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Paper 24
Entered: February 8, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC. AND TELEFONAKTIEBOLAGET LM ERICSSON,
Petitioner,

v.

INTELLECTUAL VENTURES II LLC,
Patent Owner.

Cases IPR2015-01664
Patent 7,787,431 B2

Before JAMESON LEE, JUSTIN BUSCH, and J. JOHN LEE,
Administrative Patent Judges.

BUSCH, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Ericsson Inc. and Telefonaktiebolaget LM Ericsson ("Petitioner") filed a Petition, Paper 2 ("Petition" or "Pet."), requesting an *inter partes* review of claims 8–12 and 18–22 ("the challenged claims") of U.S. Patent No. 7,787,431 B2, Ex. 1001 ("the '431 patent"). On February 11, 2016, we instituted an *inter partes* review of the challenged claims. Paper 7

("Institution Decision" or "Dec."). Intellectual Ventures II LLC ("Patent Owner") filed a Patent Owner Response ("PO Resp.") on May 9, 2016. Paper 13. Petitioner filed a Reply. Paper 15 ("Reply"). An oral hearing was held on October 6, 2016.[1]

We have jurisdiction 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, we determine Petitioner has not shown by a preponderance of the evidence that claims 8–12 and 18–22 are unpatentable.

B. Related Proceedings

The parties indicate the '431 patent is at issue in ten district court proceedings involving numerous parties. Pet. 1; Paper 5, 2–3. The '431 patent also was the subject of another *inter partes* review: IPR2014-01195 ("1195 IPR"). Pet 1; Paper 5, 3. The petition in the 1195 IPR challenged claims 1, 2, 8–12, and 18–22. 1195 IPR, Paper 2, 1. The Board instituted review of claims 1 and 2, but did not institute review of claims 8–12 and 18–22 in the 1195 IPR. 1195 IPR, Paper 11, 18. The Board held claims 1 and 2 to be unpatentable. 1195 IPR, Paper 37, 27.

C. The '431 Patent

The '431 patent relates to multi-carrier communication systems and methods with variable channel bandwidth. Ex. 1001, Abstract.

The challenged claims recite methods performed by base stations for generating information-bearing signals, wherein the information-bearing signals include a primary preamble having certain properties. *Id.* at 9:33–10:9, 11:54–12:27, 13:4–47.

[1] The record includes a transcript of the oral hearing. Paper 23 ("Tr.").

D. Illustrative Claim

Of the challenged claims, claims 8 and 18 are independent. Claim 8 is illustrative and reproduced below:

> 8. A cellular base station comprising:
>
> circuitry configured to transmit a broadcast channel 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, wherein each subcarrier group includes a plurality of subcarriers, wherein the core-band is utilized to communicate a primary preamble sufficient to enable radio operations, the primary preamble being a direct sequence in the time domain with a frequency content confined within the core-band or being an OFDM symbol corresponding to a particular frequency pattern within the core-band,
>
> wherein properties of the primary preamble comprise:
>
> an autocorrelation having a large correlation peak[2] with respect to sidelobes;
>
> a cross-correlation with other primary preambles having a small cross-correlation coefficient with respect to power of other primary preambles; and
>
> a small peak-to-average ratio; and
>
> wherein a large number of primary preamble sequences exhibit the properties; and
>
> circuitry configured to transmit control and data channels using a variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band.

[2] A certificate of correction was issued on August 31, 2010, to replace the word "creak" with the word "peak." Ex. 1001, 20.

E. The Evidence Relied Upon By Petitioner

Petitioner relies upon the following prior art references as its basis for challenging claims 8–12 and 18–22 of the '431 patent.[3]

Reference	Patents/Printed Publications	Exhibit
Dulin	U.S. Patent Pub. 2002/0055356 A1 (May 9, 2002)	1002
Zhuang	U.S. Patent No. 7,426,175 B2 (September 16, 2008)	1004
Yamaura	U.S. Patent No. 7,782,750 B2 (August 24, 2010)	1003
Hwang	I. Hwang et al., *A New Frame Structure for Scalable OFDMA Systems,* (March 11, 2004)	1005

1. Dulin (Ex. 1002)

Dulin describes systems and methods for scheduling and synchronizing data transmission between base stations and subscriber units (or terminal stations). Ex. 1002, Abstract. One aspect of Dulin describes generating a frame map that is sent to subscriber units to inform the subscriber units which subscriber units are authorized to send or receive a transmission in each frequency block and time slot. *Id.* ¶ 65.

