

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.

IPR2022-00974
Patent 8,953,641 B2

Before AMBER L. HAGY, JASON W. MELVIN, and
AARON W. MOORE, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

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

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I. INTRODUCTION

Continental Automotive Systems Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) challenging the patentability of claims 6–9, 11, 13, 14, 18, 22–25, 27, 28, 32, and 36–38 (“the challenged claims”) of U.S. Patent No. 8,953,641 B2 (Ex. 1001, “the ’641 patent”), which is assigned to Intellectual Ventures II LLC (“Patent Owner”).¹

The Petition presented the following grounds (*see* Pet. 5):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
6–9, 11, 13, 14, 18, 22–25, 27, 28, 32, 36–38	103(a)	Hwang, ² McFarland ³
6, 7, 8, 9	103(a)	Hwang, McFarland, Miyoshi ⁴

The primary references, Hwang and McFarland, were not before the Examiner during the original prosecution.

Patent Owner filed a Preliminary Response (Paper 6), and we instituted a trial on the asserted grounds of unpatentability (*see* Paper 11, 59). During the trial, Patent Owner filed a Response, Petitioner filed a Reply, and Patent Owner filed a Sur-reply. *See* Paper 18 (“PO. Resp.”); Paper 19 (“Reply”); Paper 27 (“Sur-reply”).

¹ Toyota Motor Corp. was on the Petition but settled with Patent Owner and was terminated from the proceeding. *See* Paper 24.

² Inseok Hwang et al., *A New Frame Structure for Scalable OFDMA Systems*, IEEE C802.16d-04/19 (2004).

³ U.S. Pub. App. 2002/0006167 A1.

⁴ U.S. Patent No. 7,372,909 B2.

Petitioner relies on testimony from Dr. Robert Akl, D.Sc. *See* Ex. 1003 (“Akl Declaration”); Ex. 1021 (“Supplemental Akl Declaration”). Patent Owner relies on testimony from Dr. Gary Lomp. *See* Ex. 2001 (“Lomp Declaration”); Ex. 2015 (“Second Lomp Declaration”).

We conducted an oral hearing on September 6, 2023, and a copy of the transcript is included in the record. *See* Paper 39 (“Tr.”).

We now determine, for the reasons explained below, that Petitioner has shown by a preponderance of the evidence that claims 6–9, 11, 13, 14, 18, 22–25, 27, 28, 32, and 36–38 of the ’641 patent are unpatentable.

A. Related Matters

Petitioner identifies six civil actions as related matters. *See* Pet. 69–70. Petitioner also identifies the following *inter partes* reviews as related: IPR2018-01689 (concerning the ’641 patent); IPR2018-01770 (concerning the ’641 patent); IPR2015-01664 (concerning US 7,787,431 B2); and IPR2014-01995 (concerning US 7,787,431 B2). Patent Owner identifies three of the six civil actions identified by Petitioner, and two of the four *inter partes* reviews identified by Petitioner. *See* Paper 4, 2.

We instituted review in IPR2018-01689 to consider challenges to claims of the ’641 patent based on references called Li, Husted, and Chang. *See* IPR2018-01689, Paper 15, 62. We instituted review in IPR2018-01770 to consider challenges to claims of the ’641 patent based on the Hwang and McFarland references that are used in this petition. *See* IPR2018-01770, Paper 18, 64. Both cases terminated before reaching a final written decision. *See* IPR2018-01689, Paper 22; IPR2018-01770, Paper 24.

B. The '641 Patent

The '641 patent is titled “Methods and Apparatus for Multi-Carrier Communication with Variable Channel Bandwidth.” The patent explains that it is ideal for a broadband wireless communication device to roam from one part of the world to another, but that “wireless communication spectra are heavily regulated and controlled by individual countries or regional authorities.” Ex. 1001, 1:31–35. The patent further explains that, even within the same country or region, a wireless operator may own and operate on a broadband spectrum that is different from other operators. *Id.* at 1:37–40. The patent concludes that it would be desirable to have “[a] practical and feasible solution for multi-carrier communication with variable channel width.” *Id.* at 2:1–3.

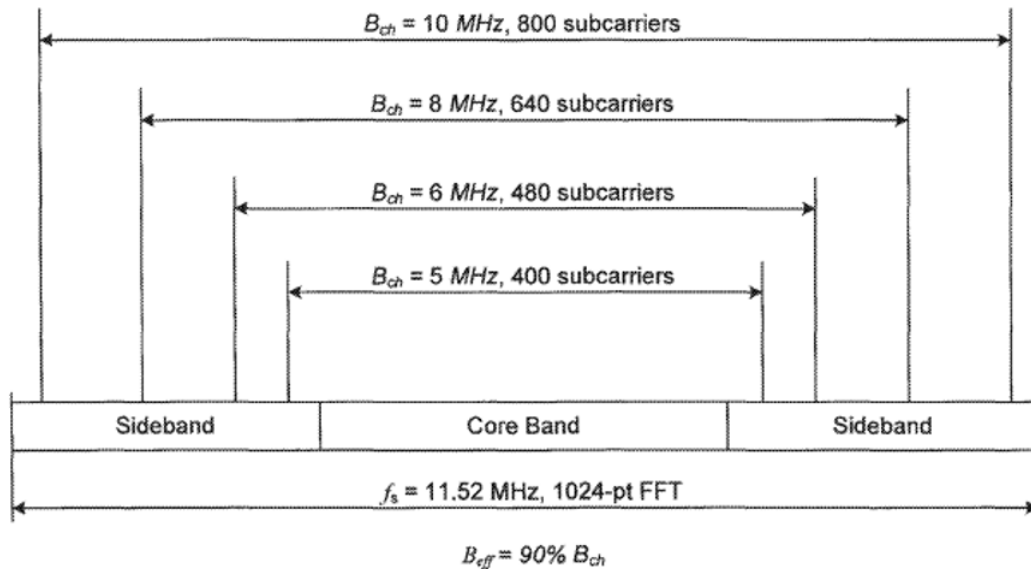
The '641 patent describes how a “variable channel bandwidth is realized by adjusting the number of usable subcarriers, whose spacing is set constant.” Ex. 1001, 4:41–42. This is shown in a table of sample system parameters, which lists four different operating bandwidths, 10MHz, 8MHz, 6MHz, and 5MHz, each with its own corresponding number of subcarriers, 800, 640, 480, and 400:

TABLE 1

Sample System Parameters				
Sampling freq.	11.52 MHz			
FFT size	1024 points			
Subcarrier spacing	11.25 kHz			
Channel bandwidth	10 MHz	8 MHz	6 MHz	5 MHz
# of usable subcarriers	800	640	480	400

Table of Sample System Parameters

Figure 6 of the '641 patent, reproduced below, shows the claimed concept schematically:



“FIG. 6 illustrates a variable channel bandwidth being realized by adjusting a number of usable subcarriers, whose spacing is set constant.” Ex. 1001, 2:20–22.

