA frame structure modified to support FDD. In this example, the PLCCH 212 shares a timeslot with another downlink shared channel. This is possible since normal downlink physical channels are used to transmit the PLCCH. The downlink frame also comprises a downlink beacon timeslot 206, an access control timeslot 208, and normal traffic carrying timeslots 210. The uplink frame comprises a UL_Beacon control timeslot 216, an access control timeslot 218, and normal traffic carrying timeslots 214.

Ex. 1001, 5:50–60; *see Sisvel*, 81 F.4th at 1236 (the intrinsic evidence and the claim language do not limit the claims to particular cellular networks).

Patent Owner does not identify a description of a fixed number of time intervals in a frame, a lexicographical definition of a time interval or a frame, or a clear, unmistakable disclaimer that limits the claimed time intervals to a fixed frame structure. Nor do Patent Owner and Dr. Lomp cite other evidence to support their assertions that claim 22 requires a fixed-frame duration.

That independent claims 1, 22, 43, and 45 are not limited to particular frame structures or schemes is made clear by claims 7, 28, 44, and 46, which recite that the uplink physical control channel and the physical uplink shared channel in claims 1, 22, 43, and 45 can be FDD or TDD (as in the Standard). Ex. 1001, 9:40–14:26. Thus, even if FDD uses a fixed frame structure, the claims are not limited to an FDD scheme. In the Standard, “[a] TDD frame also has a fixed duration and contains one downlink and one uplink subframe” and capacity allocated to the downlink versus the uplink *may vary*. Ex. 1005, 309. A “frame” is “[a] structured data sequence of fixed duration.” *Id.* at 8.

(2) *channels in the Standard*

Patent Owner argues that the Standard uses a single channel, sends data within a region of a frame of that channel, and another frame may be sent over that same channel with another configuration. PO Resp. 26. Patent Owner asserts that uplink bursts are not allocations of a region of the uplink subframe because “[t]he uplink bursts are placed in the channel . . . on a frame-by-frame basis. They do not constitute channels.” *Id.* at 27; *see* Ex. 2005 ¶ 63 (same).

Dr. Lomp testifies that an SS transmits a one-time burst in an assigned region of a frame and then “may be assigned to a totally different region of the UL subframe for a UL-burst, or assigned no burst at all” in the next frame so “[t]hese one-time bursts are not channels.” Ex. 2005 ¶ 64. Dr. Lomp asserts that the “Ranging subchannel” would be considered a shared channel by this logic because it “also shares the UL subframe” with the UL bursts. *Id.* ¶ 65.

These arguments are unavailing because claim 22 does not require a fixed frame structure as discussed. The ’356 patent describes physical uplink shared channels that vary from frame to frame for fractionation or when a UE sends only control signals over an uplink physical control channel in a frame without sending any data over a physical uplink shared channel in that frame, or terminals are managed actively. Ex. 1001, 2:18–28, 4:20–27, 5:32–6:44.

In the ’356 patent, uplink physical control channels and physical uplink shared channels are *placed in* the uplink (UL) frame frequency channel on a frame by frame basis. These channels are placed *in* the UL frame frequency channel in different allocated timeslots in Figure 2. Ex. 1001, 5:50–60, Fig. 2. Data and signals are sent in different regions (timeslots 0–6, 8–13 for data and 7 for UL-Beacon in the UL frequency channel) in Figure 2, just as UL bursts are sent in different allocated time and frequency domain regions of an uplink subframe in the Standard as shown in Figure 218, which is reproduced above.

(3) “*sending . . . in assigned time intervals*”

Patent Owner also argues that the physical uplink shared channels are “shared on the basis of time slots” but the Standard’s UL bursts occupy the identical time slot as shown in Figure 218 of the Standard. Sur-reply 10.

Claim 22 recites “sending, by the UE, data over the physical uplink shared channel in assigned time intervals.” Ex. 1001, 11:31–32. Figure 2 of the ’356 patent shows data being sent over the physical uplink shared channel (PUSCH 214) in *time intervals 0–6 and 8–13*. Ex. 1001, 5:58–60. Figure 218 of the Standard also shows data sent in UL burst regions of the UL subframe in assigned *time intervals $k+1$ to $k+26$* . Ex. 1005, 500; Pet. 37–40; Ex. 1003 ¶¶ 78–83. The Standard may send data bursts in different time intervals as shown in Figure 8.14 of *Fundamentals of WiMAX*, reproduced below.

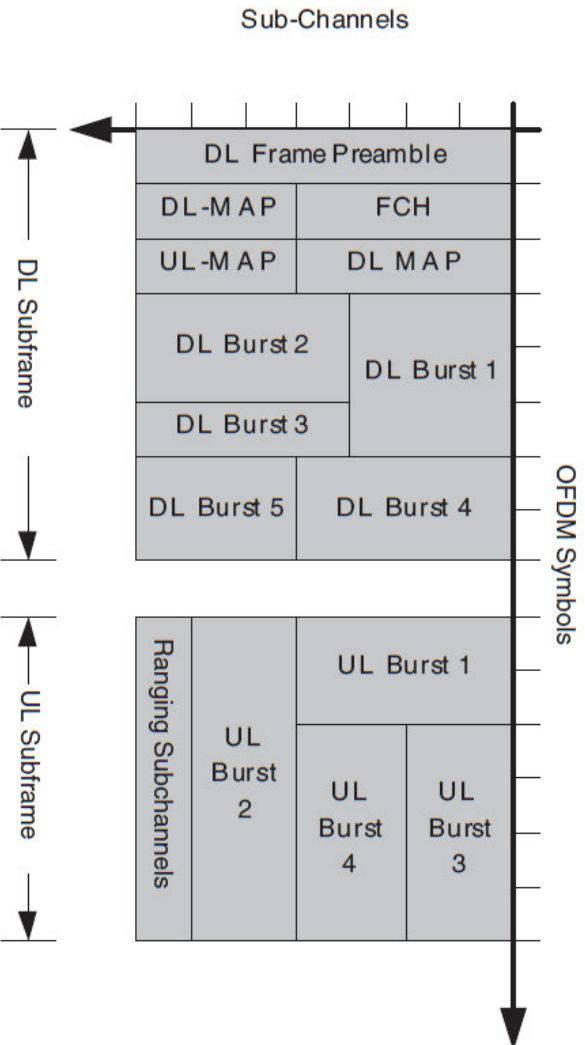


Figure 8.14 TDD frame structure

Figure 8.14 depicts a TDD frame structure that allocates different OFDM time intervals for UL Bursts 1–3 sent in the UL Subframe and the DL Subframe. Ex. 1008, 319–320; *see also* Ex. 1005, 500 (showing DL Burst #2 and #4 sent in different assigned time intervals $k+3$ to $k+9$ and $k+11$ to $k+15$, respectively, of a downlink (DL) subframe in Figure 218 of the Standard). Ex. 1005, 500.

Petitioner has shown by a preponderance of evidence that the Standard discloses element 22[b].

- g) 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*”

Petitioner asserts that the Standard discloses an SS sending a signal as a Ranging Code message in a Ranging Slot of a Ranging Subchannel, which is an “uplink physical control channel.” Petitioner asserts that the BS allocates the Ranging Subchannel as an Initial Ranging opportunity in a UL-MAP as shown in Table 121. Petitioner asserts that the Ranging Code message is sent “in a time interval that [the SS] is not sending information over the” uplink bursts “because the SS sends the Ranging code message at a time that the SS is not sending data in its uplink burst” because the SS has not received the second UL-MAP message that allocates the uplink burst region for the SS to send UL data bursts. Pet. 40–42 (citing Ex. 1005, 7, 48–51, 154, 174–75, 178, 205–06, 666, Table 121; Ex. 1003 ¶¶ 84–87; Pet. §§ V.A., V.A.2).

Dr. Akl testifies that the Standard discloses this element as an SS sending a Ranging Code message over the Ranging subchannel based on the Initial Ranging opportunity received as “resource allocation information” from a BS. Ex. 1003 ¶¶ 84, 85 (citing Ex. 1005, 49, 154, 175, 205–06, 666 (a “Ranging subchannel” is “the OFDM subchannel . . . used to transmit the initial ranging message”). Dr. Akl testifies that the SS identifies the Ranging subchannel from the Initial Ranging opportunity and sends the Ranging Code message in a time interval that the SS is not sending uplink bursts because the SS has not received the Second UL-MAP that allocates uplink burst regions to the SS to send data. *Id.* ¶¶ 86, 87 (citing Ex. 1005, 7, 48–51, 154, Table 121).