2. Yamaura (Ex. 1003)

Yamaura describes a method, and apparatuses for implementing the method, of radio communication "for exchanging information between a base station and a terminal station." Ex. 1003, Abstract. The described method communicates multi-carrier signals using OFDM modulation, "including plural subcarriers within a bandwidth, communicating control signals in addition to the information between the base station and the terminal station, and wherein part of the control signals . . . is transmitted by

[3] Petitioner also proffers the Declarations of Zygmunt J. Haas, Ph.D. *See* Exs. 1012, 1020. Other testimony relied on in this proceeding are the Declaration of Kenneth Zeger, Ph.D., Ex. 2001; the deposition testimony of Dr. Zeger, Ex. 1018; and the deposition testimony of Dr. Haas, Ex. 2003.

one or more specific subcarriers in the bandwidth for the multi-carrier signals." *Id.*

3. Zhuang (Ex. 1004)

Zhuang describes optimizing the auto-correlation properties of each pilot signal, and the cross-correlation properties between pilot signals, through the use of certain chirp sequences. Ex. 1004, 2:7–29.

4. Hwang (Ex. 1005)

Hwang describes a new frame structure and carrier-allocation methods that an OFDM-modulated system can implement to improve system performance under scalable bandwidth. Ex. 1005, 1. Hwang describes system parameters for implementing an OFDMA system that scales its operating channel bandwidth from 2.5 MHz to 20 MHz. *Id.* at 2–3. Hwang further describes grouping subcarriers into bins as a basic allocation unit of subcarriers to a channel. *Id.* at 3–4, 8.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms of an unexpired patent are given their broadest reasonable interpretation in light of the specification in which they appear and the understanding of others skilled in the relevant art. *See* 37 C.F.R. § 42.300(b); *In re Cuozzo Speed Techs., LLC,* 793 F.3d 1268, 1275–79 (Fed. Cir. 2015). Applying that standard, we interpret the claim terms of the '431 patent according to their ordinary and customary meaning in the context of the patent's written description. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (quoting *Philllips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)).

The parties propose the same or similar constructions for "core-band," "primary preamble," and "peak-to-average ratio." *See* Pet. 22–24; PO Resp. 10–12; Reply 2. Additionally, Petitioner does not dispute Patent Owner's proposed constructions for "first plurality of subcarrier groups," "second plurality of subcarrier groups," and "control and data channels." PO Resp. 13, 16–21; Reply 3.

The parties dispute the proper construction of "transmit[ting] a broadcast channel in an" OFDMA core-band and "variable band." We construe only those claim terms in controversy, and we do so only to the extent necessary to resolve the controversy. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). Thus, we explicitly construe only the phrase "transmit[ting] a broadcast channel in an" OFDMA core-band.

In the Institution Decision, we provided a partial preliminary construction of "transmit[ting] a broadcast channel in an orthogonal frequency division multiple access (OFDMA) core-band." Dec. 11. In particular, we indicated that "the plain meaning of transmitting a broadcast channel in a core-band merely requires transmitting some part of the broadcast channel in a core-band and does not exclude transmitting another part of the broadcast channel outside the core-band." *Id.* Patent Owner disagreed with that preliminary determination, arguing that an ordinarily skilled artisan would have understood the limitation to *exclude* transmitting any portion of the recited broadcast channel outside of the core-band. PO Resp. 35–36 (citing Ex. 2001 ¶ 57). Patent Owner further argued our preliminary construction is inconsistent with the stated purpose of the '431 patent. *Id.*

We note Petitioner neither agrees with our preliminary statement in the Institution Decision nor disputes Patent Owner's assertion that our statement was incorrect. Pet. Reply 3–5. Petitioner's argument regarding the proper construction of the transmitting a broadcast channel limitation merely asserts that Patent Owner's proposed construction adds no clarity and that no construction is necessary. *Id.* Petitioner then notes that Patent Owner mischaracterizes the prior art because "the prior art demonstrates a broadcast channel contained *within* the limits of an OFDMA core-band." *Id.* at 5 (emphasis added). We understand Petitioner's assertion to be related to its position that Yamaura does not transmit signals outside its narrow band during the BCH and FCH time slots. *See id.* at 5, 9–15.

