Trials@uspto.gov
571-272-7822

Paper 53
Entered: September 03, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY, GENERAL MOTORS LLC, and
NISSAN NORTH AMERICA, INC.,[1]
Petitioner,

v.

NEO WIRELESS LLC,
Patent Owner.

IPR2023-00763
Patent 10,447,450 B2

Before KRISTEN L. DROESCH, HYUN J. JUNG, and
STEPHEN E. BELISLE, *Administrative Patent Judges.*

DROESCH, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Granting Motion to Submit Supplemental Information
37 C.F.R. § *42.123*

---

[1] General Motors LLC and Nissan North America, Inc. were joined as a petitioner to this proceeding based on a petition and motion for joinder filed in IPR2023-00962, which were granted.

I. INTRODUCTION

We have authority to hear this *inter partes* review under 35 U.S.C. § 6, and this Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has not established by a preponderance of the evidence that claims 7 and 11 of U.S. Patent No. 10,447,450 (Ex. 1001, "the '450 Patent") are unpatentable.

A. Procedural History

Ford Motor Company ("Ford") filed a Petition requesting *inter partes* review of claims 7 and 11 of U.S. Patent No. 10,447,450 B2 (Ex. 1001, "the '450 Patent"). Paper 1 ("Pet."). Neo Wireless LLC ("Patent Owner") filed a Preliminary Response. Paper 12.

On November 9, 2023, we denied institution under § 314(a), after considering the factors set forth in *General Plastic Industrial Co. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (PTAB Sept. 6, 2017) (precedential only as to Section II.B.4.i) ("*General Plastic*"), and expanded upon in *Valve Corp. v. Electronic Scripting Products, Inc.*, IPR2019-00062, Paper 11 (PTAB Apr. 2, 2019) (precedential) ("*Valve*"). Paper 17 ("Ford Institution Denial Decision").

General Motors LLC and Nissan North America Inc. ("GM and Nissan") filed a petition requesting *inter partes* review of claims 7 and 11 of the '450 Patent and a motion for joinder with this proceeding. IPR2023-00962 ("GM and Nissan IPR"), Papers 3, 4.

On December 6, 2023, we denied institution under § 314(a) based on the petition filed in the GM and Nissan IPR after consideration of the factors set forth in *General Plastic* and *Valve* and denied the Motion for Joinder as

moot on the basis of the Ford Institution Denial Decision. *See* GM and Nissan IPR, Paper 11 ("GM and Nissan Institution Denial Decision").

Ford requested Director Review of the Institution Denial Decision, which was granted. Papers 18, 19. On March 22, 2024, the Director issued a Decision Vacating the Ford Institution Denial Decision as an improper extension of the "significant relationship," as set forth in *General Plastic* and *Valve*, and remanding to the Board to issue a decision on institution that addresses the merits of the Petition. Paper 28 ("Director's Decision"). In addition, the Director *sua sponte* granted Director Review of the GM and Nissan Institution Denial Decision and, on March 22, 2024, vacated and remanded the GM and Nissan Institution Denial Decision for the same reasons as those set forth in the Director's Decision. GM and Nissan IPR, Papers 12, 16.

Subsequently, pursuant to 35 U.S.C. § 314, we instituted trial on September 11, 2024, as to all of the challenged claims and all of the grounds raised in the Petition. Paper 30 ("Institution Decision," "Dec. on Inst."). We also instituted trial and granted the Motion for Joinder in IPR2023-00962. *See* GM and Nissan IPR, Paper 18.

After institution of trial, Patent Owner filed a Response. Paper 39 ("PO Resp."). Ford, GM, and Nissan (collectively "Petitioner") filed a Reply to the Response (Paper 40, "Pet. Reply") and Patent Owner filed a Sur-reply to the Reply (Paper 45, "PO Sur-reply").

The Petition relies on a Declaration of Todor Cooklev (Ex. 1003), and the Reply relies on a second Declaration of Dr. Cooklev (Ex. 1031). Patent Owner filed a Declaration of William P. Alberth, Jr. (Ex. 2001) to support its

Response and a second Declaration of Mr. Alberth (Ex. 2023) to support its Sur-reply.

Dr. Cooklev was cross-examined during trial, and transcripts of Dr. Cooklev's depositions are included in the record. Exs. 2024, 2039.

Oral argument was held on June 10, 2025. A transcript of the oral argument is included in the record. Paper 51 ("Tr.").

II. BACKGROUND

A. Real Parties in Interest

Petitioner and Patent Owner identify themselves as the real parties in interest. Pet. 63; Paper 6, 1.

B. Related Matters

The parties indicate that the '450 Patent was the subject of IPR2021-01486 ("Dell IPR") (institution denied) and IPR2022-01567 ("Volkswagen IPR") (Final Written Decision issued Nov. 11, 2024, currently on appeal to Court of Appeals for the Federal Circuit) and IPR2023-00793 (joined to Volkswagen IPR). *See* Pet. 6–7; Paper 6, 1.

Patent Owner indicates the '450 Patent is currently involved in the following district court proceedings between the parties:

> *In Re: Neo Wireless, LLC Patent Litigation*, No. 2-22-md-03034 (E.D. Mich.)
>
> *Neo Wireless, LLC v. Ford Motor Co.*, No. 2-22-cv-11402 (E.D. Mich.)
>
> *Neo Wireless LLC v. American Honda Motor Co., Inc. et al.*, No. 2-22-cv-11403 (E.D. Mich.)
>
> *Neo Wireless, LLC v. Volkswagen Group of America, Inc. et al.*, No. 2-22-cv-11404 (E.D. Mich.)

> *Neo Wireless, LLC v. Nissan North America Inc. et al.*, No. 2-22-cv-11405 (E.D. Mich.)
>
> *Neo Wireless LLC v. Toyota Motor North America, Inc. et al.*, No. 2-22-cv-11406 (E.D. Mich.)
>
> *Neo Wireless, LLC v. General Motors Co. et al.*, No. 2-22-cv-11407 (E.D. Mich.)
>
> *Neo Wireless, LLC v. Tesla Inc.*, No. 2-22-cv-11408 (E.D. Mich.)
>
> *Neo Wireless, LLC v. Mercedes-Benz USA, LLC*, No. 2-22-cv-11769 (E.D. Mich.)
>
> *Neo Wireless v. FCA US LLC*, No. 2-22-cv-11770 (E.D. Mich.)

See Paper 6, 1–2.

Patent Owner also advises us that the ’450 Patent was formerly involved in fourteen other district court proceedings. *See* Paper 6, 2–4. In addition, Petitioner identifies a dozen U.S. patent applications and issued U.S. patents “related to the ’450 Patent.” *See* Pet. 63.

C. The ’450 Patent

The ’450 Patent, titled “Method and System for Multi-carrier Packet Communication with Reduced Overhead,” issued on October 15, 2019, from an application filed August 14, 2017, and claims the benefit of an earlier effective filing date through a series of continuation applications to a provisional application filed on September 28, 2005. Ex. 1001, codes (22), (45), (54), (60), (63).

According to the ’450 Patent, “[b]andwidth efficiency is one of the most important system performance factors for wireless communication systems.” Ex. 1001, 1:33–34. In order to support the high degree of flexibility needed to accommodate different applications having different sized application payloads and different quality of service (“QoS”)

requirements in packet-based data communication, however, wireless communication systems generally must provide a high degree of flexibility. *Id.* at 1:34–40. In wireless systems based on the IEEE 802.16 standard, for example, "multiple packet streams are established for each mobile station to support different applications," and "[a]t the medium access control (MAC) layer, each packet stream is mapped into a wireless connection." *Id.* at 1:42–47. "Special scheduling messages, DL-MAP and UL-MAP, are utilized to broadcast the scheduling decisions to the mobile stations." *Id.* at 1:47–50. According to the '450 Patent, the MAP scheduling method defined by the IEEE 802.16 standard involves significant control overhead, amounting altogether to 52 bits, representing as much as 32.5% of overall data communication for application such as voice-over-IP ("VoIP") and resulting in a relatively low spectral efficiency. *Id.* at 1:51–2:13.

With the goal of improving spectral efficiency, the '450 Patent describes a system and method for minimizing the control overhead in a multi-carrier wireless communication network by using a "time-frequency resource." Ex. 1001, 2:13–16, 2:45–47. One or more zones in the time-frequency resource may be dedicated for particular applications, such as VoIP applications. *Id.* at code (57), 2:47–50. By grouping applications of a similar type together within a zone, a reduction can be achieved in the number of bits necessary for mapping a packet stream to a portion of the time-frequency resource. *Id.* at 2:50–54.

Figure 3 of the ’450 Patent is reproduced below.

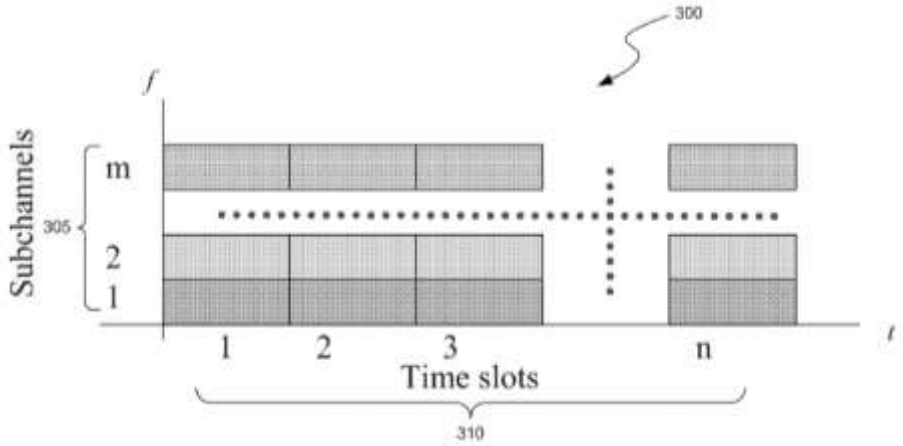

Figure 3 is a block diagram depicting a division of communication capacity in a physical media resource (e.g., radio or cable) into frequency and time domains. Ex. 1001, 2:25–26, 4:16–18. With reference to Figure 3, “[t]he frequency is divided into two or more subchannels 305, represented in the diagram as subchannels 1, 2, . . . m;” and “[t]ime is divided into two or more time slots 310, represented in the diagram as time slots 1, 2, . . . n.” *Id.* at 4:18–22. The ’450 Patent explains that “[t]he canonical division of the resource by both time and frequency provides a high degree of flexibility and fine granularity for resource sharing between multiple applications or multiple users of the resource.” *Id.* at 4:22–26.