Patent Owner argues that “[a] ranging subchannel in which a ranging request is sent uplink over an initial ranging interval is not a control channel because such a ranging request does not control anything.” PO Resp. 30. Patent Owner asserts that “the ranging subchannel is not a channel but a subdivision of a frame within the much larger channel in the standard.” *Id.* at 30–31. Patent Owner argues that the Standard refers to a “Ranging Code” not a Ranging Code message” as Petitioner alleges and the Ranging Code is just a code and nothing more. *Id.* at 31–33. Patent Owner argues that Petitioners do not provide any evidence that the Ranging subchannel and uplink bursts are physical channels. *Id.* at 33–34. Patent Owner argues that the uplink physical control channel is used as part of a feedback loop to maintain the call, whereas a physical random access channel (PRACH) is used to access the network and set the initial transmission power level in the ’356 patent. *Id.*

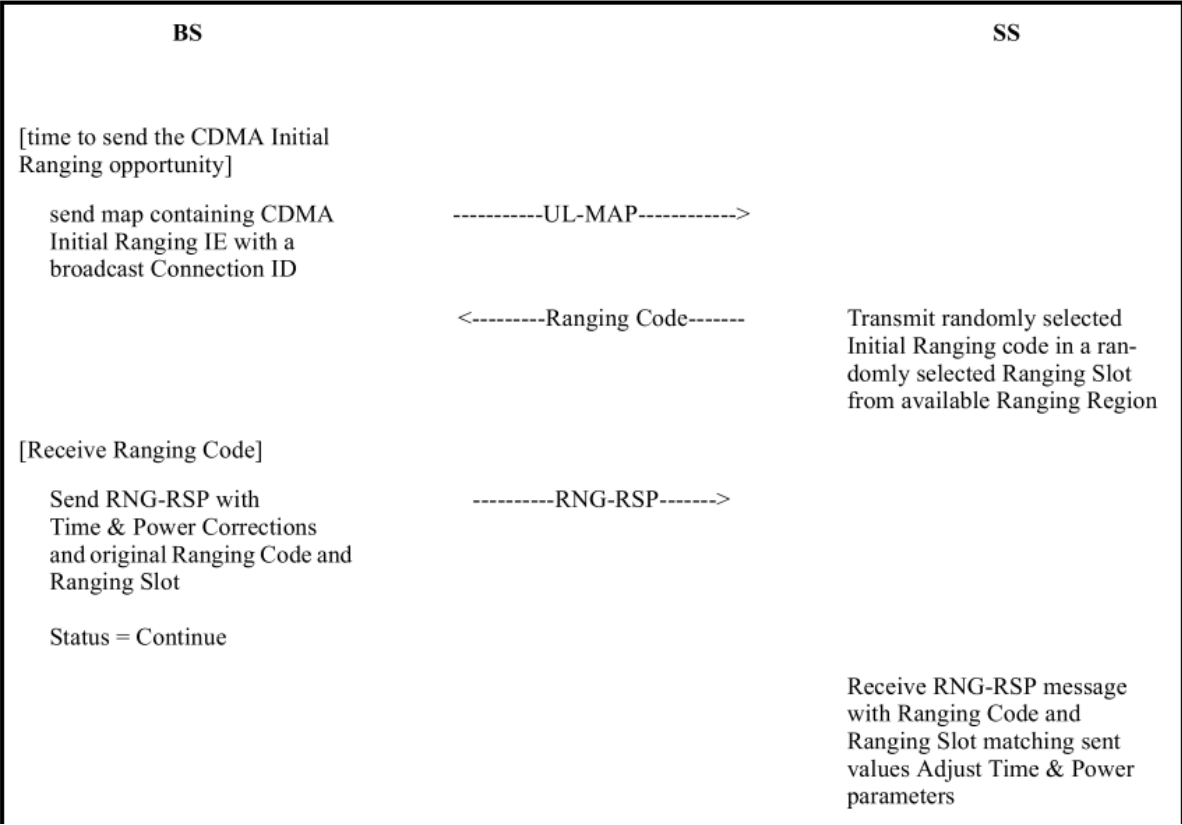
The ’356 patent delineates channels by time and frequency. An “uplink physical control channel” is placed in an uplink frame frequency channel. It is delineated by UL_Beacon region 216 at timeslot 7 in the *uplink (UL) frame frequency* channel. It is sent *in* the UL frame channel with physical uplink shared channels (PUSCH 214 at timeslots 0–6, 8–13) and PRACH and RICH channels 218 at timeslot 14. Ex. 1001, 5:50–60, 4:5–10, Fig. 2. The uplink physical control channel may be FDD or TDD (claim 28) so it may be sent on the same or different uplink frequency channels. *See* Ex. 1001, 4:1–7.

The Standard allocates a Ranging subchannel so the SS can transmit an initial ranging message to a BS in an allocated Ranging Slot from an available Ranging Region. In response, the BS sends a RNG-RSP message with “Time & Power Corrections” so the SS can “Adjust Time & Power parameters” to send data to the BS. Ex. 1005, 48–51, 205–06, 666, Table 121. A Ranging Code is sent as a ranging message. *See id.* at 51, 154, 175–78, 205–206, 666.

(1) *the Ranging Channel is a control channel*

The Ranging subchannel is an uplink physical control channel used to send a Ranging Code to a BS, which sends time and power adjust parameters to the SS to control its uplink transmissions. Ex. 1005, 48–51, 205–206, 666. We reproduce Table 121 in relevant part below to show this feedback control.

Table 121—CDMA initial Ranging and automatic adjustments procedure



The portion of Table 121 of the Standard reproduced above illustrates a BS sending a “UL-MAP” with “Initial Ranging IE” (information elements) to an SS. Then, the SS transmits an Initial Ranging code in a Ranging Slot of the Ranging Region that was allocated by the BS. In response to receiving the Ranging Code, the BS sends a RNG-RSP to the SS with “Time & Power Corrections” so the SS can “Adjust Time & Power parameters” for its uplink data transmission(s) to the BS. Ex. 1005, 205–206; Pet. 16–18, 40–41.

(2) *Ranging subchannel is a physical channel*

A Ranging subchannel is a physical layer channel defined in frequency and time to send a Ranging Code in an Initial Ranging opportunity. Ex. 1005, 154, 167, 174–76. “Via the Initial Ranging IE, the BS specifies an interval in which the new stations may join the network.” *Id.* at 154. A Ranging Slot is delineated by OFDMA symbols (*time*) and subchannel (*frequency*). *Id.* at 205. “The BS shall allocate an Initial Ranging Interval consisting of one or more transmission opportunities” and SSs scan a UL-MAP for Initial Ranging Intervals. *Id.* at 174–75. A transmission opportunity is allocated in a UL-MAP for a group of SSs to send Initial Ranging requests. *Id.* at 167.

The Ranging subchannel is a physical channel. The UL-MAP IE is a “*PHY specification*.” “PHY” is the “physical layer.” Ex. 1005, 15, 48. IE’s define uplink bandwidth allocations. *Id.* at 48. A Ranging code or RNG-REQ message is sent by an SS at initialization to request power changes. *Id.* at 49, 175. “The RNG-REQ message may be sent in Initial Ranging” “when the SS is attempting to join the network.” *Id.* The “Ranging Subchannel” indicates OFDMA time symbols and subchannel (frequency) to send the initial ranging message. It is allocated by the MAC layer and UL-MAP. *Id.* at 51, 577, 666.

The Ranging Code and RNG-REQ message are used in a closed loop feedback process to control the uplink transmission of an SS. In response to the Ranging Code or RNG-REQ message, the BS sends a RNG-RSP message that provides “Power Adjust Information” and “Timing Adjust Information.” Ex. 1005, 50, 176–77, Table 115. “On receiving a RNG-RSP, the SS shall not transmit until the RF signal has been adjusted in accordance with the RNG-RSP.” *Id.* at 178. Thus, the Ranging subchannel is used as an uplink physical control channel by an SS to send signals to a BS in order to receive power and timing settings for the SS’s uplink data transmissions over the network.