Patent Owner argues the challenged claims explicitly recite transmitting a broadcast channel *in* a core-band, which is the opposite of transmitting the broadcast channel *outside* the core-band. PO Resp. 35. The '431 patent explains that "specific signaling and control methods are required" in order to facilitate operation of the user terminals in a variable bandwidth system. Ex. 1001, 4:63–6:32. The '431 patent describes the use of its core-band to transmit its radio control and operation signaling. *Id.* at 4:66–67, 5:8–18 (explaining that certain control signals are transmitted in the core-band to allow the terminals "to maintain basic radio operation" prior to switching "to the normal full-bandwidth operation"). Patent Owner explains the purpose of transmitting the broadcast channel in the "core-band is to provide essential radio control channels and a set of data channels in a core-band to maintain basic radio operation." *Id.* at 36 (citing Ex. 1001, 5:8–13). Patent Owner asserts restricting transmission of the broadcast channel to the core-band allows mobile stations in a variable operating

channel bandwidth system to use only the core-band to initiate communications with a base station, obtain essential information, and transition to a full bandwidth state to actively communication. *Id.* (citing Ex. 1001, 5:15–18, Abstract).

Dr. Zeger testifies an ordinarily skilled artisan would understand that "any part of the broadcast channel not transmitted within the core-band is necessarily transmitted within the side-band." Ex. 2001 ¶ 57; *see* PO Resp. 35. Dr. Zeger further states that a construction encompassing transmission of part of a broadcast channel in the core-band and part of the broadcast channel outside the core-band is inconsistent with the plain language of the claims and the purpose of the '431 patent. Ex. 2001 ¶¶ 56, 57; *see* PO Resp. 35. Dr. Zeger testifies that the purpose of the '431 patent would therefore be frustrated if part of the broadcast channel is transmitted outside of the core-band, because the mobile stations would not receive all of the necessary broadcast channel information, preventing those stations from switching to a full bandwidth state of operation. Ex. 2001 ¶ 57; PO Resp. 36. Petitioner provides no rebuttal in regard to Dr. Zeger's testimony and Patent Owner's arguments that the recited broadcast channel must be transmitted using only the core-band.

Upon further review of the '431 patent, particularly in view of Patent Owner's arguments supported by Dr. Zeger's testimony discussed above, we are persuaded that our preliminary partial construction was unreasonably broad to the extent that construction indicated the transmitting a broadcast channel limitation would be met by the transmission of a broadcast channel that is only partially within the core-band. Thus, we agree with Patent Owner that to show that the transmitting "a broadcast channel in an"

OFDMA core-band limitation is met, Petitioner must demonstrate that the prior art teaches or suggests transmitting a broadcast channel, wherein the entire channel is contained within the core-band.

B. Obviousness Challenge of Claims 8–12 and 18–22

Petitioner contends the challenged claims are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Dulin, Yamaura, Zhuang, and Hwang. Pet. 25–60; Reply 9–29. Relying on the testimony of Dr. Haas, *see* Ex. 1012, Petitioner explains how the references allegedly teach the claim limitations, and argues a person of ordinary skill in the art would have combined Dulin, Yamaura, Zhuang, and Hwang. Pet. 25–60 (citing Ex. 1012); Reply 9–29 (citing Ex. 1012).

Patent Owner contends the proposed combination fails to teach or suggest "transmit[ting] a broadcast channel in an orthogonal frequency division multiple access (OFDMA) core-band," PO Resp. 27–37, and "transmitting control and data channels using a variable band including a second plurality of subcarrier groups," *id.* at 37–46, as recited in independent claims 8 and 18. Patent Owner also asserts an ordinarily skilled artisan would not have combined Dulin, Yamaura, Zhuang, and Hwang. PO Resp. 47–63. Patent Owner provides no separate arguments for the patentability of dependent claims 9–12 and 19–22, which depend from claims 8 and 18, respectively. *See id.* at 1–2, 26, 26 n.3.

We have reviewed the Petition, Patent Owner Response, Petitioner's Reply, and the relevant evidence discussed therein. We determine Petitioner has failed to demonstrate that the proposed combination teaches transmitting "a broadcast channel in an" OFDMA core-band, as recited in independent claims 8 and 18 for the reasons that follow. Accordingly, we determine

Petitioner has not shown, by a preponderance of the evidence, that the challenged claims would have been obvious in view of the asserted combined teachings of Dulin, Yamaura, Zhuang, and Hwang.