Figure 6 of the ’450 Patent is reproduced below.

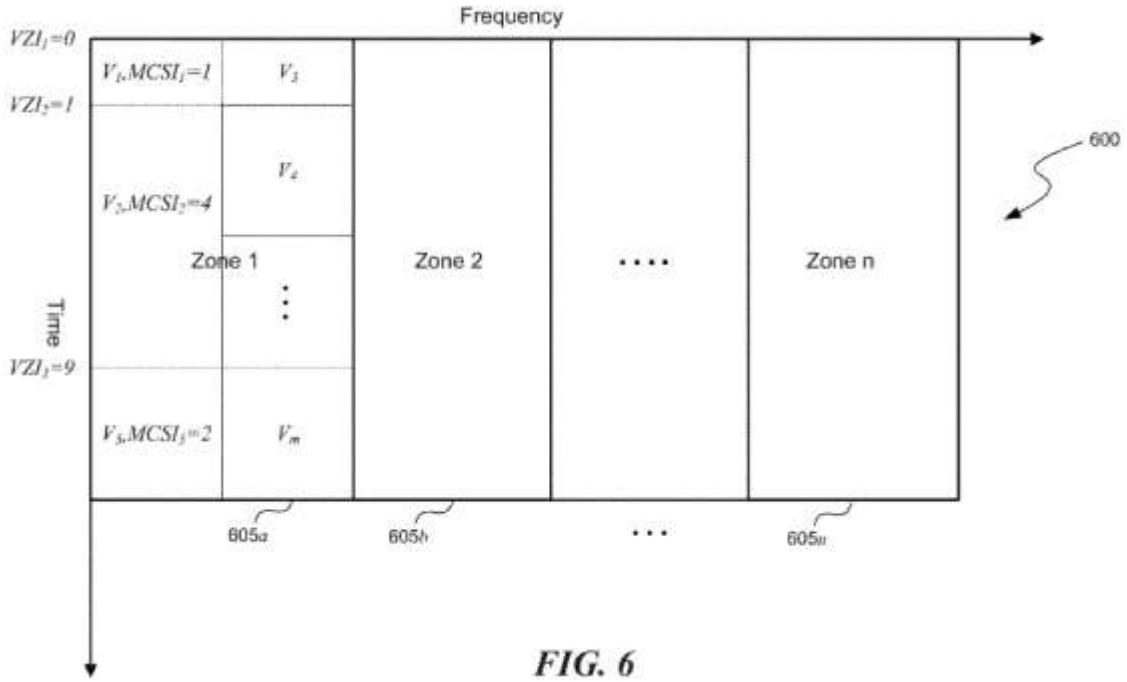

FIG. 6

Figure 6 is a block diagram of a frequency-time resource utilized by a wireless communication network. Ex. 1001, 2:32–33, 5:32–34. Figure 6 depicts an alternative way of managing multiple packet streams in order to overcome the inefficiencies associated with the mapping of packet streams in typical wireless systems based on the IEEE 802.16 standard. *Id.* at 5:34–43. In Figure 6, time-frequency resource 600 is divided into zones 605*a*, 605*b*, . . . 605*n*, each of which is associated with a particular type of application (e.g., VoIP, video applications). *Id.* at 5:43–49. “[B]y grouping like applications together[,] the amount of control overhead in MAC headers is reduced.” *Id.* at 5:49–51. More particularly, according to the ’450 Patent, “[w]hen applications of a similar type are grouped together within a zone, a reduction in the number of bits necessary for mapping a packet stream to a time-frequency segment can be achieved.” *Id.* at 5:54–57. “In some embodiments, the identification of the time-frequency segment

associated with a particular packet stream can be indicated by the starting time-frequency coordinate and the ending time-frequency coordinate relative to the starting point of the zone." *Id.* at 5:57–61.

The '450 Patent further explains that "[w]ithin each zone 605*a*, 605*b*, . . . 605*n*, the time-frequency resource may be further divided in accordance with certain rules to accommodate multiple packet streams V_1, V_2, . . . V_m." Ex. 1001, 6:3–6. "For example, as depicted in Figure 6, zone 605*a* is divided into multiple columns[,] and the packet streams are arranged from top down in each column and from left to right across the columns." *Id.* at 6:6–9. "The width of each column can be a certain number of subcarriers[, and e]ach packet stream V_1, V_2, . . . V_m may be associated with an application." *Id.* at 6:9–11. Further, according to the '450 Patent,

> When the zones are further subdivided into time-frequency segments in accordance with certain rules, a mapping of packet streams to segments may be achieved using a one-dimensional offset with respect to the origin of the zone rather than the two-dimensional (i.e., starting time-frequency coordinate and ending time-frequency coordinate relative to the starting point of the zone) mapping method discussed above.

Id. at 6:22–29.

The '450 Patent further describes use of a "basic resource unit," which is the resource utilized by the highest available modulation coding scheme (MCS) associated with a particular packet stream, such that the resources used by other MCSs can be represented as integer multiples of the basic unit. Ex. 1001, 6:45–52. Once the MCS is selected for each packet stream contained in a particular zone, the offset to a segment representing a particular packet stream may be easily calculated, and the index for any selected packet stream is defined as the sum of all basic resource units

associated with each packet stream preceding the selected packet stream, with an optional adjustment depending on the location where the division of the time-frequency resource is started. *Id.* at 7:7–18. The ’450 Patent explains that “[u]sing basic resource units as the granularity of a location offset to the packet stream reduces the number of bits required to represent its location with the zone.” *Id.* at 7:28–30.

D. Challenged Claims

Claim 7 is independent and claim 11 depends therefrom. Claim 7 is representative and is reproduced below:

> A mobile device in a wireless packet system using a frame structure of multiple frames for transmission, each frame comprising a plurality of time intervals, each time interval comprising a plurality of orthogonal frequency division multiplexing (OFDM) symbols, and each OFDM symbol containing a plurality of frequency subcarriers, the mobile device configured to:
>
> receive an identifier from a base station in a cell in which the mobile device is operating; and
>
> receive a signal containing information from the base station over a segment of time-frequency resource, the segment having a starting time-frequency coordinate and the segment comprising N time-frequency resource units within a time interval, each unit containing a set of frequency subcarriers in a group of OFDM symbols, where N=2, 4, or 8; and
>
> recover the information from the received signal using the starting time-frequency coordinate and N in conjunction with the received identifier.

Ex. 1001, 13:15–33.

E. Patentability Challenge and Asserted Prior Art

Petitioner asserts that claims 7 and 11 would have been unpatentable based on the following ground (Pet. 1–2, 9–49):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
7, 11	103[2]	Park[3], IEEE 802.16-2004[4]

III. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner asserts that a person having ordinary skill in the art as of the critical date of the ’450 Patent “would have a bachelor’s degree in electrical engineering, computer engineering, computer science, or an equivalent field, or an advanced degree in those fields, as well as at least 3–5 years of academic or industry experience in mobile wireless communications, or comparable industry experience.” Pet. 7–8 (citing Ex. 1003 ¶¶ 36–38). Petitioner further contends that “[s]uperior education could compensate for a deficiency in work experience, and vice-versa.” Pet. 9 (citing Ex. 1003 ¶ 32). Patent Owner does not provide its own assessment regarding the level of skill in the art, or otherwise dispute Petitioner’s assertion. *See generally* PO Resp.

---

[2] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. §§ 102 and 103 effective March 16, 2013. Because the ’450 Patent claims the benefit of an earlier effective filing date prior to the effective date of the applicable AIA amendment, we refer to the pre-AIA versions of §103.

[3] US 2006/0039274 A1, published Feb. 23, 2006 (Ex. 1005).

[4] *IEEE Standard for Local and metropolitan area networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems* (Oct. 1, 2004) (Ex. 1006).

Based on our review of the record, we find that Petitioner's proposal is consistent with the level of skill reflected in the prior art references of record. *See Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007) (listing the type of problems encountered in the art, prior art solutions to those problems, and the sophistication of the technology as factors that may be considered in determining the level of ordinary skill in the art). *See also Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required "where the prior art itself reflects an appropriate level and a need for testimony is not shown").

Accordingly, based on the record, we adopt Petitioner's definition of the person of ordinary skill in the art.

B. Claim Construction

We interpret claim terms using "the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b). Under the principles set forth by our reviewing court, the "words of a claim 'are generally given their ordinary and customary meaning,'" as would be understood by a person of ordinary skill in the art in question at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). "In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). Extrinsic evidence

may be useful, but it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence. *Phillips*, 415 F.3d at 1317.

Petitioner argues that "[t]he prior art relied on in this Petition discloses the subject matter of the challenged claims under any reasonable construction, including their plain meaning." Pet. 8. Petitioner, however, asserts that the parties agreed the preamble was limiting and "agreed on several claim constructions in district court" including claim constructions for: "configured to," "time-frequency coordinate," and "wherein modular coding is applied." Pet. 8–9 (citing Ex. 1011, 9, 12–13, 15) (emphasis omitted). Petitioner also contends the parties disagreed in district court as to a construction for the claimed "time-frequency resource unit," and asserts that the plain meaning applies. Pet. 9–10 (citing Ex. 1011, 17; Ex. 1019, 21–24).