Claim 22 does not require the uplink physical control channel or the signal sent over the uplink physical control channel to control anything. *Cf.*, PO Resp. 30 (arguing that sending a ranging request in an initial ranging interval over a ranging subchannel is not a control channel because such a ranging request does not control anything). The '356 patent makes clear that the UL_Beacon signal that is sent over the uplink physical control channel does not control anything. The UL_Beacon signal is used by the base station to send power control commands back to a UE to increase or decrease its power based on the power received in the UL_Beacon signal. Ex. 1001, 4:49–5:1. The Standard's ranging code and RNG-REQ message are sent by an SS to a BS, which uses them to control the SS's power and timing settings to transmit for joining the network. 1005, 48–51, 174–78, 205–06, Table 121.

Regarding Patent Owner's and Dr. Lomp's assertions that "Petitioners do not provide any evidence to support such a conclusory statement that a [skilled artisan] would have recognized [the ranging subchannel and uplink bursts] as physical channels" (PO Resp. 33–34; Ex. 2005 ¶ 77), Petitioner has provided such evidence. Dr. Akl testifies that a skilled artisan would have recognized that both channels are transmitted over the air at actual frequencies and times (as opposed to being transport and logical channels) as physical channels. Ex. 1003 ¶ 73. Dr. Akl supports his testimony with citations to the Standard, which discloses frequencies and times for sending Ranging codes over the ranging subchannel and uplink bursts in Figure 218 and describes the OFDMA and these channels as "PHY" implementations where PHY refers to the "physical layer." *Id.* (citing Ex. 1005, 15, 493, Fig. 218) (cited in Pet. 34).

These contentions and citations establish that a ranging subchannel and uplink bursts are physical channels and understood as such by skilled artisans. Pet. 14–17, 40–42; Ex. 1003 ¶¶ 73–87; Ex. 1005, 48–51, 577, 666, Fig. 218.

Dr. Akl also asserts that his level of skill in the art was at least that of a skilled artisan so he is qualified to provide opinions concerning the knowledge and understanding of a skilled artisan at that time. Ex. 1003 ¶ 20.

The Standard's description of generating ranging codes as binary codes and pseudonoise codes to modulate subcarriers in adjacent subchannels as a ranging subchannel (Ex. 1005, 578; PO Resp. 33; Ex. 2005 ¶ 76) evidences that the Ranging subchannel is a physical channel. As discussed above, the Ranging code and RNG-MSG provide data and information to the BS. The BS uses the information in the ranging code sent over the Ranging subchannel to define the transmit power level of the SS and control the power and timing of SSs transmissions to join the network as the Standard makes amply clear. *See* Ex. 1005, 48–51, 174–78, 205–06, 493, 496 (a slot in the OFDMA PHY requires a time and a subchannel dimension), 666, Tables 115, 121, Fig. 287.

The '356 patent describes the UL_Beacon signal sent over the uplink physical control channel being used by the base station to detect the received power and/or other channel information from the UL_Beacon in order to send controlling commands back to each UE terminal. Ex. 1001, 2:17–48, 4:33–5:1, 5:50–60. Claim 22 does not recite any features of the signal sent over the uplink physical control channel. Nor has Patent Owner identified any claimed feature of a signal that distinguishes it from the Ranging code in the Standard.

(3) claim 22 covers ranging before data is sent

Petitioner contends persuasively that “the claims make no distinction between ‘initial power control’ and a ‘feedback loop to maintain the call.’ Rather, the claims require only that the ‘signal over the uplink physical control channel’ be sent ‘in a time interval that is not sending information over the physical uplink shared channel.’” Reply 14.

In response, Patent Owner argues that

Petitioner's argument ignores the explicit statement in the specification of the '356 patent that "[t]he uplink physical control signal is referred to herein as an 'Uplink Beacon' (UL_Beacon)." Ex. 1001, 4:38-40. Although the claims themselves do not recite the term "uplink beacon" or "UL beacon," the claimed "uplink physical control channel" is clearly described in the specification, and it is not the PRACH channel.

Sur-reply 12; PO Resp. 34 (arguing, "the '356 patent has a physical random access channel (PRACH), which is used to access the network and set the initial transmission power level of the PUSCH. . . . The uplink physical control channel is used as part of a feedback loop to maintain the call.").

These arguments are not commensurate with claim 22, which does not recite a method of maintaining a call for a period of time or frames.

Patent Owner's arguments also are inconsistent with the '356 patent specification, which does not limit use of the uplink physical control channel to *maintaining* a call. Indeed, the '356 patent describes the use of the uplink physical control channel for a UE to join a network before it sends any data.

The '356 patent touts embodiments that "transmit the uplink physical channel control signal (UL_Beacon) *independently from the uplink physical channel* [so that] the implementation of *closed loop feedback may operate in the absence of an uplink physical channel*." Ex. 1001, 2:24–28 (emphasis added). An uplink physical control channel is used to estimate uplink channel conditions, and a downlink channel provides feedback control information, but "[t]hese channels may not need an associated data physical channel to be operational." *Id.* at 4:25–27. The '356 patent covers embodiments that send a signal over an uplink physical control channel for feedback control before a UE accesses a physical uplink shared channel to send data just as the Standard sends a Ranging Code allocated in a first UL-MAP before the SS is allocated access to uplink burst channels in a second UL-MAP to send data.

The '356 patent describes its feedback control used by an SS to access uplink channels initially. The Background of the Invention indicates that:

When access to a limited number of uplink channels is shared between a large population of terminals it is imperative that access to the channels can be switched between terminals with minimal latency. A data terminal that can derive information *needed to access uplink channels* from the downlink transmissions (beacon signals) has a significant advantage over a terminal that relies on the (lengthy) configuration of a dedicated channel in order to establish a feedback channel.

Ex. 1001, 1:37–45 (emphasis added). The invention addresses this issue.

“To obtain *rapid access to the uplink shared channels*, terminals can transmit at the correct power *with their first transmission* so that latency can be kept to a minimum.” Ex. 1001, 4:45–48 (emphasis added). “Because the UE is aware of the uplink pathloss conditions from the feedback channel, it *can have instant access to the uplink shared channels.*” *Id.* at 6:66–7:2 (emphasis added). This feedback control occurs *before* a UE accesses the physical uplink shared data channel like the initial ranging in the Standard.

The '356 patent uses the uplink physical control channel and signal to control UEs' access to a network so UEs can access the physical uplink shared channel more quickly like the Standard describes initial ranging to enable later UL data bursts. We agree with Petitioner's contention (Reply 14–15) that

the claims make no distinction between “initial power control” and a “feedback loop to maintain the call.” Rather, the claims require only that the “signal over the uplink physical control channel” be sent “in a time interval that is not sending information over the physical uplink shared channel.” '356 Patent, 9:48-52. The Ranging Code message is a “signal over” the Ranging Subchannel, and it is sent “in a time interval that is not sending information over the” UL bursts, as explained in the Petition (and further discussed below). Petition, 40-42. The claims require nothing more.

Patent Owner argues that the '356 patent uses a physical random access channel (PRACH) to access a network and set initial transmission power levels for data. PO Resp. 34 (citing Ex. 2005¶ 78), 19. Patent Owner asserts

the initial ranging code message is more similar to the PRACH in the '356 patent than the uplink physical channel control signal. The initial ranging code is used to establish the initial power level and access the network, as does the PRACH of the '356 patent. The uplink physical channel control signal is different, as it is used as a continuous feedback mechanism during a call, after the initial power level is established for the uplink. A POSITA understands that the PRACH is used to set the initial power level of the PUSCH and that the uplink physical control channel is used afterwards as feedback during the call. Ex. 2005, ¶48.

PO Resp. 19.

Patent Owner asserts that “[a]lthough the claims themselves do not recite the term ‘uplink beacon’ or ‘UL beacon,’ the claimed ‘uplink physical control channel’ is clearly described in the specification, and it is not the PRACH channel.” Sur-reply 12. This argument is not persuasive.