The figure above shows “[a] core-band, substantially centered at the operating center frequency, [that] is defined as a frequency segment that is not greater than the smallest operating channel bandwidth among all the possible spectral bands that the receiver is designed to operate with.”

Ex. 1001, 4:66–5:3. The '641 patent describes how “a set of data channels and their related dedicated control channels are placed within the [core-band] to maintain basic radio operation” and that “[w]hen entering into the network, a mobile station starts with the primary state and transits to the normal full-band-width operation to include the sidebands for additional data and radio control channels.” *Id.* at 5:6–17.

Claims 6, 11, and 25 are independent. Claim 6 is directed to a variable bandwidth communication method in which a mobile station

receives synchronization information in a core-band, where the core-band is substantially centered at an “operating center frequency” and includes subcarrier groups that include subcarriers with a fixed spacing. The number of subcarriers is adjustable to realize a “variable band,” the core-band is the same for all bandwidths, and the core-band is not greater than the smallest bandwidth. The mobile station and the base station are synchronized using the synchronization information, and the mobile station receives control and data channels using the variable band.

Claim 11 is directed to a mobile station, and claim 25 is directed to a corresponding method performed by a mobile station. These claims focus on receipt of “broadcast information” by a mobile station, reciting that the broadcast information is in a first band, with a first bandwidth, carried by a group of subcarriers that have a fixed spacing. A second bandwidth is determined based on the broadcast information, where the second bandwidth is greater than and contains the first, and a data channel is carried by a subcarrier group of the second band.

For ease of reference, independent claims 6 and 11 are reproduced in full below:

6. A variable bandwidth communication method, comprising:

receiving synchronization information by a cellular mobile station from a base station in an orthogonal frequency division multiple access (OFDMA) core-band, wherein the core-band is substantially centered at an operating center frequency and the core-band includes a first plurality of subcarrier groups where each subcarrier group includes a plurality of subcarriers having a fixed spacing between adjacent subcarriers, wherein a number of useable subcarriers is adjustable to realize a variable band, wherein the number of useable subcarriers is determined based on plurality of operating channel bandwidths, the core-band

defined as a frequency segment with a bandwidth that is not greater than a smallest operating channel bandwidth among the plurality of operating channel bandwidths, the core-band having a same value for the plurality of operating channel bandwidths, wherein the cellular mobile station is configured to operate within the plurality of operating channel bandwidths;

synchronizing the cellular mobile station with the base station using the received synchronization information; and

receiving control and data channels by the cellular mobile station using the variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band.

11. A mobile station, comprising:

circuitry configured to receive broadcast information to access an orthogonal frequency division multiple access (OFDMA) system, wherein the broadcast information is received only in a first band having a first bandwidth and the broadcast information is carried by a plurality of groups of subcarriers with each group having a plurality of contiguous subcarriers;

circuitry configured to determine a second bandwidth of a second band that is associated with the OFDMA system based upon the broadcast information received in the first band, wherein a second bandwidth of the second band is greater than the first bandwidth of the first band, wherein the first band is contained within the second band,

wherein a data channel is carried by at least one subcarrier group of the second band,

wherein the plurality of contiguous subcarriers have fixed spacing,

wherein a number of usable subcarriers is adjustable to realize a variable band, wherein the number of usable subcarriers is determined based on a plurality of operating channel bandwidths, and

wherein the first band is defined as a frequency segment with a bandwidth that is not greater than a smallest operating

channel bandwidth among the plurality of operating channel bandwidth, the first band having a same value for the plurality of operating channel bandwidths wherein the mobile station is configured to operate within the plurality of operating channel bandwidths.

II. ANALYSIS

A. *Principles of Law*

A patent claim is unpatentable under 35 U.S.C. § 103(a) 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.” *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 ordinary skill in the art; and, (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. *Level of Ordinary Skill in the Art*

The level of skill in the art is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *See Al-Site Corp. v. VSI Int’l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham*, 383 U.S. at 17–18; *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention “would have had a Bachelor of Science in electrical engineering, computer engineering, or an equivalent field as well as three years of experience in wireless communication technology, or a master’s

degree in electrical engineering, or other equivalent degree.” Pet. 6–7 (citing Ex. 1003 ¶¶ 38–40). Patent Owner has not proposed an alternative, and, having reviewed the arguments and evidence in the full record, we adopt Petitioner’s definition, as we did in the Institution Decision, finding it consistent with the ’641 patent and the asserted prior art.

C. Claim Construction

In interpreting the claims of the ’641 patent, we “us[e] the same claim construction standard that would be used to construe the claim[s] in a civil action under 35 U.S.C. [§] 282(b).” *See* 37 C.F.R. § 42.100(b) (2021). The claim construction standard includes construing claims in accordance with the ordinary and customary meaning of such claims as would have been understood by one of ordinary skill in the art in light of the written description and the prosecution history pertaining to the patent. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

Petitioner proposes a construction for the term “radio network information” in dependent claims 9, 14, and 28. *See* Pet. 7. Patent Owner has not proposed a specific construction for any claim term and has not disputed Petitioner’s proposed construction for “radio network information.”

In view of the analysis below, we determine that we need not expressly construe “radio network information,” and that no other claim construction is necessary. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (explaining that construction is needed only for terms that are in dispute, and only as necessary to resolve the controversy).

D. Overview of the Primary References

1. Hwang

Hwang is an IEEE submission titled “A New Frame Structure for Scalable OFDMA System.” Petitioner’s declarant, Randall Schwartz, testified at length about how Hwang was made public in connection with Session #30 of the IEEE 802.16 Working Group that took place in Orlando, Florida on March 15–18, 2004. *See* Ex. 1010 ¶¶ 4–21.

