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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.

Case IPR2018-01689
Patent 8,953,641 B2

Before JAMESON LEE, AMBER L. HAGY, and JASON W. MELVIN, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge.*

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

I. INTRODUCTION

A. Background

On September 7, 2018, Petitioner filed a Petition to institute *inter partes* review of claims 1–5 of U.S. Patent No. 8,953,641 B2 (Ex. 1001, "the '641 patent"). Paper 1 ("Pet."). Patent Owner filed a Preliminary Response. Paper 5 ("Prelim. Resp."). Petitioner filed a Reply to the Preliminary Response. Paper 9. Patent Owner filed a Surreply. Paper 12.

To institute an *inter partes* review, we must determine that the information presented in the Petition shows "that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). Having considered all submissions of both parties, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail in establishing the unpatentability of each of claims 1–5.

Accordingly, we institute inter parties review of claims 1–5 on all the alleged grounds of unpatentability asserted in the Petition.

B. Related Matters

The parties identify two civil actions involving the '641 patent: *Intellectual Ventures II LLC v. T-Mobile USA, Inc. et al.*, Case No. 2:17-cv-00661 (E.D. Tex.), and *Intellectual Ventures II LLC v. Spring Spectrum LP et al.*, Case No. 2:17-cv-00662 (E.D. Tex.). Pet. 2; Paper 5, 2. The '641 patent is also the subject of another petition for *inter partes* review, IPR2018-01770.

C. The '641 Patent

The '641 patent is titled "Methods and Apparatus for Multi-Carrier Communication with Variable Channel Bandwidth." Ex. 1001, [54]. The

'641 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." *Id.* at 1:31–35. The '641 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 in frequency and bandwidth from other operators. *Id.* at 1:37–40. "A practical and feasible solution for multi-carrier communication with variable channel width is desirable." *Id.* at 2:1–3.

The '641 patent discloses an embodiment implementing variable bandwidth by adjusting the number of usable subcarriers, and states that in the frequency domain, the entire channel is aggregated by subchannels. *Id.* at 4:25–28. The number of subchannels can be adjusted to scale the channel in accordance with the given bandwidth. *Id.* at 4:31–33. "[a] specific number of subchannels, and hence the number of usable subcarriers, constitute a channel of certain bandwidth." *Id.* at 4:33–35.

The '641 patent includes a table of sample system parameters:

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

The table presents sample system parameters for a variable band communication system. *Id.* at 4:36–57. The table shows four different

operating bandwidths of 10MHz, 8MHz, 6MHz, and 5MHz, each with its own corresponding number of subcarriers of 800, 640, 480, and 400.

Figure 6 of the ’641 patent is reproduced below:

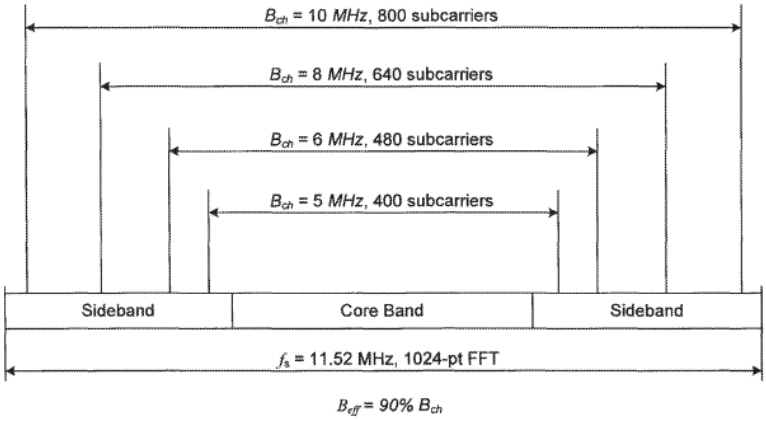

FIG. 6

Figure 6 illustrates a variable channel bandwidth implemented by adjusting the number of usable subcarriers the spacing of which remains constant. *Id.* at 2:20–22; 4:41–42. Figure 6 also illustrates a core-band shared by all the operating bandwidths 5MHz, 6MHz, 8MHz, and 10MHz. *Id.* at 5:4–6. The width of the core-band is less than the smallest channel bandwidth in which the system is to operate. *Id.* at 4:43–44. With regard to the core-band, the ’641 patent explains:

> To facilitate the user terminals to operate in a variable bandwidth (VB) environment, specific signaling and control methods are required. Radio control and operational signaling is realized through the use of a core-band (CB). A core-band, substantially centered at the operating center frequency, 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. For example, for a system that is intended to work at 5-, 6-, 8-, and 10-Mhz, the width of the CB can be 4MHz, as shown in Fig.6. The rest of the bandwidth is called sideband (SB).