Patent Owner acknowledges that the parties have agreed the preamble is limiting. *See* PO Resp. 4 n.1 (citing Ex. 2004, 3–4; Pet. 8–9). Patent Owner, however, does not provide its own explicit claim constructions or otherwise dispute Petitioner's assertions. *See generally* PO Resp.

As demonstrated below in our analysis, the forgoing claim terms and phrases do not require express construction. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) ("The Board is required to construe 'only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

"Mobile Device"

Petitioner does not provide an explicit claim construction for "mobile device," recited in independent claim 7. *See* Pet. 8–10. Despite our "invit[ation to] the parties in further briefing to offer respective proposed claim constructions for the term 'mobile device'" (Dec. on Inst. 28), neither party provides an explicit claim construction. *See generally* PO Resp.; Pet. Reply; PO Sur-reply. Nonetheless, the meaning of "mobile device" was discussed at length by the parties in the context of the applied prior art. *See generally* PO Resp.; Pet. Reply; PO Sur-reply. We address below the parties' contentions regarding "mobile device."

Patent Owner asserts that claim 7 "requires a 'mobile device' configured' to perform certain claimed limitations." PO Resp. 1 (citing Ex. 1001, claim 7). Patent Owner contends that the pertinent prior art teachings apply only to fixed subscribers, not mobile devices. *See* PO Resp. 1–2, 5, 9–25; *accord* Tr. 25:5–10. According to Patent Owner, "[i]n the field of the Patent, a 'mobile device' configured to perform the claimed limitations is capable of performing the claimed limitations while the device is in motion." *Id.* at 35–36 (citing Ex. 1025, 33; Ex. 2025, 71); *accord* Tr. 25:5–10. Patent Owner further contends that "[i]f a 'mobile device' as claimed were simply a 'fixed device,' that would render the word 'mobile' superfluous." *Id.* at 36 (citing *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir. 2021); *Dell Inc. v. Acceleron, LLC*, 818 F.3d 1293, 1300 (Fed. Cir. 2016); Ex. 2023 ¶ 86); *see* PO Sur-reply 8 (citing PO Resp. 36).

Patent Owner further asserts that Petitioner's expert Dr. Cooklev explained in his 2004 Wireless Communications book that "'fixed or slowly moving stations' were not considered to be 'mobile' stations by persons in

this field." PO Resp. 35 (citing Ex. 2025, 71). According to Patent Owner, Dr. Cooklev, "explained under cross-examination, even a device moving at 'pedestrian speed' of approximately 5 km/hr was (and is) not considered a 'mobile device' in this field." *Id.* (citing Ex. 2023 ¶ 85; Ex. 2024, 50:5–8, 153:8–14).

In reply, Petitioner asserts that there is no basis in the intrinsic record for Patent Owner's contention that a wireless device moving 5 km/hr is not mobile, and that it is refuted by the '450 Patent's disclosure that one or more mobile devices may be fixed or may roam within the geographic region covered by the network. Pet. Reply 10 (citing Ex. 1001, 3:40–42). Petitioner contends that "nothing in the '450 Patent, nor claim 7, requires the claim to be practiced only when the 'mobile device' is 'in motion.'" *Id.* at 11 (citing PO Resp. 35–36; Ex. 1031 ¶ 25). Petitioner asserts that there is no basis for Patent Owner's "in motion" argument. *See id.* (citing Ex. 1031 ¶ 25). Petitioner points out that that "claim 7 is an *apparatus* claim directed to a 'mobile' device having three 'configur[ations]' recited in the body of the claim." *Id.*

Petitioner further asserts that Patent Owner's arguments omit Petitioner's expert Dr. Cooklev's statement that "fixed or slowing moving stations can be considered portable." *See* Pet. Reply 11–12 (citing PO Resp. 35; Ex. 2024, 49:23–25; Ex. 2025). According to Petitioner, "[t]his is consistent with the evidence of record, including the '450 Patent, that even 'mobile' devices are sometimes stationary." *Id.* at 12.

In the Sur-reply, Patent Owner asserts that "the record evidence uniformly shows that, in this field, the ordinary meaning of a 'mobile device' configured to practice the invention does not encompass a device

that can practice the invention only when 'stationary or slowly moving.'" PO Sur-reply 4 (citing PO Sur-reply 4–15); *see also id.* at 7–8 (citing Ex. 1025, 33; Ex. 2023 ¶¶ 85–86; Ex. 2025, 71; Ex. 2024, 50:5–8, 153:8–14). According to Patent Owner, "the record makes clear [that] references to 'mobile stations' in this field unambiguously refer to devices capable of performing their functions while mobile—not merely to devices that can be mobile only when not engaged in the relevant activity." *Id.* at 8–9 (citing Ex. 2025, 54, 331, 332).

Patent Owner contends that Petitioner's expert Dr. Cooklev relies on the plain meaning of 'mobile device' but provides no analysis or discussion of its plain meaning. *See* PO Sur-reply 9 (citing Ex. 2039, 12:19–13:1). According to Patent Owner, Dr. Cooklev's testimony in "support of the Petition is not reconciled with his own statements in his published book and deposition testimony." *Id.* Patent Owner further contends that Petitioner does not offer any other evidence to support its position and fails to define what "slowly moving" means to qualify as "mobile." *See id.* According to Patent Owner, "complete failure of proof on the plain meaning of 'mobile device' in this field is fatal to Petitioner's case," and "Petitioner's Reply resorts to attorney arguments." *Id.* at 9–10 (citing 37 C.F.R. § 42.104(b)(3); *Google LLC v. Neonode Smartphone LLC*, IPR2021-01041, Paper 52, 25 (Jan. 11, 2023); *Intuitive Surgical, Inc. v Ethicon LLC*, IPR2018-01248, Paper 34, 41 (Feb. 6, 2020); *Samsung Elecs. Co., Ltd. v. Elm 3DS Innovations, LLC*, IPR2016-00393, Paper 62, 37 (June 23, 2017)).

At the hearing, we asked counsel for both parties for their positions regarding the meaning of "mobile device." *See* Tr. 7:6–7, 24:22–24. Counsel for Petitioner clarified its position as follows: "[a] mobile device is

a device that can be used to communicate when it is mobile, when it is moving, but that doesn't mean that when it stops moving, like the cell phone in my bookbag, it is no longer a mobile device." Tr. 7:8–11.

In summary, we understand Petitioner to assert that a "mobile device" is a device that can communicate when it is moving, but retains its description as a "mobile device" when it is not moving or stationary. *See* Tr. 7:8–11; *accord* Ex. 1031 ¶ 9. On the other hand, we understand Patent Owner to assert that a "mobile device" is a device capable of performing the claimed limitations while the device is in motion, and does not encompass a device that can perform the claimed limitations only when stationary or slowly moving. *See* PO Resp. 35–36; PO Sur-reply 4, 7–8.

We begin our analysis with the intrinsic evidence, specifically the claim language and '450 Patent Specification. Claim 7 recites "[a] mobile device in a wireless packet system. . . configured to:" followed by recitations directed to wireless network communications such as, receiving an identifier and a signal from a base station. Ex. 1001, 13:15–33. Aside from the use of the term "mobile," and the device being configured for wireless network communications, the language of claim 7 does not offer meaningful insight as to the construction for "mobile device." The '450 Patent Specification, uses the terms "mobile station" and "mobile device" and discloses mobile devices in the context of a wireless system based on the IEEE 802.16 standard. *See e.g., id.* at 1:42–59, 3:35–4:16, 5:34–37. As pointed out by Petitioner, the '450 Patent Specification, discloses that "[o]ne or more mobile devices . . . may be fixed or may roam within the geographic region covered by the network." Ex. 1001, 3:40–42. The cited excerpt of '450 Patent Specification does not offer meaningful insight as to the construction

for "mobile device," but merely describes that the "mobile device" can be fixed (stationary) or roam (move). *See id.*

Turning to the extrinsic evidence, there are several references cited by the parties that identify a distinction between the meanings for "mobile" and "fixed" devices (i.e., stations, terminals, or subscribers). The book titled "Wireless MAN Inside the IEEE 802.16™ Standard for Wireless Metropolitan Networks" discloses that "[w]ireless devices may be classified based on whether the communicating devices are physically fixed at one location or allowed to move during a communication session." Ex. 1025, 33[5] of the book); *see also id.* at 3–4 (addressing fixed and mobile terminals and fixed/mobile devices), 25 (addressing fixed and mobile terminals), 46–47 (addressing fixed and mobile wireless devices). Similarly, Park distinguishes "mobile subscribers" and "fixed subscribers" in the context an IEEE 802.16 system applies to an OFDMA system. Ex. 1005 ¶¶ 7, 11. Dr. Cooklev's book titled "Wireless Communication Standards" discloses the following:

> Wireless communication protocols are affected by the mobility of stations. There are two types of stations to distinguish between-portable and mobile stations. A portable station is one that can be moved from one place to another place, but normally participates in a wireless network when it is in a fixed location. Fixed or slowly moving stations can be considered portable. Mobile stations can participate in a network while in motion.

Ex. 2025, 71; *accord id.* at 164–165.

[5] All references are to original page numbers of the document, not the page numbers of Ex. 1025.