Hwang proposes a new frame structure to “improve system performance under scalable bandwidth.” Ex. 1004, 1. Table 1 of Hwang is reproduced below:

Table 1. System Parameter				
Parameter	Values			
System BW	2.5 MHz	5 MHz	10 MHz	20 MHz
FFT Size	256	512	1024	2048
Samp. Frequency	2.5 MHz	5 MHz	10 MHz	20 MHz

Tone Spacing	9.975625 kHz			
Total OFDM Symbols	42			
Used Subcarriers	216	432	864	1728
Data Subcarriers	192	384	768	1536
Pilot Subcarriers	24	48	96	192

Hwang’s System Parameters

This table shows the system parameters chosen to support a scalable bandwidth (the “System BW”) of 2.5, 5, 10, or 20 MHz. *See* Ex. 1004, 2–3. Petitioner indicates that “tone spacing” in the table means subcarrier spacing (*see* Pet. 9), and Patent Owner does not dispute that characterization. Thus, Table 1 of Hwang shows four different system operating bandwidths, 2.5 MHz, 5 MHz, 10 MHz, and 20 MHz, with a scaling number of useable subcarriers and a common and fixed subcarrier spacing.

2. *McFarland*

McFarland is a U.S. patent application directed to communication systems and networks that use multi-carrier protocols, including orthogonal frequency division multiplexing (OFDM), and to techniques for communicating using such protocols. *See* Ex. 1005 ¶ 3. McFarland explains that systems of that type “take a relatively wide bandwidth communication channel and break it into many smaller frequency sub-channels,” and that the narrower sub-channels “are then used simultaneously to transmit data at a high rate.” *Id.* ¶ 5.

McFarland discloses a control unit that accepts several inputs, on the basis of which it will determine the appropriate symbol rate (subcarrier spacing⁵) and the number of carriers to use. *See id.* ¶ 45. The combination of symbol rate and number of carriers defines an “operating mode.” *Id.*

McFarland discloses several ways to change the number of carriers in active use. *See* Ex. 1005 ¶ 38. In one embodiment, a single iFFT (inverse Fast Fourier Transform) processor is large enough to handle the maximum number of carriers that might be required, and a subset of carriers can be used by inputting zero magnitude signals on the unused carriers. *See id.* ¶ 39. Another embodiment uses multiple complete iFFT processors of various sizes, and, for a given transmission, only one of the processors would be used. *See id.* ¶ 40. In another embodiment, a single iFFT processor is used and can disable portions of its own internal circuitry depending on how many carriers are needed. *See id.* ¶ 41.

⁵ Petitioner refers to “symbol rate” as equivalent to subcarrier spacing. Pet. 26. Patent Owner does not dispute that characterization. We use the terms interchangeably.

McFarland explains that “all nodes may not support all modes,” and that “[b]roadcast messages, or any other messages that need to be received by multiple nodes, must be transmitted in a mode that all nodes to which they are directed are able to receive.” Ex. 1005 ¶ 60. McFarland also describes how “[o]ne method for communicating the mode of operation . . . is to signal it in the header of the packet,” that “it might be preferred to send a first short exchange establishing the mode at which the data communication will take place,” and that “[t]his first short exchange would be done with a base mode of operation that all nodes support.” *Id.* at ¶ 62. McFarland also describes how, “when a new node enters a network, it could learn of the operating mode by . . . receiving a packet header or special packet” and that “[t]he packet header or special packet could be transmitted in some base mode that all nodes are guaranteed to support.” *Id.* at ¶ 63.

E. Motion to Exclude

Patent Owner moves to exclude (1) paragraphs 31 and 35 of Dr. Akl’s Supplemental Declaration, and (2) Hwang. *See* Paper 33 (“Mot. to Exclude”). For the reasons given below, the motion is denied.

1. Paragraph 31 of the Supplemental Declaration

Patent Owner argues that “Dr. Akl’s Original Invalidity Theory was limited to modifying the ‘header’ portion or ‘broadcast information’ of Hwang’s frame” but “Dr. Akl’s Supplemental Declaration . . . proposes a New Invalidity Theory where the original Hwang frame in its entirety (rather than just the Preamble and SICH) is constrained to the 2.5 MHz band regardless of the operating mode, and the combination becomes untethered from McFarland’s ‘short header.’” Mot. to Exclude 1–3. According to

Patent Owner, “Dr. Akl’s New Invalidity theory marks a significant shift in theory, and exceeds the scope of a proper reply.” *Id.* at 5.

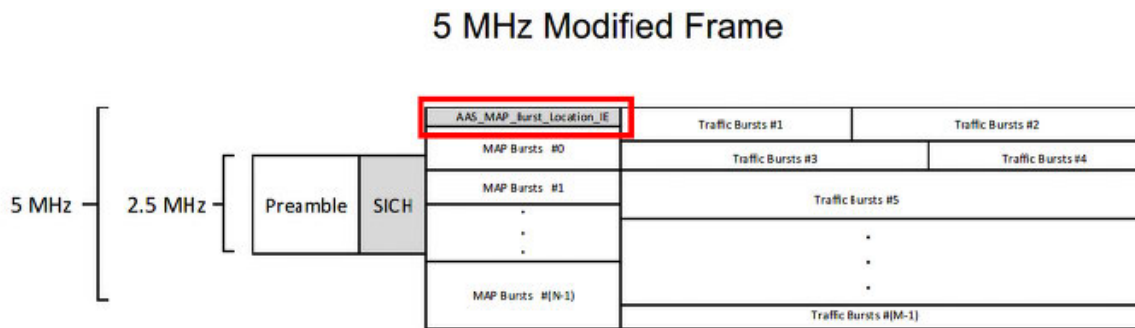
We do not agree that there is a “New Invalidity Theory.” Dr. Akl’s contention is that the map burst location block would be located in a bandwidth supported by the mobile station⁶ with which the base station is communicating. This is consistent with the Petition and original declaration. *See* Pet. 37 (contending that it would have been “obvious to modify Hwang to provide the ‘header’ portion of Hwang’s frame . . . within the base mode (i.e., 2.5 MHz system bandwidth) *and the remainder of the frame within an operating mode* (i.e., one of 2.5, 5, 10, or 20 MHz))”) (emphasis added; quoting Ex. 1003 ¶ 126).

In the case of a legacy mobile station limited to 2.5 MHz, the only available operating mode would be the 2.5 MHz bandwidth, so the preamble, SICH, and data blocks (including the map burst location block) would all be communicated in that bandwidth. In the case of a 5 MHz mobile station, the preamble and SICH would be sent in the 2.5 MHz bandwidth and then, if desired, the 5 MHz operating mode could be used, in which case the data blocks (including the map burst location block) would lie in the 5 MHz bandwidth.

There appears to be some confusion arising from the diagrams the parties are using to illustrate the arguments. Patent Owner created diagrams for the Preliminary Response that were intended to support an argument that Hwang’s “uniform frame structure” would be lost if the bandwidth changed.