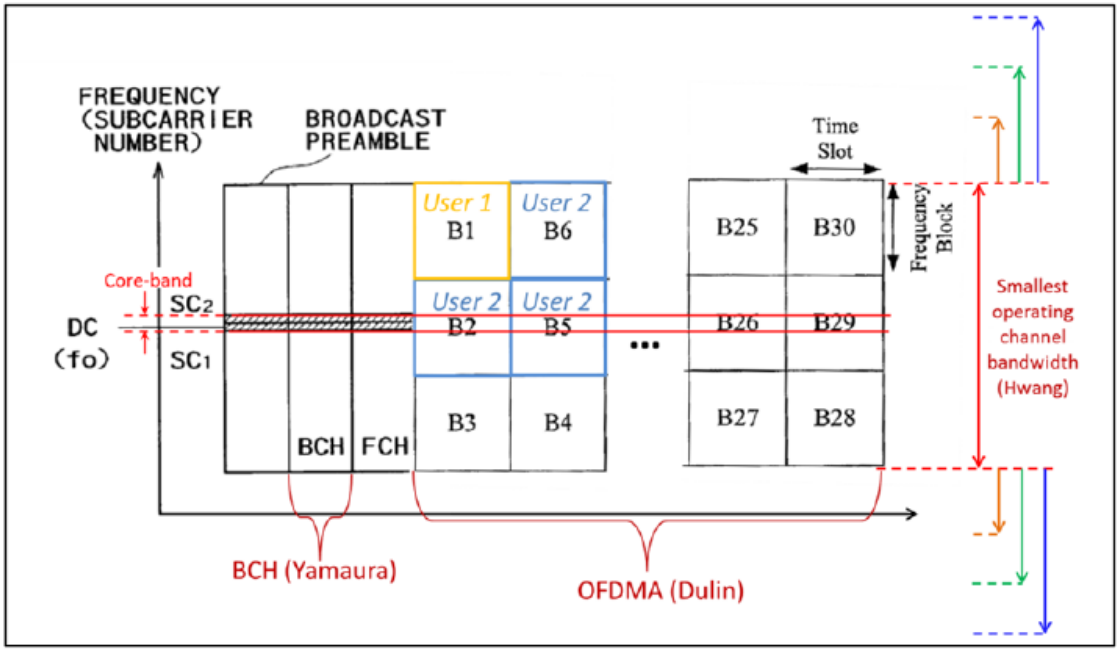
Petitioner asserts Dulin, Yamaura, and Hwang teach or suggest "transmitting a broadcast channel in an Orthogonal Frequency Division Multiple Access (OFDMA) core-band," as recited in claim 18, and circuitry configured to do the same, as recited in claim 8. Pet. 27–36, 57. Specifically, Petitioner argues Dulin discloses a base station with a transceiver configured to transmit employing frequency division multiple access (FDMA) using orthogonal frequency division multiplexing (OFDM), which "is equivalent to . . . OFDMA." *Id.* at 27 (citing Ex. 1012 ¶ 48).

Petitioner argues Yamaura, like Dulin, discloses a base station transmitting using OFDM, and that Yamaura discloses transmitting "a broadcast channel including control signals." *Id.* (citing Ex. 1003, 21:27–32, Fig. 2; Ex. 1012, 66–68). Petitioner further explains that Yamaura "transmits control signals to the terminal stations via broadcast bursts that include broadcast channels (e.g., BCH, FCH, either of which individually are 'broadcast channels')," and that BCH and FCH are "transmitted in a frequency segment that is not greater than . . . the operating bandwidth of Yamaura's system." *Id.* at 27–28 (citing Ex. 1003, 1:64–2:9; Ex. 1012 ¶¶ 65–68); *see* Pet. Reply 9–15. Petitioner asserts that Yamaura discloses using *only* the narrow band during the broadcast preamble, BCH, and FCH time slots, and transmits other control signals using the entire operating bandwidth during the ACH time slot. Pet. Reply 9 (citing Ex. 1012, 63–80; Ex. 1020 ¶¶ 11–13), 11–12. Petitioner concludes that Yamaura's transmission of control signals in BCH and FCH, which are transmitted in a

narrow band, discloses base station circuitry configured to transmit a broadcast channel in a narrow band. Pet. 28.