Claim 22 recites a generic “signal” rather than a UL_Beacon as Patent Owner admits. The '356 patent describes such a signal being used to access a network before an uplink data channel is established for a UE. Claiming a signal indicates some intent to cover initial ranging before a UE accesses an uplink data channel and not to limit the claims to using a UL_Beacon signal, which is not described as being used only to maintain a call in any case.

Even if a PRACH channel sets initial power levels, claim 22 sends a “signal” over the uplink physical control channel. The '356 patent describes such a signal being used to set a UE's power before data is sent on an uplink data channel or before such channel is allocated. Ex. 1001, 2:24–28, 4:25–27. This ranging allows UEs to send data more quickly when they later try to access the physical uplink shared data channel. *Id.* at 4:45–48, 6:66–7:2.

Petitioner asserts that the Standard describes a Ranging code is sent in an allocated timeslot over a Ranging subchannel to establish SS power levels for initial uplink transmissions as illustrated in Table 121. Pet. 40–42. During this initial ranging opportunity, the SS is not sending information in the uplink burst region of the uplink subframe because the uplink data region(s) have not yet been allocated to the SS by the BS. Dr. Akl provides testimony to support these contentions. Ex. 1003 ¶¶ 84–87. Dr. Akl testifies that the SS sends the Ranging Code message in response to the first UL-MAP that is sent by the BS in a ranging slot time interval in which the SS is not sending any data on the UL burst channel because the SS is not allocated an uplink burst channel/slot to send data until it subsequently receives the second UL-MAP. *Id.* ¶¶ 86, 87.

In view of the foregoing analysis and in light of the respective evidence and contentions of Petitioner and Patent Owner, we find the plain language of claim 22 interpreted in light of the '356 patent Specification encompasses a method where the uplink physical control channel is used to send a signal from a UE to a BS to obtain feedback information in element 22[d] as part of an initial ranging process to access a network before a UE is allocated access to the uplink data channel. The UE sends a signal over the physical uplink shared channel in a time interval when the UE is not sending information over the physical uplink shared channel, e.g., because it has not yet been allocated resources to do so. The Standard discloses this arrangement. An SS sends a Ranging Code to a BS to receive power commands to adjust its power settings that it uses subsequently to send its first data burst over the UL Burst region that is allocated in the Second UL-MAP. Ex. 1005, Table 121; *cf.*, Ex. 1001, 4:45–48, 6:66–7:2, 1:40–45. This arrangement promotes the same efficiency and quick access to the uplink data channel that the '356 patent touts for the signal that is sent over the uplink physical control channel as discussed above.

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

Petitioner contends that the Standard discloses “receiving, by the UE, feedback information from a downlink control channel” in element 22[d] as an SS receiving parameters such as Power Adjust Information in a RNG-RSP message sent in a specific region of the downlink frame from a BS. Petitioner asserts that the SS uses these parameters to adjust power and other parameters of its transmissions to the BS. Petitioner asserts that the RNG-RSP message is sent in a “channel” that is allocated or “mapped” as a dedicated region of the downlink subframe like other medium access control layer (MAC) messages such as the UL-MAP and DL-Map in Table 14 and Figure 218. Petitioner contends that a skilled artisan would recognize this assigned region to be “a downlink control channel” used to transmit RNG-RSP messages as control information. Pet 42–47 (citing Ex. 1005, 9, 31, 45, 46, 50–51, 123, 178, 205, 497, 522–23, 547, 620, Tables 14, 121, Figs. 90, 218; Ex. 1003 ¶¶ 88–92; Ex. 1001, 2:33–48 (describing feedback information); Pet. § V.A.3.).

Petitioner asserts that the Standard discloses the SS receiving feedback information as a UL-MAP IE in a second UL-MAP message that is sent in a dedicated region of the downlink subframe that is allocated to the UL-MAP. Petitioner contends that the UL-MAP allocates access to the uplink channel by including a Map IE that provides “feedback information” because a BS sends the Map IE in response to receiving the Ranging code message from the SS. Petitioner asserts that an SS transmits uplink information according to the Map IE, adjusts its transmission, and sends uplink transmissions in an uplink burst region allocated to it by a BS in a second UL-MAP shown in Figure 218. Pet. 47–52 (citing Ex. 1005, 47, 48, 500, 532–33, Tables 18, 121, 287, Fig. 218; Ex. 1003 ¶¶ 93–97; Ex. 1001, 2:33–48, 5:5–6; Pet. § V.A.4.).

Patent Owner argues that a skilled artisan would not consider a region of the DL subframe allocated to the UL-Map to be a channel or a downlink control channel because the size of the region can vary from frame to frame as the size of the UL-MAP_IE() is variable. PO Resp. 35. Dr. Lomp testifies that the size of the UL-MAP may change as the UL-MAP_IE() has a variable size, and a skilled artisan would not consider a region of the downlink (DL) subframe allocated to the UL-MAP to be a channel or a downlink control channel when its size is variable from frame to frame. Ex. 2005 ¶ 82.

As discussed above, claim 22 does not recite fixed frames or a frame structure size as Patent Owner argues. The '356 patent does not describe the UL or DL frames or the downlink physical layer control channel (PLCCH) as having a fixed size. Indeed, the '356 patent describes PLCCH 212 sharing timeslot 9 with another downlink channel (SFPACH). Ex. 1001, 5:50–54.

Figure 218 discloses the UL-MAP allocated in a region of the downlink subframe at OFDMA symbol number $k+3$ and several subchannels. Ex. 1005, 500. It shares a timeslot with part of DL burst #2, which is allocated another region of the DL subframe. *Id.* at 48, 205–06, Tables 18, 275, Fig. 218.

Patent Owner does not contest that a BS sends a RNG-RSP message in a region of the downlink subframe like the UL-MAP. The Standard describes RNG-RSP as a MAC management message like DL-MAP and UL-MAP sent in allocated regions/channels of the DL subframe. Ex. 1005, 43, Table 14. This MAC data is mapped to an OFDMA Data Region in the downlink subframe defined by the DL-MAP message. *Id.* at 45, 46, 522–23; *see* Pet. 46–47. Dr. Akl testifies that the Standard discloses an SS receiving feedback information as Power Adjust parameters in a RNG-RSP message and uplink transmission parameters in a second UL-MAP message, and both messages are sent in an allocated region of the downlink subframe. Ex. 1003 ¶¶ 93–97.

i) Must step 22[b] be performed before step 22[c]?

To attempt to limit Petitioner’s reliance on the initial ranging in the Standard to disclose element 22[c], Patent Owner asserts that the steps must be performed sequentially with data sent in step 22[b] before a control signal is sent in step 22[c]. PO Resp. 16–19. Patent Owner argues that data is sent over the physical uplink shared channel in assigned intervals in element 22[b] “only after element 22[a] is performed.” *Id.* at 16. Patent Owner asserts that without “assigned time intervals” for a physical uplink shared channel in element 22[b], “a time interval that it [the UE] is *not* sending information over the physical uplink shared channel” in element 22[c] is “nonsensical.” *Id.* at 17. Patent Owner argues “the specification describes only embodiments of process steps performed in the temporal sequence described above.” *Id.*

Petitioner asserts that claim 22 does not recite an order of steps and the claimed steps should not be construed to require an order of steps. Reply 17. Petitioner asserts that the “resource allocation information” in element 22[a] assigns time intervals and nothing in element 22[b] assigns any time intervals. *Id.* at 18. As a result, Petitioner asserts that “once the ‘resource allocation’ is received in element 22[a], a UE can send a signal “in a time interval that it is not sending information over the physical uplink shared channel,” because the resource allocation in element 22[a] tells a UE which timeslots are assigned for the physical uplink shared channel and which are assigned for the uplink physical control channel. *Id.* at 19 (“The claim language reflects this by reciting that the ‘signal’ in element 22[c] is sent ‘**based on** the received resource allocation information’ that was received in element 22[a].”). Petitioner contends that the ’356 patent specification does not require the ordering of steps that Patent Owner proposes. *Id.* at 19–20.