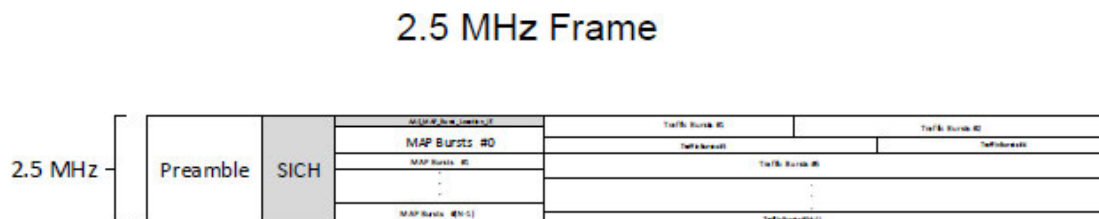
⁶ For clarity, we will use the claim terms “base station” and “mobile station” even though some of the references use different words (e.g., “node” or “subscriber station”) to refer to those elements of the wireless system.

See Prelim. Resp. 17–19. Then, in the full Response (see PO Resp. at 19), Patent Owner used one of those figures, depicting a “5 MHz Modified Frame,” to argue that a 2.5 MHz mobile station would not be able to read the burst map outlined in red:



Patent Owner’s Drawing of a “5 MHz Modified Frame”

That drawing, however, shows how the combination would work for a 5 MHz mobile station, not a 2.5 MHz mobile station. The 5 MHz mobile station would receive the preamble in the 2.5 MHz base mode and then could switch to 5 MHz operating mode to receive the map and traffic data. A 2.5 MHz mobile station, however, would not attempt to switch to 5 MHz, because it cannot communicate at that larger bandwidth, meaning that the problems Patent Owner identifies would not exist in the combination. The 2.5 MHz mobile station would stay in the 2.5 MHz band—its only operating mode—as shown in the figure below from page 19 of the Preliminary Response:



Patent Owner’s Drawing of a “2.5 MHz Frame”

At his deposition, Dr. Akl testified that there would have to be a map burst location block within the 2.5 MHz band for the legacy mobile stations, but that there also could be additional map bursts and traffic bursts outside the 2.5 MHz band. *See* Ex. 2020, 63:1–65:15. He depicted that on page 17 of his Supplemental Declaration, as follows:

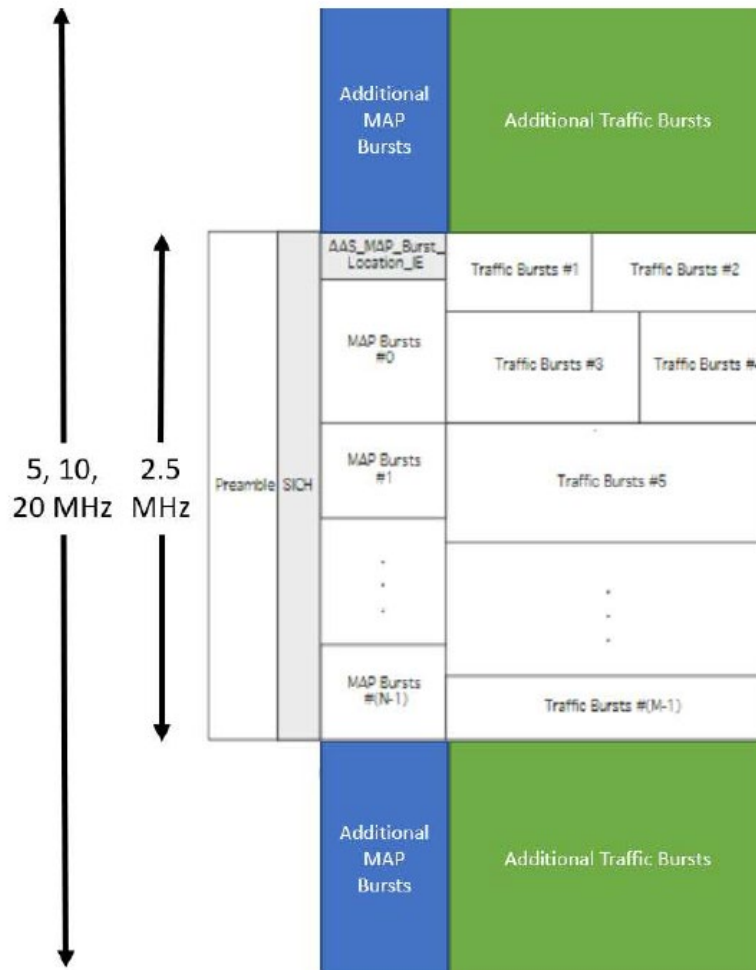


Figure from Page 17 of the Akl Supplemental Declaration

We find it unclear from this figure and the associated explanation in the Declaration (*see* Ex. 1038 ¶¶ 30–32) how the map burst and traffic burst blocks in green and blue factor in, because they cannot be received by the 2.5 MHz device.

Dr. Akl testified that “McFarland teaches that necessary messages, e.g., including broadcast messages, or any other messages that need to be received by multiple nodes, ‘must be transmitted in a mode that all nodes to which they are directed are able to receive,’ that is, the base mode (e.g., the core-band).” Ex. 1038 ¶ 31 (quoting Ex. 1004 ¶ 60). He then states that one “would understand that because Hwang’s AAS_MAP_Burst_Location_IE contains system information and an index of where the MAP bursts are going to be, it is a message that needs to be received by multiple nodes, and thus is a necessary message that must be transmitted in a mode that all nodes to which they are directed are able to receive.” *Id.*

It does not appear, however, that the blue and green blocks could be part of “broadcast messages” intended for a 2.5 MHz mobile station because they cannot be received by that mobile station. We thus do not agree that McFarland would suggest including map burst blocks in the 2.5 MHz band because they are “broadcast messages.” We also fail to see why the map burst locations would need to be received by multiple nodes, as that seems to be data that is tailored to the mobile device with which the base station is communicating.⁷

However, we do find it readily apparent that if the base station and the mobile station have determined to communicate using a particular bandwidth, as contemplated by the combination presented in the Petition, the map bursts necessarily would be included in that bandwidth in order for the communication scheme to be successful. The mobile station would need to

⁷ For example, the blue MAP burst blocks in Dr. Akl’s figure can’t be received by the 2.5 MHz handset.

be able to read the map burst location data to process the traffic bursts.

See Ex. 1003 ¶ 157.