Finally, Petitioner contends Hwang discloses scalable operating channel bandwidths in OFDMA systems by varying subcarriers used. *Id.* at 29–30 (citing Ex. 1005, Table 1; Ex. 1012 ¶¶ 85, 86). Petitioner argues Yamaura's operating bandwidth could, therefore, be scaled based on Hwang's teachings, while still transmitting its control signals in a narrow band that is narrower than any of the operating bandwidths disclosed in Hwang, which teaches or suggests a core-band, as recited in the challenged claims. *Id.* at 30.

In sum, Petitioner contends the proposed combination teaches variable operating channel bandwidths according to Hwang, wherein the selected operating channel bandwidth may be divided into frequency blocks when transmitting data according to Dulin, but transmission of certain control signals is constrained to a narrow band according to Yamaura, where the narrow band is centered at the operating channel frequency and smaller than the smallest operating channel bandwidth according to Yamaura and Hwang. Pet. 31. Petitioner's annotated figure from Yamaura, indicating how the cited teachings from Dulin, Yamaura, and Hwang would have been combined is reproduced below:



Pet. 31 (depicting Petitioner's proposed combination, including elements and information from Yamaura Figure 17, Dulin Figure 13A, and Hwang Table 1).

Patent Owner argues "BCH and FCH span the entire width of Yamaura's 20 MHz transmission channel, as does ACH, which is not even shown to include a narrow-band." PO Resp. 30 (citing Ex. 1003, Fig. 17). Patent Owner contends Yamaura's narrow band within the BCH and FCH portions of a frame are transmitting only part of the control signals and "the Yamaura base station transmits the remaining control signals in the broadcast burst outside of the narrow-band." *Id.* (citing Ex. 1003, 6:21–23, 6:26–27, 28:54–55, 29:4–8; Ex. 2001 ¶¶ 107–116). More specifically, Patent Owner argues that Yamaura broadcasts "specific control signals" (such as calling signals) in the narrow band within the BCH and FCH portions of the broadcast burst, but that Yamaura also broadcasts control signals, other than the calling signals, in the BCH and FCH portions of the broadcast burst. *Id.* at 30–34 (citing Ex. 1003, 1:65–2:9, 6:5–8, 6:24–28,

6:33–35, 20:57–60, 21:16–20, 28:54–55, 29:4–8, Figs. 16, 17; Ex. 2001 ¶¶ 115–117).

It is undisputed that Yamaura transmits *specific* control signals (such as calling signals) in a "broadcast burst" (including Yamaura's BCH and FCH) using only a subset of the subcarriers near the center of the bandwidth that makes up the channel. Pet. 27–29, 36–37; PO Resp. 30; Ex. 1003, 1:65–67, 6:5–8, 20:65–67, 21:30–32, 24:6–14; Ex. 1012 ¶¶ 65–68. There is some ambiguity, however, regarding whether Yamaura transmits signals outside of its narrow band during the time slots assigned to the alleged broadcast channels BCH and FCH (e.g., SC1 and SC2 as depicted in Figure 17 of Yamaura). *See* Ex. 1003, 21:1–43, Fig. 17. After reviewing the relevant portions of Yamaura, we determine Petitioner has not demonstrated by a preponderance of the evidence that Yamaura transmits signals only in its narrow band during the BCH and FCH time slots for the reasons discussed below.

The closest Yamaura comes to addressing whether it transmits signals outside of its narrow band within the BCH and FCH time slots is its description of the process executed at the base station for generating the waveforms it transmits. Ex. 1003, 8:27–9:53; 21:27–32; *see also* Ex. 2001 ¶¶ 108–114 (Dr. Zeger explaining Yamaura's disclosure of how its base station builds and transmits its signals and disputing Dr. Haas's contention that Yamaura does not transmit signals outside the narrow band during BCH and FCH). Yamaura describes its "ordinary transmitting process," and distinguishes that from "the case where it is necessary to transmit specific control data from the base station to the terminal station." Ex. 1003, 8:27–9:16.

Specifically, Yamaura's method identifies "the presence of specific control data," generates a signal waveform for that control data, and sums that waveform with a waveform generated from the "ordinary transmitting process." *Id.* at 9:18–26. Yamaura further explains that, when the specific control data waveform overlaps the OFDM-modulated waveform generated by the ordinary process (i.e., in embodiments where the specific signals are placed near the center of the operating channel bandwidth), it nulls the carriers reserved for the specific control signals, such that the resultant summed signal on the reserved carriers is simply the control data waveform. *Id.* at 9:28–44. Yamaura explains that the base station used in the embodiment upon which Petitioner relies operates in the same way. *Id.* at 21:27–32.