The plain meaning of element 22[a] is that the UE receives resource allocation information so it can send “a signal over the uplink physical control channel based on the received resource allocation information” when it is not sending information over the physical uplink shared channel in element 22[c]. *Id.* at 11:31–36. The uplink physical control channel and the physical uplink shared channel use different resources, but element 22[a] does not allocate resources for a physical uplink shared channel to a UE in this step. Nor is that allocation required to occur before element 22[a]. Ex. 1001, 11:25–38.

Claim 22 does not require the UE to send data before signals. The UE must receive resource allocation information in element 22[a] before it sends a signal in element 22[c], and it must be assigned time intervals before it sends data in element 22[b], but claim 22 does not specify when the UE is assigned time intervals to send data or require time intervals to be allocated to send data before time intervals are allocated in element 22[a]. A UE can send signals as long as a time interval is allocated in element 22[a], before it sends any data.

According to the ’356 patent, assigning a time interval to send a signal over an uplink physical control channel enables a UE to send a UL_Beacon signal before or without sending data over the physical uplink shared channel. Thus, “[e]mbodiments of the invention allow a terminal to transmit the uplink physical channel control signal (UL_Beacon) *independently* from the uplink physical channel [so] the implementation of closed loop feedback *may operate in the absence of an uplink physical channel.*” Ex. 1001, 2:24–28 (emphasis added). Allocating *resources* to send signals on a physical control channel, as in element 22[a], allows UEs to send signals “independently of their access to the uplink shared channel.” *Id.* at 4:49–55. Element 22[a] thus allows a UE to send a signal in element 22[c] without first sending data in element 22[b]. Element 22[c] occurs *independently* of element 22[b].

We disagree that the specification describes only embodiments in the temporal sequence of data sent before signals. PO Resp. 17. To the contrary, the '356 patent specification describes embodiments in which signals are sent on an uplink physical control channel before data is sent on uplink physical channels, as discussed. Ex. 1001, 2:24–28, 4:20–27, 4:45–55.

Nor has Patent Owner provided technical reasons for a UE to send data in element 22[b] before sending a signal in element 22[c]. *See* PO Resp.; Sur-reply 16–18; *cf.*, Reply 18–20. Instead, the '356 patent describes advantages to sending a signal on an assigned channel *before sending data* to a BS over a shared channel because it allows a UE to access the uplink shared channel and send data with minimal latency. Ex. 1001, 1:37–45. The UE can “obtain rapid access to the uplink shared channels, [so] terminals can transmit at the correct power with their first transmission [and] latency can be kept to a minimum.” *Id.* at 4:45–48. “Because the UE is aware of the uplink pathloss conditions from the feedback channel, it can have instant access to the uplink shared channels.” *Id.* at 6:66–7:2.

Even if a UL_Beacon signal is sent with data, it can be sent before any data is sent over the physical uplink shared channel in the frame. Dr. Lomp testified that there is latitude to when the UL_Beacon is sent. It can be in the first timeslot, i.e., before data is sent. Reply 20 (quoting Ex. 1019, 23:1–19). Patent Owner asserts the testimony answers hypothetical questions (Sur-reply 16), but it comports with the disclosure of many possibilities for arranging a UL_Beacon (Ex. 1001, 5:32–49) and indicates the understanding in the art.

Petitioner has shown by a preponderance of evidence that claim 22 does not require step 22[b] to occur before step 22[c]. Allocating a separate signal channel allows a UE to send a signal independently of, and before, it sends data in a different channel. Ex. 1001, 2:17–34, 4:49–55; *see* Reply 18–20.

Mformation Techs., Inc. v. Research in Motion Ltd., 764 F.3d 1392 (Fed. Cir. 2014), relied on by Patent Owner (Sur-reply 16–17), does not alter the outcome. *Mformation* indicates why claim 22 does not require data to be sent in step 22[b] before the UE sends a signal in step 22[c] in a time interval in which it is not sending information over the physical uplink shared channel.

In *Mformation*, the Court held, “delivering the command [for a wireless device] from the mailbox at the server to the wireless device by establishing a connection between the wireless device and the server” required a connection to be established between the wireless device and server before the server sent the command from the mailbox to the wireless device. *Mformation*, 764 F.3d at 1394, 1399. The Court explained, “the separate sub-step for establishing a connection would become ‘superfluous’ if we concluded that a connection did not have to be established (completed) before transmission . . . because, . . . establishing a connection is necessarily encompassed in transmitting a command.” *Id.* The specification also described “establishing a connection” before commands stored in mailbox 512 are transmitted to device 502. *Id.*

Here, a UE sends a signal over the uplink physical control channel in element 22[c] after resources are allocated *for that channel* in element 22[a]. Because resources are allocated to send signals in element 22[a], the UE can send a signal *independently* of (and before) sending data on an uplink shared channel (Ex. 1001, 2:17–34, 4:20–27, 4:49–55, 6:33–37). This arrangement allows a UE to access uplink data channels with minimal latency. *Id.* at 1:37–45, 4:41–48, 6:64–7:3. Sending signals in element 22[c] before sending data in element 22[b] does not make element 22[b] superfluous. Data is sent later with minimal latency. *Id.* Sending signals in allocated channels means the signals are sent in element 22[c] independently of data in element 22[b], e.g., at registration or re-synchronization. *Id.* at 2:17–34, 4:49–55; Ex. 1005, 620.

- j) *Sending a signal over the uplink physical control channel in a time interval the UE is not sending information over the physical uplink shared channel*

Based on our determination that claim 22 does not require a temporal sequence of element 22[b] to be performed before element 22[c], we disagree with Patent Owner's contention that "Petitioner's interpretation is contrary to the sequence performed according to claim 22." PO Resp. 37.

Patent Owner argues that the Standard describes an SS sending an initial ranging request over the ranging subchannel to the BS and later sending data over the physical uplink shared channel in subsequent frames. PO Resp. 38. Patent Owner argues, "it would be impossible for the SS to transmit data over a physical uplink shared channel before the SS transmits an initial ranging request in an attempt to establish a connection with the BS." *Id.* at 39.

Because claim 22 does not require a UE to send data over a physical uplink shared channel before it sends a control signal such as a Ranging code over an allocated Ranging subchannel, Petitioner has established by a preponderance of evidence that the Standard discloses element 22[c] by first sending a Ranging code over a ranging subchannel region allocated in a first UL-MAP before timeslots are allocated to send data and then sending uplink burst data in an uplink burst region of the UL subframe allocated later in a second UL-MAP as Patent Owner recognizes. Pet. 37–42; PO Resp. 38–40.

Based on the evidence and arguments presented by the parties and the analysis discussed above, we determine that Petitioner has established by a preponderance of evidence that the Standard discloses every limitation recited in claim 22, and that the Standard anticipates claim 22.

4. *Claim 23*

Petitioner contends that the Standard discloses a UE receiving data on a physical downlink shared channel in claim 23 as an allocated downlink burst in a region of the subframe allocated by the DL-MAP and its MAP IE for the SS to receive downlink transmissions from a BS. Pet. 52–55 (citing Ex. 1005, 15, 44, 46, 493–500, 521–22, Table 275, Fig. 218; Ex. 1003 ¶¶ 98, 100, 101; Pet. § V.A.5.). Patent Owner does not address specifically Petitioner’s contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 23 is anticipated by the Standard.

5. *Claim 25*

Petitioner contends that the Standard discloses power control feedback information in claim 25 by sending the RNG-RSP message with Power Adjust Information. Petitioner contends that the SS will adjust its transmission power according to Power Adjust parameters in the RNG-RSP message upon receipt of that message. Pet. 55 (citing Ex. 1005, 50, 176, 178, 205; Ex. 1003 ¶¶ 102, 103). Patent Owner does not address specifically Petitioner’s contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 25 is anticipated by the Standard.

6. *Claim 26*

Petitioner asserts that the Standard discloses a downlink control channel with power control information for plural UEs in claim 26 by sending RNG-RSP messages for each SS using an Uplink Channel ID and different bits to send Power Adjust Information to multiple SSs. Pet. 55–57 (citing Ex. 1005, 33, 50–51, 105, 205–06 Table 20; Ex. 1003 ¶¶ 104–107). Patent Owner does not address specifically Petitioner’s contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 26 is anticipated by the Standard.