In summary, the extrinsic record shows that, in the context of wireless network communications using the IEEE 802.16 standard, a "mobile device" is distinct from and excludes a device that is "fixed" or "portable," where a "mobile" device is described as a device that is mobile during wireless network communications, and a "fixed" or "portable" device is described as a device that is fixed or slowly moving during wireless network communications. *See* Ex. 1005 ¶ 11; Ex. 1025, 24, 34, 38, 45; Ex. 2025, 71. This understanding of a "mobile device" from the extrinsic record is consistent with the language of claim 7 which recites a mobile device configured for wireless network communications (e.g., receiving an identifier and a signal from a base station), and consistent with the '450 Patent disclosure that repeatedly and consistently utilizes the term "mobile device."

Accordingly, based on the record, we construe "mobile device" as a device that is mobile during wireless network communications, and is not fixed or slowly moving during wireless network communications.

C. Principles of Law

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (2012) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")).

A 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 the subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) if in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).[6]

A. Challenge to Claims 7 and 11 over Park and IEEE 802.16-2004

Petitioner asserts that claims 7 and 11 are unpatentable as obvious over Park and IEEE 802.16-2004. *See generally* Pet. We begin our analysis with a brief overview of Park and IEEE 802.16-2004, followed by an analysis of the parties' contentions addressing the challenged claims.

1. Overview of Park (Ex. 1005)

Park is titled "Method for Discretely Indicating Resource Allocation Information and a Method for Reducing Load When Indicating a Resource Allocation Information." Ex. 1005, code (54). Park "relates to an Orthogonal Frequency Division Multiple Access (OFDMA) wireless communication system" and, "[m]ore particularly, . . . [to] indicating resource allocation information in an OFDMA wireless communication system." *Id.* ¶ 3.

[6] The parties do not present evidence or arguments regarding secondary considerations.

Figure 1 of Park is reproduced below.

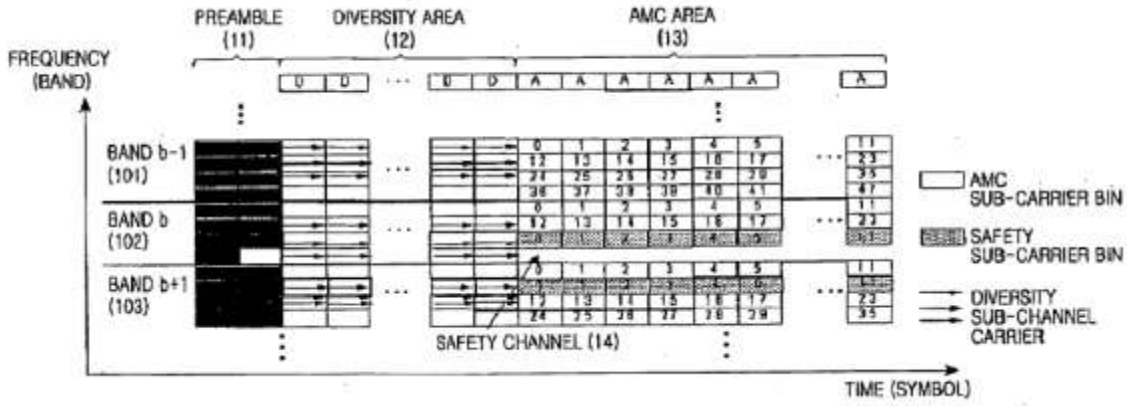

Figure 1 shows a frequency-time "view [of] a frame structure of a . . . Wireless Broadband (Wibro) system or an IEEE 802.16 system applied to an OFDMA system." Ex. 1005 ¶ 7.

> According to the OFDMA scheme, resources are allocated to subscribers through a plurality of sub-carriers (for example, 512 sub-carriers or 1024 sub-carriers) provided in a frequency domain and a plurality of time slots (for example, 20 to 30 time slots) provided in a time domain to transmit upstream and downstream data.

Id. ¶ 6. "As shown in FIG. 1, total frequency bands are divided into a plurality of bands 101, 102 and 103." *Id.* ¶ 8. "[T]he time axis (symbols) is divided into a preamble area 11, a diversity area 12 and an adaptive modulation and coding (AMC) area 13." *Id.* ¶ 10. "The diversity area 12 is used for allocating resources for mobile subscribers, and the AMC area 13 is used for increasing the transmission speed through a frequency-selective adaptive modulation for fixed subscribers." *Id.* ¶ 11.

Figure 2 (composed of Figures 2A–C) is reproduced below.

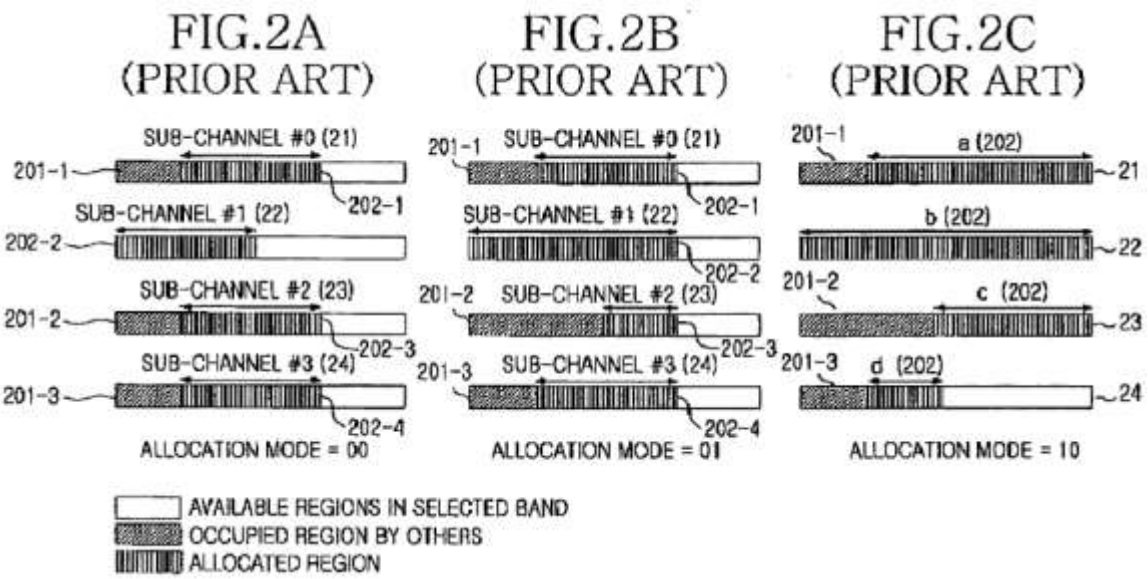

Figure 2 shows a frequency-time "view [of] sub-channel allocation modes defined in Table 95(/101) of the IEEE 802.16-2004 standard." Ex. 1005 ¶ 17. "According to the sub-channel allocation modes defined in Table 95(/101) of IEEE 802.16-2004, . . . the 'Allocation Mode' is assigned after selecting the Bands, thereby indicating resource allocation information." *Id.* ¶ 18. "The Allocation Mode consists of 2 bits and defines three modes." *Id.* ¶ 19. The modes are:

> set to binary "00" when the same numbers of sub-channels are allocated in the selected Bands[;] set to binary '01' when different numbers of sub-channels are allocated in selected Bands[;] and set to binary '10' when the total number of the sub-channels allocated in the selected Bands is defined by the "Nep code" and "Nsch code".

Id. ¶ 20.

As shown above in Figures 2A–C, "the Bands have sub-channel groups 21, 22, 23 and 24 including regions 201-1, 201-2 and 201-3 occupied by others." Ex. 1005 ¶ 22. "FIG. 2A[] represent[s] the Allocation Mode

'00' . . . [whereby] the sub-channel groups 21, 22, 23 and 24 have the same-sized allocated regions 202-1, 202-2, 202-3 and 202-4 . . . adjacent to the regions 201-1, 201-2 and 201-3." *Id.* ¶¶ 22–23. "FIG. 2B[] represent[s] the Allocation Mode '01' . . . [whereby] the sub-channel groups 21, 22, 23 and 24 have the different-sized allocated regions 202-1, 202-2, 202-3 and 202-4 . . . adjacent to the regions 201-1, 201-2 and 201-3." *Id.* ¶¶ 24–25.

> FIG. 2C[] represent[s] the Allocation Mode "10" . . . [whereby] the sub-channel groups 21, 22, 23 and 24 have allocated regions a, b, c and d . . . determined by the "Nep code" and "Nsch code"[; t]hat is, the allocated regions a, b, c and are formed while sequentially filling the available regions of the sub-channel groups 21, 22, 23 and 24.

Id. ¶¶ 26–27.

"[A]ccording to the above method for indicating resource allocation information, present resource allocation information may indicate a position sequenced to previous resource allocation information, so that it is impossible to ensure an interval when allocating resources to various subscribers, thereby degrading flexibility of resource allocation." Ex. 1005 ¶ 28. "In addition, since the position sequenced to previous resource allocation information is indicated, the present resource allocation information may depend on the previous resource allocation information, so that it is necessary to indicate the resource allocation information after fully recognizing the previous resource allocation information." *Id.* ¶ 29.

Park's "invention has been made to solve the above-mentioned problems." Ex. 1005 ¶ 30. "[A]n object of the present invention is to provide a method for discretely indicating resource allocation information

regardless of previous resource allocation information in an OFDMA wireless communication system." *Id.*

Figure 3 (composed of Figures 3A–D) is reproduced below.