Id. at 4:63 to 5:6. The ’641 patent describes that a set of data channels also is placed within the core-band to maintain basic radio operation, and that when entering into the network, a mobile station starts with that basic level of operation and then transits to normal full-bandwidth operation to include the sidebands for additional data and radio control channels. *Id.* at 5:9–17.

The ’641 patent discloses several ways for a receiver to recognize automatically the operating bandwidth when it enters an operating environment or service area of a particular frequency and channel bandwidth. In one embodiment, a mobile station will scan the spectral bands of different center frequencies. *Id.* at 6:1–4. If it detects the presence of a signal in a spectral band of a particular center frequency, it can determine the operating channel bandwidth by bandwidth-center frequency association such as table lookup. *Id.* at 6:4–9. Based on the center frequency that it has detected, the mobile station looks up the value of the channel bandwidth from the table. *Id.* at 6:10–12. In another embodiment, the mobile stations will scan the spectral bands of different center frequencies in which they are designed to operate, and then decode the bandwidth information contained in the broadcasting channel or preamble. *Id.* at 6:23–29.

Of all challenged claims, claim 1 is the only independent claim. Claim 1 is reproduced below:

> 1. 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, the core-band

> defined as a frequency segment with a bandwidth that is not greater than a smallest operating channel bandwidth among a plurality of operating channel bandwidths, the core-band having a same value for the plurality of operating channel bandwidths, wherein the circuitry is further configured to maintain a fixed spacing between adjacent subcarriers and to adjust a number of usable subcarriers to realize a variable band, wherein the number of usable subcarriers is determined based on the plurality of operating channel bandwidths; and
>
> circuitry configured to transmit control and data channels using the variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band.

D. Evidence Relied Upon

Petitioner relies on the following references:[1]

References		Date	Exhibit
Li	U.S. Patent No. 6,904,283 B2	Filed April 17, 2001, issued June 7, 2005	Ex. 1005
Husted	U.S. Patent Publication No. 2005/0100039	Filed November 6, 2003, issued May 12, 2005	Ex. 1006
Cheng	U.S. Patent Publication No. 2004/0233936	Filed September 2, 2003, issued November 25, 2004	Ex. 1007

[1] The ’641 patent is a continuation of Application 10/583,534, filed as PCT/US2005/014828 on Apr. 29, 2005. Ex. 1001, (63). The ’641 patent additionally identifies five related Provisional Applications: (1) Provisional App. 60/567,233, filed May 1, 2004; (2) Provisional App. 60/540,032, filed January 29, 2004; (3) Provisional App. 60/544,521, filed February 13, 2004; (4) Provisional App. 60/542,317, filed February 7, 2004; and (5) Provisional App. 60/551,589, filed March 9, 2004. *Id.* (60); 1:8–27.

References		Date	Exhibit
McFarland	U.S. Patent No. 7,397,859 B2	Filed April 20, 2001, issued July 8, 2008	Ex. 1008
Dulin	U.S. Patent Publication No. 2002/0055356	Filed December 4, 2000, issued May 9, 2002	Ex. 1011

Petitioner also relies on the Declaration of Dr. Vijay K. Madisetti (Ex. 1003).

E. The Asserted Grounds of Unpatentability

The grounds of unpatentability asserted by Petitioner are:

Claim(s) Challenged	Basis	References
1–4	§ 103(a)	Li, Husted, Cheng, and McFarland
5	§ 103(a)	Li, Husted, Cheng, McFarland, and Dulin

II. ANALYSIS

A. The Law on Obviousness

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). One seeking to establish obviousness based on more than one reference also must articulate sufficient reasoning with rational underpinning to combine teachings. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007).

B. The Level of Ordinary Skill in the Art

Petitioner asserts that the level of ordinary skill in the art corresponds to:

> a bachelor's degree in electrical engineering, computer engineering, computer science or similar field, and three-to-five years of experience in digital communications systems, such as wireless communications systems and networks, or equivalent, or a Master's degree in electrical engineering, computer engineering, computer science or similar field, and at least two years of work or research experience in digital communications systems, such as wireless communications systems and networks, or equivalent.

Pet. 10. Patent Owner has not proposed any particular articulation for the level of ordinary skill. We adopt the level of ordinary skill as articulated by Petitioner, except that we delete the one instance of the use of the qualifier "at least" to eliminate vagueness with respect to the amount of practical experience. The qualifier "at least" expands the range indefinitely without an upper bound and thus precludes a meaningful indication of the level of ordinary skill in the art. For example, at least two years of experience encompasses more than 35 years of experience.

C. Claim Construction

In an *inter partes* review, the Board interprets claim terms of an unexpired patent using the "broadest reasonable construction in light of the specification of the patent." 37 C.F.R. § 42.100(b)(2018);[2] *Cuozzo Speed*

[2] A recent amendment to the rule does not apply because the Petition was filed on Sept. 21, 2018, prior to the Nov. 13, 2018, effective date of the rule change. *See Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board*, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42).