7. *Claim 27*

Petitioner contends that the Standard discloses that multiple SSs send a Ranging Code message to the BS on respective ranging slots of the Ranging subchannel, which is an uplink physical control channel in claim 27, by each SS randomly choosing a Ranging Slot of the Ranging subchannel. Pet. 57–58 (citing Ex. 1005, 49, 147–48, 175, 205–06, 666; Ex. 1003 ¶¶ 108–110).

Patent Owner argues that the Standard does not disclose plural UEs sending signals on uplink physical control channels in the time interval in claim 27 “because neither the Petition nor Dr. Akl’s declaration . . . identifies any part of the Standard disclosing this limitation.” PO Resp. 39.

Relying on testimony of Dr. Akl, Petitioner contends that the Standard discloses an SS sending a Ranging Code message over a Ranging subchannel by randomly choosing a Ranging Slot from the Ranging Region to send the Ranging Code message to the BS. Pet. 58. Dr. Akl testifies that the Standard discloses a BS sending a UL-Map with multiple “ranging slots” so an SS may randomly choose a Ranging Slot to send its Ranging Code message to the BS, and a skilled artisan would recognize that multiple SSs seeking to access the BS in the same time interval would send Ranging Code messages to the BS in a respective ranging slot of the Ranging subchannel. Ex. 1003 ¶¶ 109, 110.

In the Ranging Response message, a BS identifies each Ranging Code that it receives and the Ranging Slot (OFDMA symbol number, subchannel) where the Ranging Code was identified. Ex. 1005, 205–06. A BS confirms receipt of a Ranging Code because *Ranging Codes may collide*. *Id.* at 147–49. “The BS specifies *an interval* in which *new stations* may join the network.” *Id.* at 154 (emphasis added). “A transmission opportunity is defined as an *allocation provided in a UL-MAP . . . for a group of SSs* authorized to transmit . . . Initial Ranging requests.” *Id.* at 167 (emphasis added).

Based on our analysis of the evidence and arguments presented, we determine that Petitioner has established by a preponderance of evidence that the Standard anticipates claim 27.

8. *Claim 28*

Petitioner asserts that the Standard discloses the Ranging subchannel can be a CDMA channel, the uplink bursts can be TDMA channels, and the uplink and downlink subframes and uplink bursts can be TDD channels as well as the downlink subframe and UL-MAP as recited in claim 28. Pet. 58–60 (citing Ex. 1005, 11, 51, 147–48, 151–53, Fig. 218; Ex. 1003 ¶¶ 111, 112). The Standard discloses that both FDD and TDD duplexing techniques are supported in the PHY type parameter. Ex. 1005, 307–309. Patent Owner does not address specifically Petitioner’s contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 28 is anticipated by the Standard.

9. *Independent Claim 45*

Petitioner contends that the Standard anticipates independent claim 45 by disclosing a method performed by a UE in element 45[p]. Pet. 60 (citing contentions for element 22[p]; Ex. 1003 ¶ 113). Petitioner contends that the Standard discloses receiving by the UE resource allocation information for the uplink physical control channel that has different resources than the physical uplink shared channel in element 45[a]. *Id.* at 61 (citing contentions for element 22[a]; Ex. 1003 ¶ 114). Petitioner also contends that the Standard discloses the UE sending data over the physical uplink shared channel in assigned time intervals in element 45[b]. *Id.* (citing contentions for element 22[b]; Ex. 1003 ¶ 115). Petitioner further contends that the Standard discloses sending a signal over the uplink physical control channel in element 45[c]. *Id.* (citing contentions for element 22[c]; Ex. 1003 ¶ 116).

Petitioner cites its contentions for claim 27 to support its assertion that plural UEs send signals on respective uplink physical control channels in the time interval in element 45[d]. Pet. 61 (citing Ex. 1003 ¶ 117).

Patent Owner argues that the Standard discloses a contention-based initial ranging scheme instead of UEs sending respective signals on respective uplink physical control channels in the time interval. PO Resp. 39–42. Patent Owner asserts that a skilled artisan would not consider contention-based initial ranging as permitting multiple SSs, without restriction, to transmit multiple Ranging Codes within the same time interval. *Id.* at 41 (citing Ex. 2005 ¶ 98). Dr. Lomp provides testimony to the same effect. Ex. 2005 ¶ 98.

The Standard discloses that initial ranging involves an SS transmitting an initial ranging code in a randomly selected Ranging slot “from available Ranging Region.” Ex. 1005, Table 121. Petitioner and Dr. Akl assert that more than one SS may transmit an Initial Ranging code in a randomly selected slot of the available Ranging Region. Pet. 58, 61; Ex. 1003 ¶¶ 109–110, 117.

In the Standard, the BS specifies an interval in which new *stations* may join the network. Ex. 1005, 154. The BS provides a UL-MAP that allocates a transmission opportunity “for a group of SSs authorized to transmit . . . Initial Ranging requests.” *Id.* at 167. A transmission opportunity provides multiple Ranging Slots. Each SS sends a ranging code in one of the Ranging Slots that is identified by a unique OFDMA symbol number and subchannel. *Id.* at 205. If an SS receives a continue status in a Ranging Response message, it sends other ranging codes chosen from the Periodic Ranging domain to continue the ranging process. A SS randomly chooses a Ranging Slot to perform ranging, which indicates that other SSs send a Ranging Code in other Ranging slots of the predefined interval allocated by the BS in a UL-MAP. *Id.* at 205. Even so, Ranging Codes may collide. *Id.* at 147–149.

Dr. Lomp does not explain how “contention based initial ranging” relates to the sending of Ranging Codes in different timeslots of the same time interval by plural SSs. Ex. 2005 ¶ 98. Dr. Lomp cites the Standard’s description of contention opportunities for initial ranging. *Id.* ¶ 99. However, Petitioner has shown that the uplink bursts are sent in a dedicated, allocated region of the uplink subframe based on the second UL-MAP and MAP IE data. Pet. 37–40 (citing Ex. 1005, 8, 10–11, 103, 176, 500, 533, Table 287, Fig. 218; Ex. 1003 ¶¶ 78–80, 83). The Standard describes a UL-MAP defining initial ranging *slots* by OFDMA symbols (time) and frequency subchannels *for a group of SSs*. Ex. 1005, 167, 532–33, Table 287.

The Standard allows each SS to choose an *initial ranging slot* to send a Ranging code message to a BS to obtain power adjust information to control uplink transmissions. Ex. 1005, 11, 43, 50–51, 205–06, 496, 620, 666. The use of multiple timeslots in a Ranging Interval allows multiple SSs to send a Ranging Code in a randomly chosen *timeslot* of the Ranging Interval to avoid collisions with Ranging codes sent by SSs in other timeslots of that Ranging Interval. Because more than one SSs can send a Ranging Code in a ranging interval, the BS must identify the Ranging Code received from each SS by its Ranging code attributes and must contend with ranging collisions. These disclosures indicate the ranging subchannel allocated in a UL-MAP may be used by multiple SSs to transmit Ranging code messages to the BS in respective timeslots. Ex. 1005, 11, 43, 50–51, 167, 175–76, 205–06.¹¹

Accordingly, we determine that Petitioner has established by a preponderance of evidence that claim 45 is anticipated by the Standard.

¹¹ The Standard explains that a ranging request RNG-REQ message in OFDMA is called a Ranging Code message. Ex. 1005, 50, 51.

10. Claim 46

Petitioner asserts that the Standard discloses limitations of claim 46 for the same reasons that it discloses the same limitations in claim 28. Pet. 61–62 (citing contentions for claim 28; Ex. 1003 ¶ 118). Patent Owner does not address specifically Petitioner’s contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 46 is anticipated by the Standard.

E. Grounds 2 and 3: Alleged Unpatentability over the Standard Alone or in Combination with Mohanty

1. Motivation to Modify the Standard (Ex. 1005)

Petitioner contends that the Standard describes user equipment (UE) in the form of a subscriber station (SS) that performs functions performed by the “processor” recited in elements 1[a]–1[d] of claim 1. Pet. 62. Petitioner contends that a skilled artisan would have found it obvious, based on the Standard, to implement the SS with a “processor configured to” perform the claimed functions recited for the SS. *Id.* at 62–63. Petitioner asserts that a skilled artisan would have known that SSs like those described in the Standard were implemented this way. *Id.* at 63 (citing Ex. 1003 ¶ 120). Petitioner and Dr. Akl cite Mohanty as evidence of this knowledge in the art to implement an SS using “a predefined computer language, manner or syntax, for instructing a processor to perform a certain function.” *Id.* (citing Ex. 1009 ¶¶ 18, 19).