The need for the base station to null the signals for the carriers on which the specific control signals will be transmitted makes sense only if Yamaura transmits other signals during the same time slots (i.e., the broadcast preamble, BCH, and FCH). *See* Ex. 2001 ¶¶ 109–114; Tr. 55:8–56:5. Otherwise, there would be no other waveform to which the specific control signal waveform would need to be added during those time slots and, consequently, no need to null carriers on the other waveform. *See* Ex. 2001 ¶¶ 109–114; Tr. 55:8–56:5. Finally, the broadcast preamble, BCH, and FCH are part of the "broadcast burst," which the parties agree transmits control signals that are broadcast to all users. Ex. 1003, 21:7–11; *See* Tr. 53:19–24, 62:3–7, 72:15–18, 73:7–14, 100:1–5. Because signals are transmitted outside of Yamaura's narrow band during the BCH and FCH time slots, it follows that those signals are control signals that are broadcast to all subscribers.

Petitioner argues there are no signals other than calling signals sent during BCH and FCH because "the whole broadcast burst is part of the calling signal." Tr. 102:17–103:2. However, upon review of the complete record and in the context of Yamaura's entire disclosure, we credit Dr. Haas's testimony that Yamaura's repeated references to calling signals being *specific* control signals or *part* of the control signals indicates that Yamaura transmits other control signals during the BCH and FCH time slots. PO Resp. 30–31; Ex. 2001 ¶ 107.

Additionally, Yamaura discloses that the reception of the calling signals in the narrow band allows the receiver to determine that it is being called, sets its passing band variable filter to "the wide band, sets the AD converter 263 to the sampling rate for ordinary reception, and turns on the receiving system" elements used for receiving and processing the wide band signal. Ex. 1003, 23:10–24; Ex. 2001; PO Resp. 30–31; *see also* Ex. 1012, 114–15 (citing Ex. 1003, 23:15–31) (explaining how receivers use calling signals to identify whether they are being called). Yamaura then explains that this process "makes it possible to receive the control signal containing the regular calling signal which is transmitted by the head of the OFDM-modulated signal of the next MAC frame." *Id.* at 23:24–26. Thus, because it was necessary for the receiver to set its filter to the wide band to receive the "control signal containing the regular calling signal," that signal must be transmitted outside the narrow band. *Id.*

Given Yamaura's disclosure that calling signals broadcast in its narrow band are only part of the control signals, and that certain control signals can be received by a subscriber only when that subscriber is receiving the wide band, Petitioner has failed to demonstrate by a

preponderance of the evidence that Yamaura transmits signals *only in* its narrow band during the BCH and FCH time slots.

The remaining question with respect to this limitation is whether Petitioner's proposed combination teaches transmitting "a broadcast channel in an" OFDMA core-band even though Yamaura discloses transmitting control signals outside its narrow band during the BCH and FCH time slots. As discussed above, Petitioner argues BCH and FCH each individually teaches or suggests the recited broadcast channel, that Yamaura transmits no control signals outside of its narrow band during the BCH and FCH time slots, and that Yamaura's narrow band (as modified by Hwang's teaching of variable operating channel bandwidth systems) teaches the core-band. Pet. 27–32; Pet. Reply 9–15. We determine Petitioner has failed to demonstrate that Yamaura transmits no control signals outside of its narrow band during the BCH and FCH time slots. Under our construction, explained above, in which the entire broadcast channel must be transmitted in the core-band, BCH and FCH are not entirely transmitted within Yamaura's narrow band. Petitioner does not assert that any other channel teaches or suggests the recited broadcast channel or that anything other than Yamaura's narrow band, as modified by Hwang, teaches the recited core-band. Accordingly, Petitioner has failed to demonstrate by a preponderance of the evidence that the proposed combination of Dulin, Yamaura, Hwang, and Zhuang teaches or suggests transmitting "a broadcast channel in an" OFDMA core-band, as recited in the challenged claims.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has not shown, by a preponderance of the evidence, that claims 8–12 and 18–22 of the '431

patent are unpatentable as obvious over Dulin, Yamaura, Zhuang, and Hwang.

IV. ORDER

For the reasons given, it is:

ORDERED that claims 8–12 and 18–22 of the ’431 patent have not been shown to be *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.

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