Thus, although we find the portions of Dr. Akl's testimony about the blue and green blocks to be insufficiently explained and supported, we find that one of ordinary skill in the art would have understood that the map burst location blocks would be transmitted within the 2.5 MHz band for a mobile station that was limited to 2.5 MHz, and within the bandwidth of any other operating mode in use between the base station and a mobile station with a broader operating mode.

Patent Owner also argues that Dr. Akl improperly changed the mapping of the claim language "variable band" from "Map Bursts and Traffic Bursts within the frame shown in Figure 6 of Hwang," as in the Petition, to "Dr. Akl's new blue and green boxes." Mot. to Exclude 3. We find this argument unpersuasive because the variable band is simply the set of bandwidths available in the system. *See, e.g.*, Claim 6 ("[a] variable bandwidth communication method . . . wherein a number of useable subcarriers is adjustable to realize a variable band"). In the combination, the claimed "variable band" is the variable bandwidth channel consisting of the 2.5, 5, 10, and 20 MHz bands of Hwang. In Dr. Akl's figure, the central white portion is the base mode portion of the variable band, and the entire height (the central white portion plus the blue and green boxes) represents a wider bandwidth available in the variable band for mobile stations that can support it.

Patent Owner additionally argues that Dr. Akl originally located the map burst block at the edge of the frame bandwidth, but then changed position, locating the map burst block in the middle of the bandwidth.

See Mot. to Exclude Reply 2–3. We find this unpersuasive because, in each case, the map burst block is located at the “beginning” of the bandwidth that is usable by the mobile station with which the base station is communicating. We thus do not agree Dr. Akl’s position on that changed.

Because we find that paragraph 31 does not propose a new invalidity theory, we decline to exclude it.

2. *Paragraph 35 of the Supplemental Declaration*

Patent Owner argues that paragraph 35 of Dr. Akl’s Supplemental Declaration should be excluded because his “Original Declaration failed to address how his proposed modifications to Hwang’s downlink subframe would affect Hwang’s uplink subframe.” Mot. to Exclude 8.

This argument is also not persuasive. The original declaration did not need to address uplink because the claims do not have limitations concerning uplink. That issue was first raised by Patent Owner in the Response (*see* PO Resp. 25–30), and it was appropriate for Dr. Akl to then respond. Moreover, as with the map burst location block, we conclude that there is not a problem with the location of the ranging subchannel when the combination is properly understood, because it clearly contemplates the base station and mobile station communicating in an operating mode that each can use.

For these reasons, we decline to exclude paragraph 35 of Dr. Akl’s Supplemental Declaration.

3. *Hwang*

Patent Owner argues that Hwang must be excluded because it is not properly authenticated. *See* Mot. to Exclude 4–5. We do not agree.

Fed. R. Evid. 901(a), which governs authentication, requires that the proponent “produce evidence sufficient to support a finding that the item is

what the proponent claims it is.” Notably, “[t]he burden of proof for authentication is slight.” *Lexington Ins. Co. v. W. Pennsylvania Hosp.*, 423 F.3d 318, 328 (3d Cir. 2005).

Mr. Schwartz testified that “[t]he IEEE 802.16 Working Group is a public forum for collaboration and development of ideas among interested parties to develop standards and recommended practices to support the development and deployment of broadband Wireless Metropolitan Area Networks.” Ex. 1010 ¶ 4. He explained that the working group “organized meetings periodically in conjunction with other IEEE 802 groups,” and that “[a]s a matter of general practice, the . . . meetings that were organized were open to members and the general public.” *Id.* ¶ 5.

He further testified that “[a]s a matter of general practice, documents and contributions were submitted before or during the IEEE 802.16 Working Group meetings,” and that “[d]uring the . . . meetings, each of the submitted documents and contributions was presented, discussed, and when required, action was taken to determine the acceptance or viability of the contribution to the standard.” *Id.* ¶ 6. He explained how “[d]ue to the high volume of documents and contributions submitted, physical ‘paper’ copies were not handed out” but that, instead, “the documents and contributions were made electronically available for download to attendees . . . by way of the IEEE 802.16 website.” *Id.* ¶ 7. “The documents and contributions were not subject to any confidentiality and could be freely disseminated by attendees to other interested persons of skill that had not attended the meetings.” *Id.*

Mr. Schwarz described how, “during and after the IEEE 802.16 Working Group meetings, the submitted documents were publicly accessible on the IEEE 802.16 website” and that “[a]ny members that were not in

attendance at that session, or any other interested members of the general public, could also freely access and download submitted documents and contributions without restrictions on dissemination, in real time, similar to the access afforded the actual attendees of the work sessions.” Ex. 1010 ¶ 8.

He further explained that “[b]ased on [his] experience with IEEE and the telecommunications industry, [he] would expect any person implementing a cellular network or device, e.g., a UMTS network, to consult the corresponding Session Reports on the IEEE reports page, as well as other related documents,” as “[t]he whole purpose of IEEE’s online database hosting and making these reports available was so that engineers and other individuals would have ready access to them when developing and implementing cellular networks and devices.” Ex. 1010 ¶ 10.

Mr. Schwartz then described the Session #30 meeting, which he attended, and identified and attached documentation supporting his description of how Hwang was made publicly available before and during the Session #30 meeting. *See* Ex. 1010 ¶¶ 12–21.

We find Mr. Schwartz’s detailed testimony about the public availability of Hwang sufficient to authenticate Ex. 1004, as it is essentially uncontested, is corroborated by documentation, and also is corroborated by the fact that a copy of a document that appears identical to Ex. 1004 is still available on the IEEE website.⁸ There is simply no reason to think that Hwang is not what it appears to be.

Patent Owner argues “Petitioner must show that Ex. 1004 is a true and correct copy of the submission allegedly made by Hwang on March 11,

⁸ *See* https://www.ieee802.org/16/tgd/contrib/C80216d-04_19.pdf.

2004” and that Mr. Schwartz “failed to testify in his Declaration that Ex. 1004 is a true and correct copy of the document allegedly submitted by Hwang on March 11, 2004.” Mot. to Exclude 11. This is not persuasive because authentication does not require testimony about the document being a “true and correct copy.”

Patent Owner also argues that “Mr. Schwartz lacks the foundational knowledge required to authenticate Ex. 1004, because he didn’t review the document at the time and cannot even say whether or not he was at the meeting where Ex. 1004 was allegedly discussed.” Mot. to Exclude 13. We find this argument unpersuasive because the law does not require a witness who personally reviewed the document contemporaneously or attended a meeting at which it was discussed. We conclude that the Schwartz testimony is “sufficient to support a finding that the item is what the proponent claims it is.”