Petitioner contends that a skilled artisan would have been motivated to use this typical implementation due to the widespread use and availability of processors at the time of the invention and the skill in the art in implementing processors to provide efficient, powerful computing and flexible reprogramming to implement updated or new functions through software updates for predictable results. Pet. 65–66 (citing Ex. 1003 ¶¶ 123, 124).

2. *Mohanty (Ex. 1009)*

Mohanty describes wireless communication systems comprising nodes that may be implemented as a computer system or subsystem, subscriber station (SS), base station (BS), microprocessor, or a processor such as a general purpose processor, a digital signal processor (DSP), and/or a network processor. Ex. 1009 ¶¶ 12, 18. A node may be implemented as software. *Id.* ¶ 19. Figure 2 is reproduced below to illustrate such a processing system.

Processing System 200

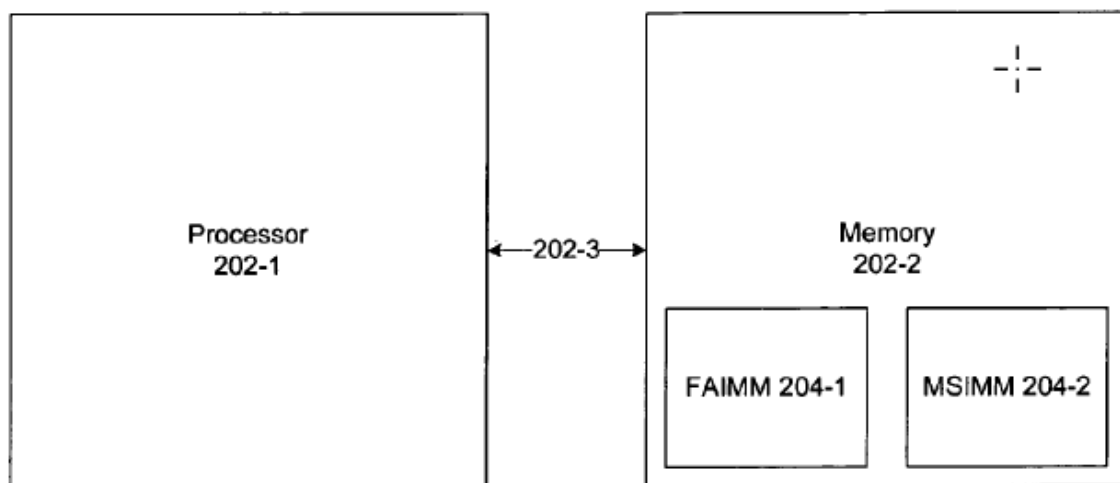


Figure 2 of Mohanty above illustrates processing system 200 as including processor 202-1 and memory 202-2. Ex. 1009 ¶ 59. Processor 202-1 may be implemented as any processor, such as a complex instruction set computer microprocessor, general purpose processor, dedicated processor such as a controller, microcontroller, or DSP. *Id.* ¶ 60. Memory may include machine-readable or computer-readable media capable of storing data such as volatile and non-volatile memory. *Id.* ¶ 61. Mohanty illustrates the predictability of implementing an SS with a “processor configured to” perform SS functions.

3. *Motivation to Combine the Standard and Mohanty*

Petitioner contends that a skilled artisan would have been motivated by Mohanty's implementation of an SS to implement the SS in the Standard with a "processor configured to" perform the functions described in the Standard for the SS because the Standard does not provide any implementation details of these functions, and Mohanty provides such known implementation details for SS's compatible with the Standard to yield predictable results. Pet. 65–67 (citing Ex. 1009 ¶¶ 18–20, 59–61; Ex. 1003 ¶¶ 123–125).

4. *Claim 1*

a) *[1p]: "A user equipment (UE) comprising:"*

Petitioner contends that the Standard discloses "a user equipment" as a "subscriber station" or "SS," which the Standard describes as "[a] generalized equipment set providing connectivity between subscriber equipment and a base station (BS)." Pet. 67 (citing Ex. 1005, 11 (definition); Ex. 1003 ¶ 126). Patent Owner does not contest these contentions for the preamble. PO Resp. 43–44. Based on Petitioner's arguments and evidence summarized above, regardless of whether the preamble is limiting, we determine Petitioner has shown sufficiently that the Standard discloses the preamble of claim 1 ([1p]).

b) *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:"*

Petitioner contends that the Standard discloses an SS "receiving . . . 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" as explained for element 22[a]. Pet. 67–69 (citing Ex. 1003 ¶ 127).

Petitioner contends that a skilled artisan would have been motivated and found it obvious from the Standard to implement the SS with a processor configured to perform the SS's functions because a skilled artisan would have known that SSs in the Standard typically were implemented this way within the level of ordinary skill in the art to yield predictable results due to known technical advantages of processors including efficient, powerful computing and the ability to be reprogrammed flexibly. Pet. 68. Petitioner also contends that a skilled artisan would have been motivated and found it obvious to implement the SS in the Standard with a "processor configured to" perform the SS's functions such as receiving the Initial Ranging opportunity associated with the Ranging subchannel based on Mohanty's teaching of such a known implementation of an SS for use with the Standard. *Id.* (citing Pet. § IX.B.1.; Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 127).

Petitioner's contentions are supported by Mohanty's teachings of the use in SSs of processors configured to perform functions of the SS through software implementations. *KSR*, 550 U.S. at 417 ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its application is beyond his or her skill [and] a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions."); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) (an implicit motivation to combine exists not only when a suggestion may be gleaned from the prior art as a whole, but when the "improvement" is technology-independent and the combination of references results in a product or process that is more desirable because it is stronger, cheaper, cleaner, faster, lighter, smaller, more durable, or more efficient).

Patent Owner does not argue these contentions specifically for claim 1 or element 1[a]. PO Resp. 43–44. Based on Petitioner’s arguments and evidence as summarized above, including Petitioner’s contentions for element 22[a], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[a] alone and in combination with Mohanty.

c) 1[b]: *“the processor is further configured to send data over the physical uplink shared channel in assigned time intervals;”*

Petitioner contends that the Standard discloses the SS sending data over the physical uplink shared channel in assigned time intervals in element 22[b]. Pet. 69. Petitioner contends that a skilled artisan would have been motivated and found it obvious to implement the SS with a “processor configured to” perform the SS’s functions because a skilled artisan would have known that SS’s in the Standard are implemented this way, as Mohanty also teaches, and would provide predictable results of more efficient, powerful, flexible, reprogrammable computing. Pet. 69–70 (citing motivation in Pet. § IX.B.1. and for element 1[a]; Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 128). Patent Owner does not contest these contentions specifically for claim 1 or element 1[b]. PO Resp. 43–44. Based on Petitioner’s arguments and evidence as summarized above, including Petitioner’s contentions for element 22[b], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[b] alone and in combination with Mohanty.

d) 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”*

Petitioner asserts that the Standard discloses element 1[c] as explained for element 22[c]. Pet. 70 (citing Ex. 1003 ¶ 129).

Petitioner contends that a skilled artisan would have been motivated and would have found it obvious to implement the SS with a “processor configured to” perform the SS’s functions to include those of elements 1[a] and 1[b] for predictable results of sending a Ranging Code message over the Ranging subchannel based on the received Initial Ranging opportunity in a time interval that the SS is not sending information in uplink bursts for more efficient, powerful, flexible, reprogrammable computing as discussed in § IX.B.1. of the Petition and element 1[a]. Pet. 70–71 (citing Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 129). Patent Owner does not contest these contentions for claim 1 or element 1[c]. PO Resp. 43–44. Based on Petitioner’s arguments and evidence summarized above, including contentions for element 22[c], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[c] alone and with Mohanty.

e) 1[d]: “the processor is further configured to receive feedback information from a downlink control channel.”