Techs., LLC v. Lee, 136 S. Ct. 2131, 2144–46 (2016). Under the broadest reasonable interpretation standard, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). There are, however, two exceptions to that rule: "1) when a patentee sets out a definition and acts as his own lexicographer," and "2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Thorner v. Sony Comp. Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

If an inventor acts as his or her own lexicographer, the definition must be set forth in the specification with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). Disavowal can be effectuated by language in the specification or the prosecution history. *Poly-America, L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016). "In either case, the standard for disavowal is exacting, requiring clear and unequivocal evidence that the claimed invention includes or does not include a particular feature." *Id.*

Only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

"OFDMA core-band"

Independent claim 1 recites an "OFDMA core-band." Ex. 1001 9:14–15. Petitioner proposes that "OFDMA core-band" means "core-band in an

OFDMA system." Pet. 12 (citing Ex. 1003 ¶ 63). Petitioner points out that "OFDMA core-band" is used only once in claim 1, and instead refers numerous times to "core-band" without the term "OFMDA." Pet. 11. Although that is true, it does not mean "OFDMA" and "core-band" are not linked. We agree with Patent Owner (Prelim. Resp. 26) that claim 1 employs a proper claim drafting technique that first recites "OFDMA core-band" and later refers to this same "OFDMA core-band" as "the core-band."

Petitioner asserts that "the '641 Patent does not make a connection between 'OFDMA' and 'core-band.'" *Id.* at 12. We disagree. A connection is made between "OFDMA" and "core-band" in the Specification of the '641 patent by making OFDMA communication in the core-band. Petitioner has pointed to nothing in the Specification of the '641 patent that makes use of a core-band for transmissions not constituting OFDMA communication. Petitioner's proposed construction is unreasonably broad by requiring no connection or linkage between "core-band" and "OFDMA" communication. We agree with Patent Owner (Prelim. Resp. 28) that the '641 patent describes the core-band as part of a variable bandwidth that implements OFDMA communication. We further agree with Patent Owner (Prelim. Resp. 29) that Petitioner's proposed construction is divorced from the context of claim 1 as well as the Specification of the '641 patent.

Patent Owner asserts that no construction of "OFDMA core-band" is necessary because the plain and ordinary meaning should apply. Prelim. Resp. 25. However, Patent Owner does not articulate what is that plain and ordinary meaning. Accordingly, we adopt a modified version of Petitioner's proposed construction of the term "OFDMA core-band," to clarify that the core-band is used for orthogonal frequency-division multiple access

(OFDMA) communication. We construe "OFDMA core-band" to mean *a core-band in an OFDMA system, wherein the core-band is used for OFDMA communication*.

D. Alleged Unpatentability of Claims 1–4 as Obvious over Li, Husted, Cheng, and McFarland

1. Li

Li "relates to the field of wireless communications," and in particular "relates to wireless systems using orthogonal frequency division multiplexing (OFDM)." Ex. 1005, 1:11–12. It discloses a method for subcarrier selection "for a system employing orthogonal frequency division multiple access (OFDMA)." *Id.* at Abstr. The method, in one embodiment, "comprises partitioning subcarriers into groups of at least one cluster of subcarriers, receiving an indication of a selection by the subscriber of one or more groups in the groups, and allocating at least one cluster in the one or more groups of clusters selected by the subcarrier for use in communication with the subscriber." *Id.* at 2:66 to 3:4. The techniques described are "directed to subcarrier allocation for data traffic channels." *Id.* at 5:11–12. Figure 1A of Li is reproduced below:

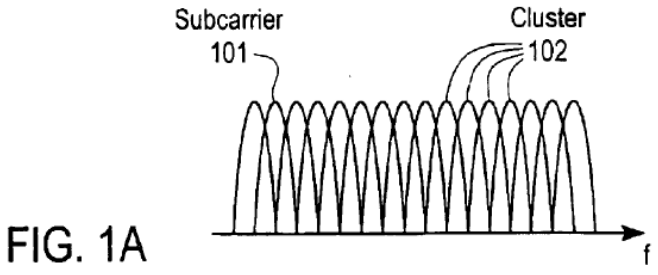

FIG. 1A

Figure 1A shows a cluster, such as cluster 102, which contains multiple subcarriers, such as subcarrier 101. *Id.* at 5:18–21.