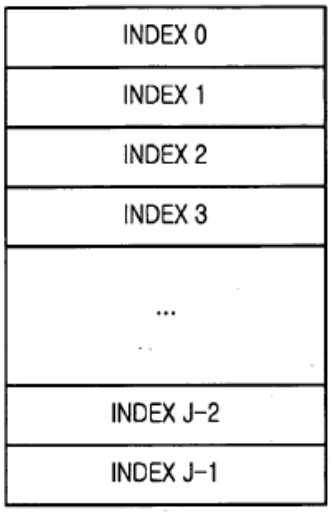

FIG.3A

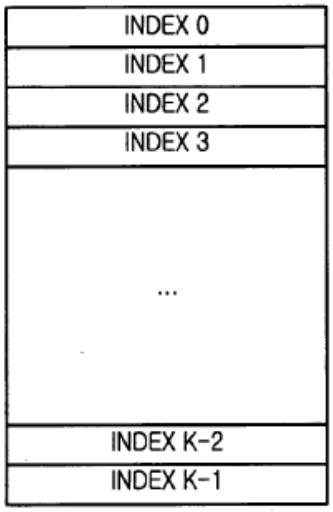

FIG.3B

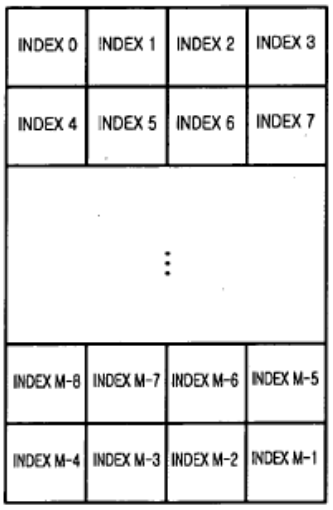

FIG.3C

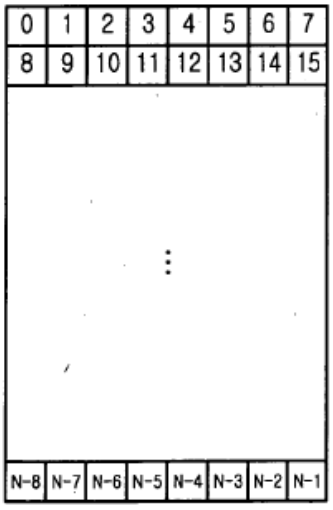

FIG.3D

Figure 3 shows a frequency-time "view [of] allocation units having mutually different sizes and shapes, . . . allocated to the total resource region[,] and indexed according to an embodiment of the present invention."

Ex. 1005 ¶ 45. "The allocation units shown in FIGS. 3A to 3D . . . are represented as a, b, c, and d, respectively." *Id.* ¶ 49. "[A]n index value of the allocation unit a is in a range of a(0) to a(J–1)[.]" *Id.* "[A]n index value of the allocation unit b is in a range of b(0) to b(K–1)[.]" *Id.* "[A]n index value of the allocation unit c is in a range of c(0) to c(M–1)[.]" *Id.* "[A]n index value of the allocation unit d is in a range of d(0) to d(N–1)." *Id.* "The resource allocation regions shown in FIG. 4," addressed next, "can be simply represented by using the allocation unit as shown in FIG. 3." *Id.* ¶ 52.

Figure 4 is reproduced below.

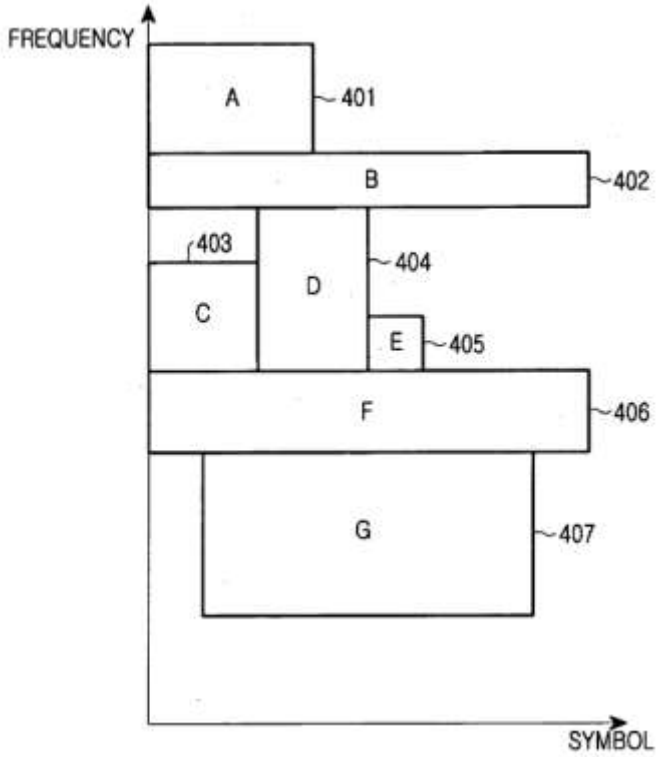

Figure 4 shows a frequency-time "view [of] allocation units having mutually different sizes and shapes, . . . allocated to the total resource region[,] and indexed according to an embodiment of the present invention."
Ex. 1005 ¶ 45. "As shown in FIG. 4, resource allocation regions for plural

subscribers include A 401, B 402, C 403, D 404, E 405, F 406 and G 407." *Id.* ¶ 51. "[U]sing the allocation unit as shown in FIG. 3 . . . , B 402 and C 403 can be represented as b(0) and c(8), respectively." *Id.* ¶ 52. "In addition, A 401 can be represented as c(0) and c(1)[; t]his means continuous resource allocation regions can be simply represented by assigning a start allocation unit index and a total number of the allocation units." *Id.* ¶ 53. And, "D 404 can be represented as d(26), d(27), d(34), d(35), d(42) and d(43) [; t]his means a rectangular shaped resource allocation region can be simply represented by assigning a start allocation unit index and an end allocation unit index." *Id.* ¶ 54.

"[As] will be described [next] with reference to FIG. 5," the "allocation mode '00' represents a signal allocation unit is allocated." Ex. 1005 ¶ 64. "[A]llocation mode '01' indicates that continuous allocation units are allocated." *Id.* "[A]llocation mode '10' indicates that allocation units are allocated in a rectangular pattern." *Id.* "In the allocation mode '00', the corresponding allocation region can be indicated by using the index value of the corresponding allocation unit." *Id.* ¶ 65. "In the allocation mode '01', the corresponding allocation region can be indicated by using the index value of the start allocation unit and the total number of allocation units." *Id.* ¶ 66. "[I]n the allocation mode '10', the corresponding allocation region can be indicated by using the index value of the start allocation unit and the index value of the end allocation unit." *Id.* ¶ 67.

Figure 5 (composed of Figures 5A–C) is reproduced below.

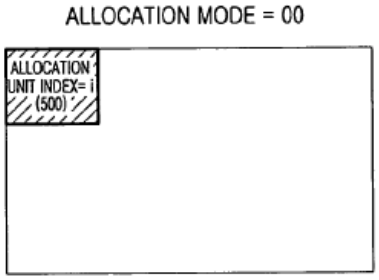

FIG.5A

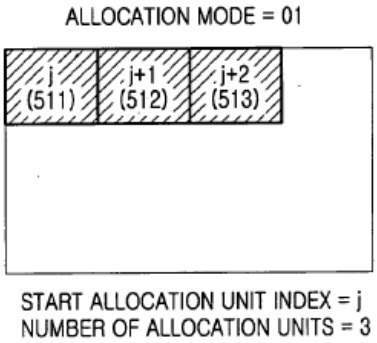

FIG.5B

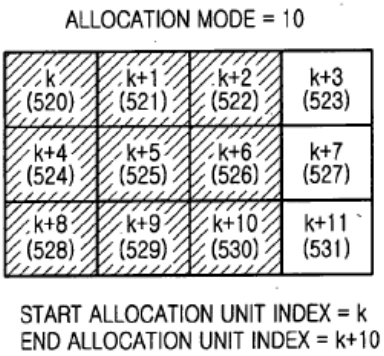

FIG.5C

Figure 5A represents allocation mode "00," Figure 5B represents allocation mode "01," and Figure 5C represents allocation mode "10." Ex. 1005 ¶¶ 68–71. Allocation mode 00 in Figure 5A is "indicating that a single allocation unit is allocated in the allocation region." *Id.* ¶ 69. "Thus, the allocation region is represented with 'i' which is an index value of the corresponding allocation unit 500." *Id.* Allocation mode 01 in Figure 5B is

"indicating that continuous allocation units 511, 512 and 513 are allocated in the allocation region." *Id.* ¶ 70. "To indicate the allocation region, 'j' which is an index value of a start allocation unit 511 and '3' which is the total number of the allocation units are used." *Id.* Allocation mode 10 in Figure 5C is "indicating that a plurality of allocation units are allocated in the rectangular pattern." *Id.* ¶ 71. "To indicate the allocation region, 'k' which is an index value of a start allocation unit 520, and 'k+10' which is an index value of an end allocation unit[] 530[,] are used." *Id.*

2. Overview of IEEE 802.16-2004 (Ex. 1006)

IEEE 802.16-2004 is a 2004 update to the IEEE 802.16 standard, revising and consolidating IEEE Std 802.16-2001, IEEE Std 802.16a-2003, and IEEE Std 802.16c-2002. Ex. 1006, 4, 37. "Th[e] revised standard specifies the air interface, including the medium access control layer and multiple physical layer specifications, of fixed [broadband wireless access] systems supporting multiple services." *Id.* at 37.

In a section describing "PMP frame structure,"[7] the standard introduces the frame structure as follows:

> When implementing a TDD system, the frame structure is built from BS and SS transmissions. Each frame in the downlink transmission begins with a preamble followed by a DL transmission period and an UL transmission period. In each frame, the TTG and RTG shall be inserted between the

[7] The undefined acronyms of the IEEE 802.16-2004's quotations herein are PMP (point-to-multipoint), TDD (time division duplex or duplexing), BS (base station), SS (subscriber station), DL (downlink), UL (uplink), TTG (transmit/receive transition gap), RTG (receive/transmit transition gap), FCH (frame control header), QPSK (quadrature phase-shift keying), and IE (information element). Ex. 1006, 49–52.

downlink and uplink and at the end of each frame, respectively, to allow the BS to turn around.

Ex. 1006, 535.

Figures 218 and 219 of IEEE 802.16-2004 are reproduced below.