Petitioner asserts that the Standard discloses element 1[d] by receiving Power Adjust Information in a RNG-RSP message sent in a specified region of the downlink subframe and by receiving the uplink MAP IE in the second UL-MAP message sent in a region of the downlink subframe as explained for element 22[d]. Pet. 71–73. Petitioner contends that a skilled artisan would have been motivated to implement the SS with a “processor configured to” perform the SS’s functions including in elements 1[a]–1[c] for predictable results of receiving parameters in the RNG-RSP message and second UL-MAP for more efficient, powerful, flexible, reprogrammable computing as described in § IX.B.1. and element 1[a]. Pet. 71–73 (citing Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 130).

Patent Owner does not contest these contentions specifically for claim 1 or element 1[d]. PO Resp. 43–44. Based on Petitioner’s arguments and evidence summarized above, including Petitioner’s contentions for element 22[d], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[d] alone and in combination with Mohanty.

Based on all of the arguments and evidence presented, we determine that Petitioner has demonstrated by a preponderance of evidence that claim 1 is unpatentable based on the teachings of the Standard alone or in combination with the teachings of Mohanty.

5. *Claim 2*

Petitioner asserts that the Standard discloses the SS “receiving data on a physical downlink shared channel” as for claim 23, and a skilled artisan would have been motivated to implement the SS with a “processor configured to” perform its functions, because SSs of the Standard were implemented this way and processors have known technical advantages for use with the Standard as taught by Mohanty’s SS implementation. Pet. 73–74. Petitioner asserts that a skilled artisan would have known that the SS would include a processor or would have found it obvious to include a processor to perform SS functions, including those of claims 1 and 2 for predictable results or, alternatively, would have found it obvious from the Standard and Mohanty to use the SS with a “processor configured to” perform functions of the SS by receiving data on its allocated downlink burst. *Id.* at 73–74 (citing Pet. § IX.B.1. and contentions for claim 1; Ex. 1009 ¶¶ 18, 19, 59–61; Ex. 1003 ¶ 131). Patent Owner does not contest these contentions specifically for claim 2. PO Resp. 43–44. Based on Petitioner’s arguments and evidence as summarized above, we determine Petitioner has shown by a preponderance of evidence that claim 2 is unpatentable over the Standard alone or with Mohanty.

6. *Claim 3*

Petitioner contends that the Standard discloses “the downlink control channel and the physical downlink shared channel are time multiplexed” in two ways. Pet. 74. Petitioner contends that a skilled artisan would have been motivated and found it obvious from the Standard to map the region of the downlink subframe allocated to RNG-RSP messages to span different symbol numbers than the SS’s allocated downlink burst. *Id.* Petitioner also asserts that the Standard teaches that the specified region of the downlink subframe in which the UL-MAP message is transmitted by the BS is time multiplexed with the SS’s allocated downlink burst. *Id.* at 74–75 (citing Ex. 1003 ¶ 132).

Citing its contentions for element 1[d], Petitioner contends that a skilled artisan would have recognized that RNG-RSP messages are sent in allocated regions of the downlink frame like other MAC Management messages. Citing its contentions for claim 2, Petitioner asserts that the Standard teaches that the SS receives data on an allocated downlink burst, such as Downlink burst #4 in Figure 218, and a skilled artisan would have been motivated to time multiplex an allocated region of the downlink subframe for RNG-RSP messages with an allocated downlink burst as a known technique for predictable results. Pet. 75 (citing Pet. § IV.; Ex. 1005, 494, 496, Figs. 215, 218; Ex. 1003 ¶¶ 133, 134).

Petitioner contends that a skilled artisan would have been motivated to time multiplex the claimed regions by mapping the RNG-RSP messages near other MAC Management messages to ensure the RNG-RSP messages are sent on a robust downlink burst at the beginning of the downlink frame with other control information where robustness is greatest to concatenate the control data in a single transmission opportunity for improved efficiency. Pet. 76–78 (citing Ex. 1005, 7, 123, 310; Ex. 1008, 307, 312; Ex. 1003 ¶ 135).

Petitioner asserts that a skilled artisan also would have been motivated to time multiplex the claimed allocated regions to allow the SS to receive parameter corrections in the same downlink subframe that it receives data for its allocated downlink burst because RNG-RSP messages are transmitted by the BS to the SS asynchronously to send corrections based on measurements that have been made so SSs should be prepared to receive an RNG-RSP at any time. Petitioner contends that time multiplex mapping of these regions in the downlink subframe would provide this desired capability as illustrated by the UL-MAP allocated at symbols $k+3$ and DL burst #4 allocated at symbols $k+11$ to $k+15$ as explained for element 1[d] like the downlink control channel 212 and the physical downlink shared channel 210 in Figure 2 of the '356 patent. Pet. 78–80 (citing Ex. 1005, 50, Fig. 218; Ex. 1003 ¶¶ 136–138).

Patent Owner does not contest these contentions specifically for claim 3. PO Resp. 43–44. Based on Petitioner's arguments and evidence presented and summarized above, including Petitioner's contentions for element 1[d] and claim 2, we determine Petitioner has demonstrated by a preponderance of evidence that claim 3 is unpatentable based on the teachings of the Standard alone or in combination with the teachings of Mohanty. *See KSR*, 550 U.S. at 417; *Dystar*, 464 F.3d at 1368.

7. *Claim 4–7 and 24*

Petitioner asserts that claims 4–7 and 24 are unpatentable for the reasons asserted for claims 3 and 25–28. Pet. 80–81 (citing Ex. 1003 ¶¶ 139–143). Dr. Akl provides testimony supported by record citations explaining how the Standard discloses Power Adjust Information in a RNG-RSP message for claim 4/25, for plural UEs in claim 5/26, plural UEs transmit a signal in claim 6/27, the claimed channels may be TDMA, TDD, and FDD in claim 7/28, and time multiplexing in claim 24/3. Ex. 1003 ¶¶ 102–112, 139–143.

Patent Owner does not contest these contentions specifically. PO Resp. 43–44. Based on Petitioner’s arguments and evidence summarized above, we determine that Petitioner has demonstrated by a preponderance of evidence that claims 4–7 and 24 are unpatentable based on teachings of the Standard alone or in combination with teachings of Mohanty.

8. *Claims 43 and 44*

Petitioner contends that the Standard alone or with Mohanty renders claim 43 obvious because it describes an SS that performs processor functions in elements 43[a]–43[c], and a skilled artisan would have been motivated to implement the SS with a “processor configured to” perform the functions as Mohanty describes. Pet. 81–82 (citing Pet. § IX.B.1.; Ex. 1003 ¶ 144).

a) *Elements 43[p]–43[d]*

Petitioner contends that the Standard teaches elements 43[p]–43[d] for the reasons explained for elements 1[p], 1[a]–1[c], and 45[d]. Pet. 82 (citing Ex. 1003 ¶¶ 145–149). Patent Owner does not contest these contentions specifically. PO Resp. 43–44. Based on Petitioner’s arguments and evidence summarized above, we determine that Petitioner has demonstrated by a preponderance of evidence that claim 43 is unpatentable based on teachings of the Standard alone or in combination with teachings of Mohanty.

b) *Claim 44*

Petitioner asserts that the Standard discloses the limitations of claim 44 for the reasons explained for claim 46. Pet. 82–83 (citing Ex. 1003 ¶ 150). Patent Owner does not contest these contentions specifically. PO Resp. 43–44. Based on Petitioner’s arguments and evidence summarized above, we determine that Petitioner has demonstrated by a preponderance of evidence that claim 44 is unpatentable based on teachings of the Standard alone or in combination with teachings of Mohanty.

IV. CONCLUSION

Petitioner has established by a preponderance of the evidence that claims 1–7, 22–28, and 43–46 are unpatentable under Grounds 1, 2, and 3.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–7, 22–28, and 43–46 are unpatentable;

FURTHER ORDERED that, Patent Owner’s Motion to Exclude is *denied*; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In Summary:

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable
22, 23, 25–28, 45, 46	102(a), (b)	802.16 Standard	22, 23, 25–28, 45, 46
1–7, 24, 43, 44	103(a)	802.16 Standard	1–7, 24, 43, 44
1–7, 43, 44	103(a)	802.16 Standard, Mohanty	1–7, 43, 44

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