Patent Owner additionally argues that Hwang should be excluded because the document includes broken references (e.g., “Error! Reference source not found”) and drawings that are difficult to read. *See* Mot. to Exclude 13–14. We find this unpersuasive because Petitioner is not relying on the problematic parts of the reference, and Patent Owner does persuade us that the alleged “irregularities” might tend to show that Hwang is not authentic.

For these reasons, Patent Owner’s motion to exclude Hwang is denied.

F. Obviousness in view of Hwang and McFarland

In view of the arguments made by the parties, we focus on the independent claims.

For claim 6, Petitioner argues that Hwang discloses a variable bandwidth communication method in which a mobile station receives synchronization information. *See* Pet. 29. For the “core band,” Petitioner relies on McFarland’s teachings concerning its “base mode” and argues that it would have been obvious to center the core-band at an operating center frequency. *See id.* at 34–39. Petitioner further argues that Hwang teaches subcarrier groups with fixed spaced subcarriers, and that the number of usable subcarriers would be adjustable depending on the bandwidth to realize a variable band. *See id.* at 39–42. Petitioner contends that McFarland’s base mode (the “core band”) would be not greater than the smallest operating bandwidth and would be the same for all operating bandwidths. *See id.* at 42–43. Petitioner then argues that Hwang discloses how the mobile station and base station would be synchronized using the synchronization information, and that the mobile station would receive control and data channels using the variable band. *See id.* at 43–46.

For claims 11 and 25, Petitioner argues that Hwang teaches a mobile station that receives broadcast information carried by groups of subcarriers each having a plurality of contiguous subcarriers and that, as taught in McFarland, the broadcast information would have been in a first band having a first bandwidth. *See* Pet. 49–52. Petitioner argues that the combination would have circuitry configured to determine a second band with a greater bandwidth based upon the broadcast information in the first band, and that the first band would be within the second band. *See id.* at 53–

56. Petitioner argues that the combination would include a data channel carried by a subcarrier group of the second band, that the plurality of contiguous subcarriers would have a fixed spacing, and that a number of usable subcarriers would be adjustable to realize a variable band based on a plurality of operating channel bandwidths. *See id.* at 56–58. Finally, Petitioner contends that the first band would have a bandwidth not greater than a smallest operating channel bandwidth and have the same value for all of the operating channel bandwidths. *See id.* at 58–59.

Regarding a motivation to modify Hwang to use McFarland’s base mode, Petitioner asserts that the base mode would have allowed “[mobile stations] having limited capabilities (e.g., lack of support for the larger system bandwidths) [to] function in Hwang’s system.” Pet. 34. Petitioner cites McFarland’s teachings that “[b]roadcast messages, or any other messages that need to be received by multiple [mobile stations], must be transmitted in a mode that all [mobile stations] to which they are directed are able to receive,” i.e., the “base mode” and that “[w]ithin that header would be an indication of which mode the remainder of the packet will be in,” so the mobile station could “quickly switch modes to receive the remainder of the packet.” *Id.* at 35 (quoting Ex. 1005 ¶ 60).

Patent Owner makes three arguments against the combination. First, that, for three reasons, it would not have been obvious to combine Hwang and McFarland (*see* PO Resp. 11–30); second, that Petitioner has not shown a reasonable expectation of success (*see id.* at 30–37); and, third, that Petitioner has not shown that the copy of Hwang made of record in this proceeding is a true and correct copy of the March 11, 2003 submission to IEEE (*see id.* at 38–47). We address these arguments in the order presented.

1. *The Combination*

Patent Owner first argues that Hwang uses the “AAS” mode of IEEE 802.16d and that, in such systems, the “the preamble is used to perform initial channel estimation.” PO Resp. 12–13. Patent Owner then argues that “[i]n the proposed modified frame structure, the preamble is transmitted using only the subcarriers in the ‘base mode’” and “[a]s a result, channel estimation based on the preamble will be foreclosed” for subcarriers that fall outside the base mode. *Id.* at 15–16 (citing Ex. 2015 ¶ 41). Patent Owner concludes that one of skill in the art “would not modify the unified frame structure of Hwang using the ‘base mode’ of McFarland” because “the modified preamble would severely degrade reception of the remainder of the frame” and would “degrade the CQI reporting.” *Id.* at 16–17.

Petitioner responds that channel estimation could be performed without using the preamble and that, in fact, “there was a plethora of ways to do so,” identifying several references describing different techniques. Reply 6 (citing Ex. 1020 ¶ 25; Ex. 1030; Ex. 1034; Ex. 1035; Ex. 1037).

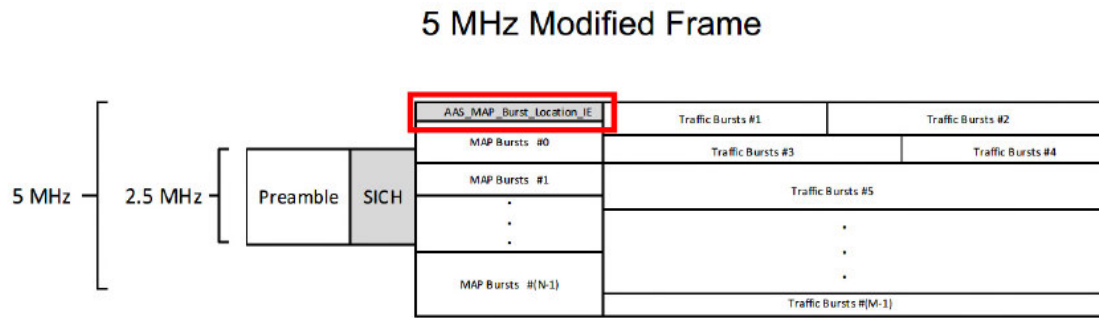
Patent Owner replies that Petitioner fails to provide “any motivation in Hwang or McFarland to deviate from the preamble-based channel estimation methodology used in the 802.16 Standard that Hwang was explicitly designed to fit into.” Sur-reply 18. At the hearing, Patent Owner did not dispute that there were ways to perform channel estimation that did not use the preamble. *See* Tr. 31:13–21.

We are unpersuaded by Patent Owner’s argument because the record reflects (as Patent Owner acknowledges) that there are other ways to perform channel estimation that do not use the preamble. In particular, the Dowler and Chang references describe the use of the data portion of the

frame for channel estimation. *See* Ex. 1034, 804; Ex. 1037, 791; Ex. 1038 ¶¶ 26–27. We conclude that one of ordinary skill in the art desiring to take advantage of McFarland’s teachings about beginning in a base mode and then switching to a higher bandwidth operating mode would have understood the need to use an available different (or additional) method of channel estimation that did not rely on the preamble for the portion of the communication using the enlarged bandwidth.