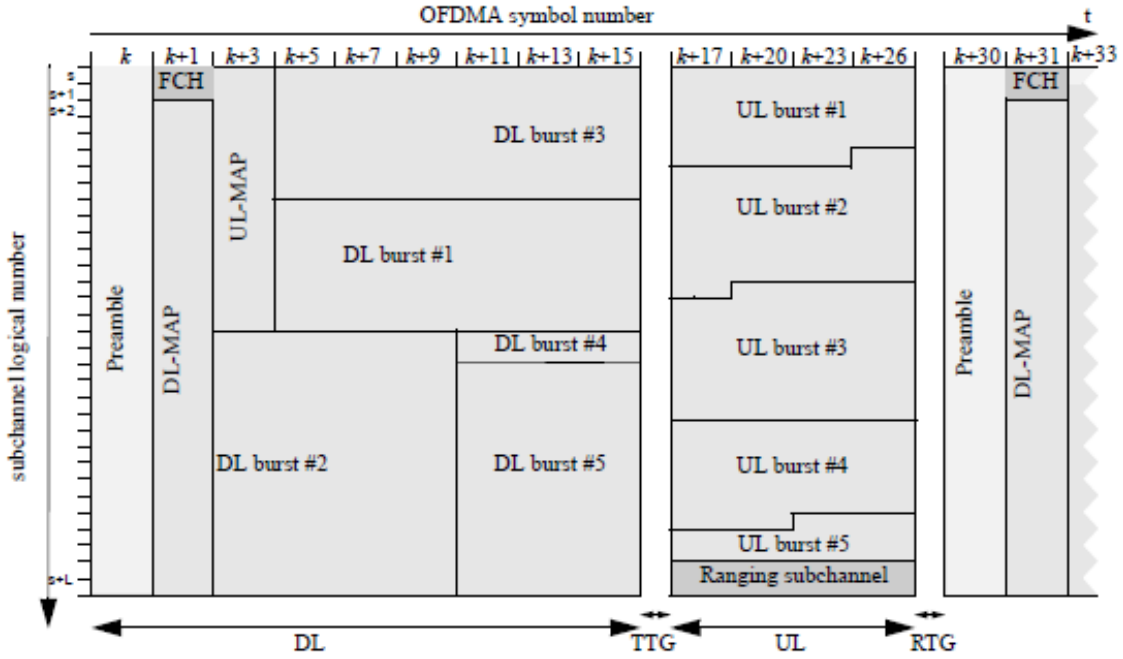

Figure 218—Time plan - one TDD time frame (with only mandatory zone)

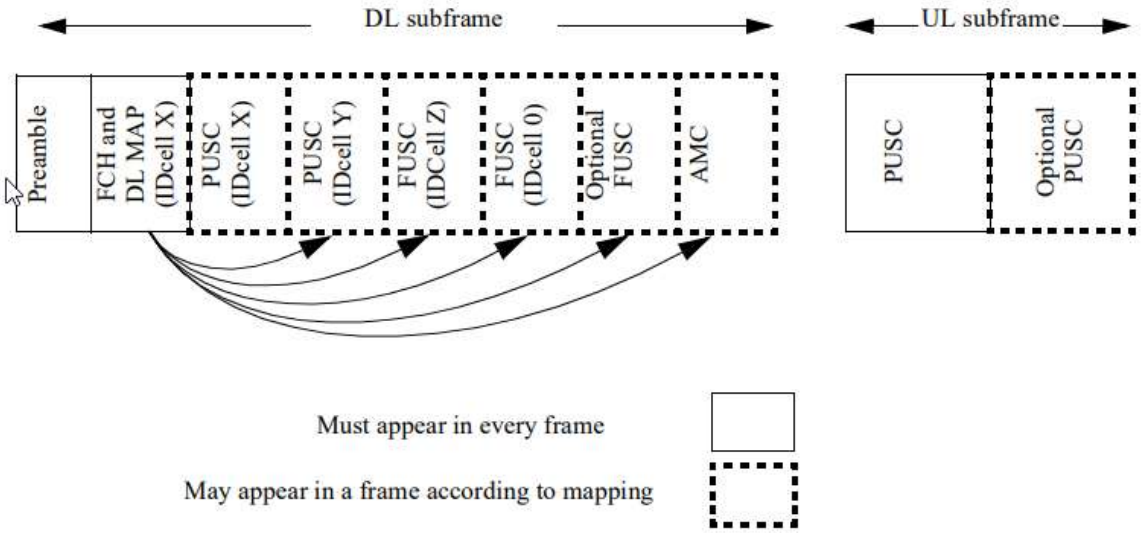

Figure 219—Illustration of OFDMA frame with multiple zones

Figures 218 and 219, respectively illustrate a "[t]ime plan – one TDD time frame (with only mandatory zone)" and "OFDMA frame with multiple zones." Ex. 1006, 536–537. Figures 218 and 219 are described as follows:

> Subchannel allocation in the downlink may be performed in the following ways: partial usage of subchannels (PUSC) where some of the subchannels are allocated to the transmitter, and full usage of the subchannels (FUSC) where all subchannels are allocated to the transmitter. The first two transmitted subchannels in the first data symbol of the downlink is called FCH. The FCH shall be transmitted using QPSK rate 1/2 with four repetitions using the mandatory coding scheme (e.g., the FCH information will be sent on four adjacent subchannels) in a PUSC zone. The FCH contains the DL_Frame Prefix as described in 8.4.4.3, and specifies the length of the DL-MAP message that immediately follows the DL_Frame_Prefix and the repetition coding used for the DL-MAP message.
>
> The transitions between modulations and coding take place on OFDMA symbol boundaries in time domain and on subchannels within an OFDMA symbol in frequency domain.
>
> The OFDMA frame may include multiple zones (such as PUSC, FUSC, PUSC with all subchannels, optional FUSC, AMC and optional FUSC with all subchannels), the transition between zones is indicated in the DL-Map by the Zone_switch IE (see 8.4.5.3.4). No DL-MAP or UL-MAP allocations can span over multiple zones. Figure 219 depicts OFDMA frame with multiple zones.

Ex. 1006, 536.

3. Analysis

The parties agree the preamble of independent claim 7 is limiting. *See* Pet. 8; PO Resp. 4 n.1. Petitioner asserts that Park teaches the preamble of claim 7 based on Park's disclosures of an OFDMA wireless network system. *See* Pet. 16–17 (citing Ex. 1001, 1:34–2:16; Ex. 1003 ¶¶ 48–49, 102–110;

Ex. 1005, code (57), ¶¶ 3, 15, 31–33, 57, Tables 1, 2; Ex. 1006, 267[8]). Petitioner contends that the combination of Park and IEEE 802.16-2004 discloses the recited "mobile device in a wireless packet system," based on Park's disclosure of a "subscriber" or "terminal." *See* Pet. 17–18 (citing Ex. 1005 ¶¶ 5–6, 31–33; Ex. 1006, 11, 20). According to Petitioner, "Park discloses improvements to existing 802.16-based systems that enabled the '[n]ext-generation *mobile* communication systems [to] transmit data with superior quality at a high transmission rate to provide subscribers with various improved multimedia services.'" Pet. 18 (citing Ex. 1005 ¶ 5); *see* Pet. 14 (citing Ex. 1005 ¶ 5), 15 (citing Ex. 1005 ¶¶ 72–73); Pet. Reply 3 (citing Ex. 1005 ¶ 5). Petitioner asserts that "Park built upon existing 802.16-based systems/service, including the South Korean 'WiBro' *mobile* wireless system." Pet. 18 (citing Ex. 1003 ¶¶ 54–101, 125–128; Ex. 1005 ¶¶ 7, 73–75; Pet. 10–14); *see* Pet. 14 (citing Ex. 1003 ¶¶ 54–65, 74–101; Ex. 1005 ¶¶ 31, 73–79, 85); Pet. Reply 3 (citing Ex. 1005 ¶¶ 73–79). According to Petitioner, "Park, which is presumed enabled, directs POSAs to implement its improvements in 802.16-based mobile systems using the teachings of the then-current 802.16-2004 standard and refers to the 802.16-2004 standard to illustrate its technique for reducing overhead in a mobile wireless system." Pet. 18 (citing Ex. 1003 ¶¶ 54–101; Ex. 1005 ¶¶ 73–79; Pet. 14–16).

Petitioner asserts that "802.16-based systems included mobile subscribers, as the '450 Patent admits, despite its title 'Air Interface for *Fixed* Broadband Wireless Systems.'" Pet. 18–19 (citing Ex. 1001, 1:42–45,

[8] Petitioner references the document page numbers not the Exhibit page numbers.

5:34–37; Ex. 1003 ¶¶ 54–101, 125–128; Ex. 1022, 7–8; Ex. 1023, 4, 9, 12, 24–25; Ex. 1025, 3–4, 6–7, 24–25, 67–68). Petitioner contends that the ’450 Patent admits and Park recognizes that “messages such as ‘DL-MAP’ in 802.16-2004 ‘are utilized to broadcast the scheduling decisions to the *mobile* stations.’” Pet. 19 (citing Ex. 1001, 1:48–50; Ex. 1003 ¶¶ 76–101, 125–128; Ex. 1005 ¶ 55 (Table 2)); *see* Pet. Reply 12 (citing Ex. 1001, 1:48–50; Pet. 19). Petitioner parenthetically notes that Dr. Cooklev testifies that “compliance with the 802.16-2004 standard did not guarantee the mobility of a mobile system, but compliant systems could and did serve mobile devices.” Pet. 19 (citing Ex. 1003 ¶¶ 76–101, 125–128). According to Petitioner, “even if the teachings in 802.16-2004 were limited to ‘fixed’ devices (they are not), the ’450 Patent admits that the claimed ‘mobile devices’ may be ‘fixed.’” *Id.* (citing Ex. 1001, 3:40–42; Ex. 1003 ¶¶ 125–128; Pet. 14–16).

Petitioner also asserts that Park and IEEE 802.16-2004 both disclose using a frame structure of multiple frames for transmission and each frame comprising a plurality of time intervals and each time interval comprising a plurality of OFDMA symbols. *See* Pet. 20 (reproducing Ex. 1005, Fig. 1; Ex. 1006, Fig. 218 (with added annotations); citing Ex. 1003 ¶¶ 48–51, 104–124; Ex. 1005 ¶¶ 7, 36), 22–23 (citing Ex. 1003 ¶¶ 111–113, 121–124; Ex. 1005 ¶ 6; Ex. 1006, 496–498, 574–575, Fig. 218); *see* Pet. Reply 15. Petitioner further contends that IEEE 802.16-2004 discloses that each OFDMA symbol is made up of frequency subcarriers. *See* Pet. 23–24 (citing Ex. 1003 ¶¶ 129–133; Ex. 1005 ¶ 9, Fig. 1; Ex. 1006, 494–495, 517, 574–575; Ex. 1025, 293–294). According to Petitioner, “Park provides exemplary modifications to 802.16-2004’s DL-MAP for allocations in an

AMC area." Pet. 21 (citing Ex. 1003 ¶¶ 84–96, 113–124; Ex. 1005 ¶¶ 55–57, Table 2; Ex. 1006, 110–111 (Table 97)); *see also id*. at 48 (addressing Park's disclosure that DL-MAP IE is used for indicating resource allocation information in the AMC area, citations omitted). Petitioner asserts that "[t]he DL-MAP that Park modifies allocates space in the AMC zone/area of the OFDMA frame." Pet. 21–22 (reproducing Ex. 1006, Fig. 218 (with Petitioner's added highlighting); citing Ex. 1003 ¶¶ 113–124; Ex. 1006, 500–501, 505–507, 574).

Petitioner also contends that Park and IEEE 802.11-2004

> further teaches that the mobile device is configured to perform the recited elements under the plain meaning of the term "configured to," . . . the mobile device is arranged to perform the receiving and recovering elements. The asserted art also teaches that the mobile device is "designed to" perform the recited elements because a POSA would have designed the device, using programming, software, and/or hardware to perform the recited receiving and recovering.

Pet. 24–25 (citing Ex. 1003 ¶ 133; Pet. 25–45); *see* Pet. Reply 15.

Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine the teachings of Park and IEEE 802.16-2004, as proposed by Petitioner, because Park directs a person of ordinary skill in the art to implement its teachings in a system based on that standard to reduce overhead and improve flexibility. *See* Pet. 14 (citing Ex. 1003 ¶¶ 54–65, 74–101; Ex. 1005 ¶¶ 31, 73–79, 85); *see also* Pet. 16 (addressing Park's teachings regarding improving flexibility and reduction in bits, citing Ex. 1003 ¶¶ 54–101; Ex. 1005 ¶¶ 31, 73–74), 17 (similar argument, citing Ex. 1005 ¶ 75). Petitioner asserts that Park describes its improvements to the IEEE 802.16-2004 allocation scheme to reduce overhead and explains that it "can be applied to the Wi[B]ro or IEEE 802.16 standards in various

manners, including by adapting the IEEE 802.16-2004 DL(/UL)_MAP IE fields." *See* Pet. 15 citing Ex. 1003 ¶¶ 54–65, 73–101; Ex. 1005 ¶¶ 72–79, 85). According to Petitioner, "[b]ecause Park improves and builds upon IEEE 802.16-2004 systems, a [person of ordinary skill in the art] at the relevant time would have looked to the teachings of 802.16-2004 to provide the underlying structure for Park's disclosed improvements." Pet. 15–16.

In response, Patent Owner contends that Petitioner does not teach a mobile device configured to perform limitations 2[b], [2d], and part of limitation [3] of claim 7. *See* PO Resp. 4–5 (citing Pet. 31). Patent Owner asserts that, although Park indicates that its embodiments may be implemented in the context of a system that also supports mobile subscribers, such as WiBro, Park will divide its frame into mutually exclusive regions for fixed and mobile subscribers and would apply only to fixed subscribers. *See id.* at 1, 5, 25–32 (citing Ex. 1003 ¶¶ 97, 101, 126, 128; Ex. 1005 ¶ 11; Ex. 1008, 20; Ex. 1025, 270; Ex. 2023 ¶¶ 77–79, 81–82; Ex. 2024, 21:10–19, 28:8–14, 30:1–21, 62:3–7, 107:24–108:18; Ex. 2025, 3, 31; Ex. 2027, 1–2; Ex. 2037, 3; Ex. 2038 ¶¶ 8–12). More specifically, Patent Owner asserts that Petitioner relies entirely on Park's embodiments that modify the DL_MAP Information Element (IE) for resource allocation for the band AMC region of a frame. *Id.* at 1, 5–9 (citing Ex. 2023 ¶¶ 37–40, 42; Pet. 31–40, 45). Patent Owner contends that these embodiments of Park cannot meet the limitations as to mobile devices because Park expressly teaches that the band AMC region of the frame applies only to fixed subscribers, not mobile subscribers. *See id.* at 1, 9–13 (citing Ex. 2023 ¶¶ 45–51); PO Sur-reply 1–2 (citing Ex. 2023 ¶¶ 45–46; PO Resp. 9–13). According to Patent Owner, "[t]he fact that these Park

embodiments are for the band AMC area of the frame is undisputed, including by Petitioner's expert" Dr. Cooklev. PO Resp. 13 (citing Ex. 1003 ¶¶ 113, 115, 139, 159, 189, 207); *see* PO Sur-reply 1 (citing PO Resp. 5–9, 13). Patent Owner further contends that the fact that the band AMC area modified by Park only supports fixed subscribers is also supported by the extrinsic evidence. *See* PO Resp. 13–18 (citing Ex. 2023 ¶¶ 53–59, 61; Ex. 2024, 36:11–13, 38:2–12, 62:3–7, 71:3–6, 107:24–108:18; Ex. 2025, 331, 332; Ex. 2027, 1–2); PO Sur-reply 2–3 (citing Ex. 2023 ¶ 59; Ex. 2024, 70:17–71:6, 107:24–108:18; Ex. 2025, 331; PO Resp. 13–19).

In the Reply, Petitioner asserts that Patent Owner misreads Park because the cited passage does not state that only fixed devices can use the AMC region illustrated in Figure 1 or that mobile devices cannot. *See* Pet. Reply 5; *see id.* at 4 (citing PO Resp. 1, 5, 9–10, 11). According to Petitioner, the passage in Park states that the AMC area is used for increasing the transmission speed for fixed subscribers, and is not excusive. *See id.* at 5. Petitioner asserts that Patent Owner omits the prior art designation for Park's Figure 1 and never addresses that the cited statement is made only in Park's "Description of the Related Art." *Id.*; *see id.* at 4 (citing PO Resp. 1, 5, 9–10, 11). Petitioner asserts that these are material omissions because it undermines Patent Owner's assertions that Park's embodiments and invention are limited to fixed devices. Pet. Reply 5. According to Petitioner, "[n]owhere does Park state that mobile devices cannot leverage his innovation to band selection AMC." *Id.* Petitioner asserts that Park applies its invention to devices that were already mobile. Pet. Reply 5–6 (citing Ex. 1031 ¶ 7). According to Petitioner, "Park teaches that his invention applies to 'next generation *mobile* communication

systems' and 'can be applied to the Wibro or IEEE 802.16 standards in various manners.'" *Id.* at 5 (citing Ex. 1005 ¶¶ 5, 75). Petitioner contends that "[a] person of ordinary skill in the art would have understood based on the teachings of Park, the software that would perform Park's invention would have been executed on a mobile device that is at times stationary or slowly moving." *Id.* at 6 (citing Ex. 1031 ¶ 7). "When a mobile device is stationary or moving slowly, it would have communicated using band AMC 'for increasing the transmission speed' as Park teaches." *Id.* (citing Ex. 1031 ¶ 7).

We do not agree with Petitioner's arguments because, as explained above in Section III.B., we construe "mobile device" as a device that is mobile during wireless network communications, and is not fixed or slowly moving during wireless network communications. Thus, after having considered both parties' arguments and the cited supporting evidence, we are not persuaded that the combination of Park and IEEE 802.16-2004, including the application of Park to WiBro's teaching of stationary or slowly moving devices communicating using band AMC, teaches or suggests a "mobile device," as properly construed, that is configured to perform the limitations recited in the body of claim 7.

Petitioner asserts that Patent Owner fails to address the descriptions of WiBro cited in the Petition, which expressly teaches that band selection AMC was used for mobile devices in WiBro. *See* Pet. Reply 6–7 (reproducing Ex 1023, 17 (with highlighting added), citing PO Resp. 13). According to Petitioner "[t]his evidence explains that channel status was monitored, and depending on that status, either band selection AMC or diversity channel was used depending on whether the user was stationary,

slowly moving or fast moving." Pet. Reply 7 (citing Ex. 1031 ¶¶ 7, 11, 20). Petitioner asserts that "[b]ased on this teaching, a POSITA would have recognized that 'slowly moving' 'mobile stations' in WiBro leveraged band selection AMC and would have benefitted from Park's innovation." *Id.* (citing Ex. 1031 ¶¶ 7, 10–11, 19–20); *see also* Pet. 7–8 (arguments that the technical characteristics of WiBro were not a secret as of September 4, 2005, citing Pet. 19; Dec. on Inst. 19; Ex. 1003 ¶ 26; Ex. 1031 ¶¶ 13–18; Ex. 2024, 110:2–8, 113:14–18; Ex. 1034, 7).