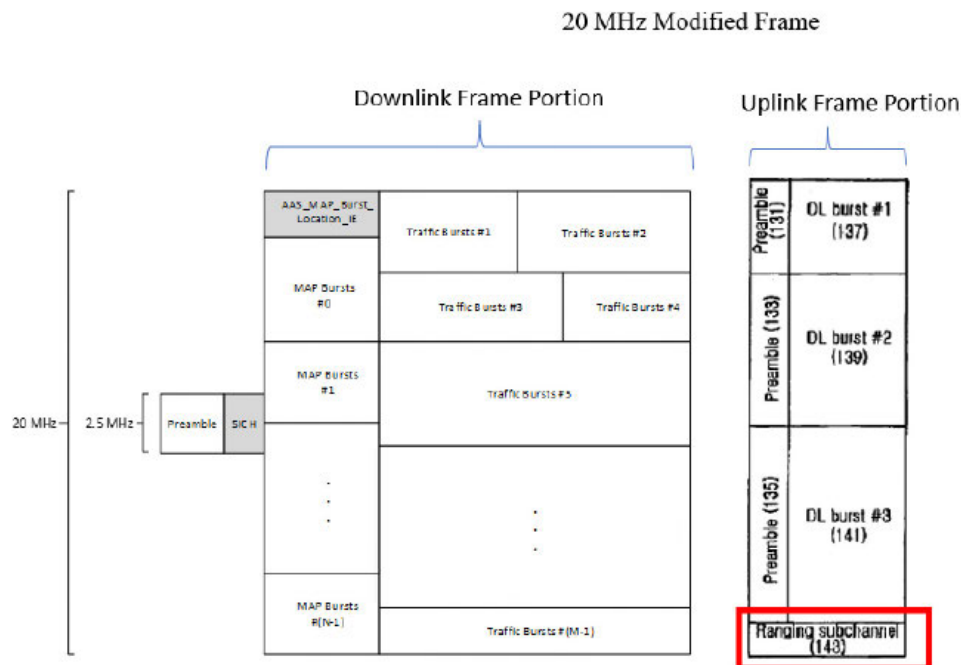
Patent Owner’s reliance on the statement in the standard that the preamble “shall” be used for channel estimation is insufficient because the standard does not require that *only* the preamble be used for channel estimation. The standard provides for using the preamble to perform channel estimation for that bandwidth, but does not preclude the use of other methods for estimation if the base station and mobile station agree to switch to a wider bandwidth supported by the mobile station.

Patent Owner also argues that the combination is flawed because mobile stations operating in the base mode would be unable to read the map burst location data and the ranging subchannel information because both would fall outside the limited bandwidth at which the mobile station can operate. *See* PO Resp. 17–37. Patent Owner illustrates the argument for the map burst location block with the following figure (*see id.* at 19), asserting that a 2.5 Mhz mobile station would not be able to read the block shown in the red box:



Patent Owner’s Drawing of a “5 MHz Modified Frame”

Patent Owner offers the following illustration (*see id.* at 28) that purports to show how a 2.5 MHz mobile station similarly would not be able to read the Ranging Subchannel information shown in the red box:



Patent Owner’s Drawing of a “20 MHz Modified Frame”

The primary problem with both of these arguments is that they are inconsistent with Petitioner’s proposed combination, because a mobile station that was limited to a 2.5 MHz bandwidth would not be trying to read

downlink or uplink data that falls outside the 2.5 MHz bandwidth. In the combination, a narrow preamble readable by all mobile stations would be transmitted first, and mobile stations would then operate in the network according to their bandwidth capabilities. *See* Pet. 36 (explaining that “the transmission of the header in the base mode [would ensure] that all [mobile] stations—even those with the most limited bandwidth capability [would be] able to receive the header information used to synchronize with the network”); *id.* at 37 (asserting that one of ordinary skill in the art “would have found it obvious to modify Hwang to provide the ‘header’ portion of Hwang’s frame . . . within the base mode (i.e., 2.5 MHz system bandwidth) and the remainder of the frame within an operating mode (i.e., one of 2.5, 5, 10, or 20 MHz))” (quoting Ex. 1003 ¶ 126); Ex. 1003 ¶¶ 126–131. Thus, the legacy 2.5 MHz mobile station would be communicating with the base station at 2.5 MHz both for the preamble and in its (only) operating mode.

Patent Owner’s annotated figures reproduced above do not accurately depict how the combination would operate in the case of a 2.5 MHz mobile station, because that mobile station can only operate at 2.5 MHz and, thus, the base station would not be trying to communicate with the mobile station at 5 or 20 MHz. Those figures more accurately depict what might happen in the case of a 5 MHz mobile station and 20 MHz mobile station, respectively. In the first figure, the 5 MHz mobile station could read the preamble in the 2.5 MHz band and then switch to 5 MHz, where it could read the map burst location block that falls within the 5 MHz bandwidth. Similarly, in the second figure, the 20 MHz mobile station could read the preamble in the 2.5 MHz band and then switch to 20 MHz, after which it could read the ranging subchannel data because it falls within the 20 MHz bandwidth.

Patent Owner contends that “[d]uring Dr. Akl’s deposition, it became apparent that the modification of Hwang proposed in his Declaration failed to account for the location of the AAS_MAP_Burst_Location_IE outside of the 2.5MHz bandwidth” and that “Dr. Akl attempted to deal with this deficiency by proposing further ad hoc modifications to Hwang that were not set forth in his Declaration (and not suggested by McFarland).”

PO Resp. 22. Patent Owner asserts that “Dr. Akl’s New Invalidity theory marks a significant shift in theory, and exceeds the scope of a proper reply.”
Sur-reply 23.

We are not persuaded by this argument because, as explained above (*see* Section II.E.1), we do not agree that there is a new invalidity theory. The proposed combination does not contemplate a base station trying to communicate with a mobile station at a bandwidth the mobile station does not support, and we agree that it would have been obvious to one of ordinary skill in the art that the map burst location block for map bursts intended to be received by a given mobile station would need to be within the bandwidth the mobile station could receive. For example, if the base station was communicating with a mobile station limited to 2.5 MHz, the map burst location block (and all the other data) would have to be found within the 2.5 MHz band.

For these reasons, we are unpersuaded by Patent Owner’s arguments concerning the motivation to combine.

2. *Expectation of Success*

Patent Owner argues that “Petitioner practically ignores its burden of establishing a reasonable expectation of success with respect to the proposed combination of Hwang and McFarland” as “[n]either the Petition nor the

declaration from Dr. Akl analyzed whether the skilled artisan would have had a reasonable expectation of success in modifying Hwang's structure such that only a subset of carriers grouped at the centered overall bandwidth were used for the preamble and SICH, while a larger set of subcarriers covering the entire bandwidth was used for data bursts." PO Resp. 30.

Patent Owner contends that "Petitioner and its expert fail to put forward any evidence to demonstrate how this proposed reconfiguration or combination would work together" and that "[t]he Board cannot assume, without evidence, that there is a reasonable expectation that Hwang and MacFarland could be successfully combined as alleged in the Petition." *Id.* at 30–31 (citing *Juniper Networks, Inc. v. Correct Transmission, LLC*, IPR2021-00682, Paper 26, at 20 (PTAB October 3, 2022)).

However, Patent Owner acknowledges that the Petition *did* address whether there would have been a reasonable expectation of success, as follows:

A POSITA would have had a reasonable expectation of success in modifying Hwang in this way, since . . . McFarland's operating modes (i.e., number of subcarriers and subcarrier spacing) correspond to Hwang's system bandwidths. Similarly, McFarland's base mode corresponds to the 2.5 MHz system bandwidth (256 FFT size and 216 useable subcarriers) of Hwang. That is, based on McFarland's receiver method, a subscriber station that supports any one of Hwang's system bandwidths will necessarily support the 2.5 MHz bandwidth. Akl, ¶ 126 (citing Hwang, Table 1, Fig. 6; McFarland, [0063]). (Pet., at 36).

* * *

. . . Because implementing the "core band" (McFarland's "base mode") at a substantially centered operating frequency is both (1) simplifying and (2) consistent with the described techniques

of Hwang and McFarland, a POSITA would have had a reasonable expectation of success in doing so.

PO Resp. 34 (quoting Pet. 39); *see also* Ex. 1003 ¶¶ 135–38.

Patent Owner’s specific complaints are that the Petition “fails to acknowledge (let alone explain away)”: (1) “the importance of channel estimation in OFDMA systems [and] the use of preamble information . . . for performing channel estimation in OFDM systems”; (2) “the fact that the proposed combination would result in large contiguous blocks of subcarriers . . . which would have no preamble/SICH information for performing the required channel estimation”; and (3) “the fact that processing frame will completely break down for subscriber stations operating at the 2.5Mhz base mode of the modified Hwang system as a result of their inability to read the [map burst location and ranging subchannel blocks].” PO Resp. 33–35.

Issues (1) and (2) are insufficient to suggest that the combination would not be successful because, as explained above, the record shows that there are other ways of performing channel estimation, including by using the data blocks, and issue (3) is insufficient to suggest that the combination would not be successful because, as also explained above, there is no concern about “break down” for 2.5 MHz mobile stations because the base station would not be seeking to communicate with them at a bandwidth broader than they support.

We also conclude that this case bears little resemblance to the non-precedential *Juniper Networks* case cited by Patent Owner, as, in that case, “‘Petitioner never mentioned any reasonable expectation of success’ in the Petition.” IPR2021-00682, Paper 26, at 22. Here, Patent Owner acknowledges that the Petition addressed the expectation of success.

We agree with Petitioner that one of ordinary skill in the art would have understood there to be a reasonable expectation of success because the combination is, essentially, just using the variable bandwidths of Hwang but starting with the narrow bandwidth that all mobile stations could receive, as taught by McFarland. Petitioner has shown this to be a straightforward combination of the teachings of these references, and Patent Owner does not identify any technical impediment that would suggest the combination might not be successful.

3. *Legitimacy of Hwang*

Patent Owner argues Petitioner cannot show that Ex. 1004 is a true and correct copy of the 2004 IEEE submission because it has “several significant irregularities,” including that “two of the figures . . . are almost completely illegible” and that “the description of Hwang’s Preamble . . . is missing.” PO Resp. 38–39. Patent Owner also argues that “[i]n order to authenticate Ex. 1004, Petitioner must show that [it] is a true and correct copy of the submission allegedly made by Hwang on March 11, 2004” and that “Mr. Schwartz lacks the foundational knowledge required to authenticate Ex. 1004, because he didn’t review the document at the time and cannot even say whether or not he was at the meeting where Ex. 1004 was allegedly discussed.” PO Resp. 43, 46–47.

We find these arguments unpersuasive for the reasons discussed above in connection with Patent Owners’ Motion to Exclude. *See* Section II.E.3. Petitioner does not rely on the portions of the reference that are allegedly irregular and Patent Owner does not explain how the alleged problems might impact the patentability analysis.

4. *Unpatentability Conclusion*

Because we agree with Petitioner’s unpatentability analysis for the independent claims, which we adopt, and find Patent Owner’s arguments unpersuasive, we conclude that Petitioner has shown independent claims 6, 11, and 25 unpatentable. We also agree with and adopt Petitioner’s analysis regarding dependent claims 7–9, 13, 14, 18, 22–24, 27, 28, 32, and 36–38 (*see* Pet. 47–49, 59–63), for which Patent Owner does not make separate arguments, and thus conclude that Petitioner has shown those dependent claims unpatentable as well.

The results are summarized below:

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
6–9, 11, 13, 14, 18, 22–25, 27, 28, 32, 36–38	103	Hwang, McFarland	6–9, 11, 13, 14, 18, 22–25, 27, 28, 32, 36–38	
6–9	103	Hwang, McFarland, Miyoshi ⁹		
Overall Outcome			6–9, 11, 13, 14, 18, 22–25, 27, 28, 32, 36–38	

⁹ In Ground 2, Petitioner added Miyoshi for claims 6–9 “[t]o the extent it is argued that Hwang and McFarland fail to teach ‘wherein the core-band is substantially centered at an operating center frequency.’” Pet. 63. Because Patent Owner did not make that argument, and because we agree that it would have been obvious to center the core-band at an operating center

III. ORDER

For the reasons given, it is:

ORDERED that claims 6–9, 11, 13, 14, 18, 22–25, 27, 28, 32, and 36–38 of U.S. Patent No. 8,953,641 B2 are unpatentable under 35 U.S.C. § 103 as obvious; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.¹⁰

frequency, we need not reach Ground 2.

¹⁰ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

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