We do not agree with Petitioner's arguments addressing the teachings of Exhibit 1023 "Introduction to WiBro Technology" based on the proper claim construction for "mobile device." Thus, after having considered both parties' arguments and the cited supporting evidence, we are not persuaded that the combination of Park and IEEE 802.16-2004, including the application of Park to WiBro's teaching of stationary or slowly moving devices communicating using band selection AMC, teaches or suggests a "mobile device," as properly construed, that is configured to perform the limitations recited in the body of claim 7.

Petitioner further asserts that the WiBro-Article (Ex. 2027), cited by Patent Owner, "confirms the article is directed to 'mobile' devices: 'Capacity Analysis Considering Channel Resource Overhead for ***Mobile*** Internet Access (WiBro).'" Pet. Reply 9 (citing PO Resp. 15–17). Petitioner also directs attention to the WiBro-Article's "Abstract [which] states 'Wireless ***mobile*** internet access is becoming an important segment for the wireless industry. In this paper the new system, ***WiBro***, being standardized in Korea is introduced.'" *Id.* (citing Ex. 2027, 1). According to Petitioner, "Patent Owner does not attempt to reconcile its narrow reading

of Exhibit 2027 with its express applicability to mobile devices. A POSITA would not have overlooked such statements." *Id.* (citing Ex. 1031 ¶ 22). Petitioner further contends that "[a] POSITA would have also recognized the teaching in Exhibit 2027 confirming, consistent with Park and Exhibit 1023, that *all* WiBro subscribe[r]s, including mobile devices, both received and leveraged band selection AMC,'" which "confirms that all WiBro subscribers, including mobile devices, both received and leveraged band selection AMC in both the downlink (where Park's invention is applied) and the uplink." *Id.* (citing Ex. 1031 ¶¶ 23–24; Ex. 2027, 2). Petitioner contends that this teaching contradicts Patent Owner's assertion that band AMC only supports fixed subscribers. *Id.* at 9–10 (citing PO Resp. 15–17).

We do not agree with Petitioner's arguments because they overlook Patent Owner's contention that Petitioner's expert Dr. Cooklev testifies on cross-examination that the WiBro article (Ex. 2027), like Park, discloses a band selection zone that is for fixed users and a diversity zone dedicated to mobile users. *See* PO Resp. 17 (citing Ex. 2024, 107:24–108:18:5–18). Therefore, after having considered both parties' arguments and the cited supporting evidence, we are not persuaded that the combination of Park and IEEE 802.16-2004, and including the application of Park to WiBro, teaches, or suggests a "mobile device," as properly construed, that is configured to perform the limitations recited in the body of claim 7.

Patent Owner contends that the combination of Park with IEEE802.16-2004 does not change Park's relied upon embodiments that apply only to fixed subscribers. *See* PO Resp. 1–2. Patent Owner further asserts that IEEE 802.16-2004 only supported fixed stations and did not support mobile devices. *See id.* at 2 (citing Ex. 2025, 332), 5, 19–25 (citing

Pet. 14; Ex. 1003 ¶¶ 77, 126; Ex. 2023 ¶¶ 64–73; Ex. 2024, 39:5–8, 54:8–25; Ex. 2025, 22, 331, 332). More specifically, Patent Owner contends that Petitioner's expert Dr. Cooklev explained in his book (Ex. 2025) that IEEE 802.16-2004 did not apply to mobile devices. *See id.* at 19–22 (citing Ex. 2023 ¶¶ 70–73; Ex. 2024, 39:5–8, 54:8–25; Ex. 2025, 22, 331, 332). Patent Owner contends that the IEEE 802.16-2004 standard itself and several pieces of literature in the field confirm that IEEE 802.16-2004 does not support mobile devices. *See id.* at 22–23 (citing Ex. 1006, 1 (Title), 4 (Abstract); Ex. 2020, 89–98, 107 (Biographies); Ex. 2021; Ex. 2023 ¶¶ 64–67). According to Patent Owner, mobile devices were not supported until IEEE 802.16e. *See id.* at 24 (citing Ex. 1006, 1 (Title); Ex. 1014, 3; Ex. 1022, 74; Ex. 1025, x, 26; Ex. 2023 ¶¶ 68–69).

In the Reply, Petitioner asserts that there are at least two problems with Patent Owner's arguments addressing the combination of Park with IEEE 802.16-2004. Pet. Reply 12 (citing PO Resp. 19, 22, 25–30). According to Petitioner, "the Background section of the '450 Patent admits that messages such as 'DL_MAP' in 802.16 'are utilized to broadcast the scheduling decisions to the *mobile* stations.'" *Id.* (citing Ex. 1001, 1:48–50; Pet. 19). According to Petitioner, "Patent Owner's concession about the state of the art in the Background section of the '450 Patent are binding admissions about the applicability of 802.16 to support mobile devices at the time of the purported invention." *Id.* (citing *Ex parte McBrady*, 2020-003744, 2021 WL 5083846 at 7–8 (PTAB Nov. 1, 2021)).

We do not agree with Petitioner's arguments. As pointed out by Patent Owner, there is no showing that the DL-MAP for mobile devices referenced in the '450 Patent is the same DL-MAP that is modified by Park.

See PO Sur-reply 16–17 (citing Ex. 1003 ¶ 60; Ex. 1006, 500; Ex. 2023 ¶ 47; Ex. 2024, 148:23–149:25, 151:24–152:6). Petitioner's assertion that the '450 Patent's disclosure amounts to a binding admission is not supported by persuasive authority. The *McBrady* case cited by Petitioner is not a precedential decision but a routine *ex parte* appeal decision of a patent application. Moreover, the record overwhelmingly supports finding that IEEE 802.16-2004 does not support mobile devices. *See, e.g.*, Ex. 1006, 1 (Title); 4 (Abstract); Ex. 1025, x, 26; Ex. 2020, 89–98, Ex. 2021; Ex. 2025, 22, 331, 332, Table 1–4). Accordingly, after having considered both parties' arguments and the record evidence, we are not persuaded that the combination of Park and IEEE 802.16-2004 teaches or suggests a "mobile device," as properly construed, that is configured to perform the limitations recited in the body of claim 7.

Having considered both parties' arguments and the cited supporting evidence, we are not persuaded that the subject matter of claim 7 and claim 11, dependent therefrom, would have been obvious over the combined teachings of Park and IEEE 802.16-2004. Therefore, based on the entire record, Petitioner has not shown by a preponderance of the evidence that claims 7 and 11 are unpatentable under 35 U.S.C. § 103 over Park and IEEE 802.16-2004.

IV. CONCLUSION

For the foregoing reasons, and after having analyzed the entire record and assigning appropriate weight to the cited supporting evidence, Petitioner has failed to establish by a preponderance of the evidence that claims 7 and 11 are unpatentable.

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
7, 11	103	Park, IEEE802.16-2004		7, 11
Overall Outcome				7, 11

V. MOTION TO SUBMIT SUPPLEMENTAL INFORMATION

Petitioner filed a Corrected Motion to Submit Supplemental Information Under 35 U.S.C. § 316(a)(3) and 37 C.F.R § 42.123(a). Paper 43 (Motion or "Mot."). Petitioner's supplemental information is (i) a declaration of Matt Ceglia (Ex. 1029), submitted to show that IEEE 802.16-2004 (Ex. 1006) is prior art, and (ii) a full public version of the file history for U.S. Patent No. 10,447,450 (Ex. 1030). *See* Paper 43, 1. According to Petitioner, "[t]he supplemental information is responsive to Patent Owner's objections to Exhibits 1002 and 1007." *Id.* (citing Paper 32). Patent Owner did not file an opposition to the Motion.

Under 37 C.F.R. § 42.123(a), a party may file a motion to submit supplemental information if the following requirements are met: (1) a request for authorization to file such motion must be made within one month of the date the trial was instituted; and (2) the supplemental information must be relevant to a claim for which trial has been instituted. In addition to these requirements, the Board considers the motion in light of its mandate under 37 C.F.R. § 42.1(b), i.e., "to secure the just, speedy, and inexpensive resolution of every proceeding."

Petitioner timely requested authorization to file the Motion. Mot. 1. We have reviewed the Motion and the supplemental information and find

that Petitioner has shown that the supplemental information is relevant to a claim for which trial has been instituted. Petitioner further asserts that "granting Petitioner's motion is in the interest of a just, speedy, and inexpensive resolution of the trial." Mot. 2.

Because Petitioner has met its burden of proving it is entitled to the requested relief under 37 C.F.R. § 42.123(a), Petitioner's Motion to submit supplemental information is granted.

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner's Corrected Motion to Submit Supplemental Information (Paper 43) is granted;

FURTHER ORDERED that Exhibits 1029 and 1030 are entered into the record of this proceeding;

FURTHER ORDERED that Petitioner has not established by a preponderance of the evidence that claims 7 and 11 of the '450 Patent are unpatentable; 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.

FOR PETITIONER:

John LeRoy
Christopher Smith
Kyle Konz
BROOKS KUSHMAN P.C.
jleroy@brookskushman.com
csmith@brookskushman.com
kkonz@brookskushman.com

FOR PETITIONER (IPR2023-00962 joined):

Timothy W. Riffe
Usman A. Khan
FISH & RICHARDSON P.C.
IPR18768-0206IP1@fr.com
PTABInbound@fr.com

Reginald J. Hill
Nicole A. Keenan
JENNER & BLOCK LLP
rhill@jenner.com
nkeenan@jenner.com

FOR PATENT OWNER:

Kenneth Weatherwax
Parham Hendifar
LOWENSTEIN & WEATHERWAX LLP
weatherwax@lowensteinweatherwax.com
hendifar@lowensteinweatherwax.com

Hamad
CALDWELL, CASSADY, & CURRY P.C.
hhamad@caldwellcc.com