2. Husted

Husted states that it relates to "communication systems" and discloses "binding a plurality of communication channels to realize an aggregate throughput improvement." Ex. 1006 ¶ 1. Husted further states that "[t]he binding feature may be added in a manner that preserves compatibility with existing standards-based wireless data systems." *Id.* A system and method are described for binding together a plurality of wireless data communications channels, whereby an aggregate throughput improvement is realized. *Id.* at Abstr. Figure 1 of Husted is reproduced below:

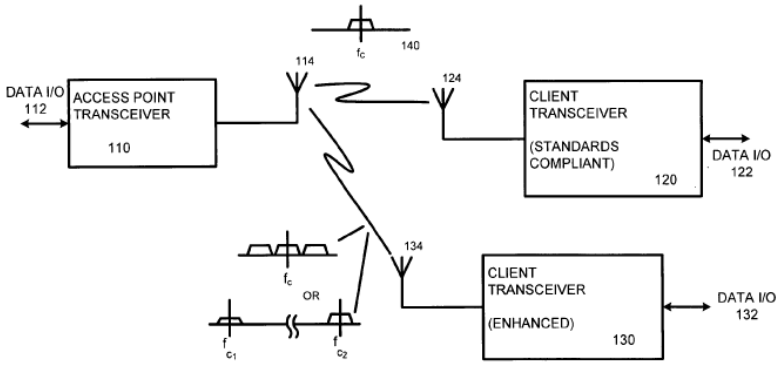

FIG. 1

Figure 1 shows access point 110 in digital wireless communication with client transceiver 120 according to existing digital data wireless standards and client transceiver 130 according to the improved ("bound channel communications") techniques of Husted." *Id.* ¶ 11. Access point transceiver 110 uses a single channel 140 to communicate with client transceiver 120, and it uses bound channels 150 to communicate with client transceiver 130. *Id.* "Multiple channels can be bound among multiple channels in a single band or multiple channels in multiple bands." *Id.*

Figure 2 of Husted is reproduced below:

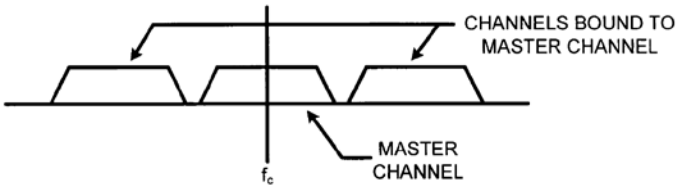

FIG. 2

Figure 2 shows a spectrum illustrating three adjacent, non-overlapping transmission channels. *Id.* ¶ 12. The center channel is the master channel whereas the secondary channels occupy channels substantially equally above and below the master channel's center frequency. *Id.*

Figure 3A of Husted is reproduced below:

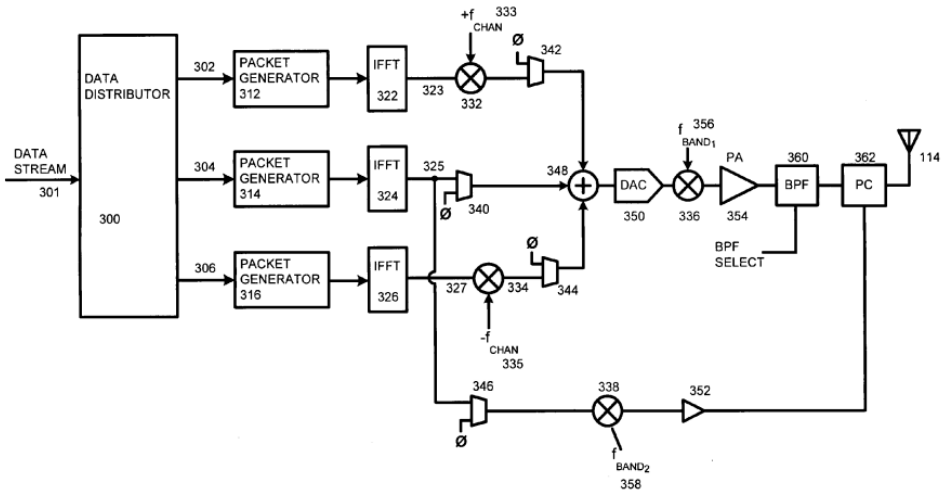

FIG. 3A

Figure 3A shows the elements that encode and modulate data according to one embodiment. *Id.* ¶ 14. Figure 3A discloses a packet generator that is associated with the master channel and generates beacons. *Id.* ¶ 16. Husted explains that "[w]hen an access point transceiver and a client transceiver seek to communicate, the client, in accordance with

existing standards and practice, would listen for a beacon signal from the access point and then enter into an exchange that establishes an association." *Id.* ¶ 23.

Figure 3A also discloses a "selectable bandpass filter (BPF) 360," which has two settings: (1) single-channel width, and (2) three-channel width. *Id.* ¶ 17. When BPF 360 is set to single-channel width, access point transceiver 110 communicates via the master channel, which becomes the only active channel. *Id.* On the other hand, when BPF 360 is set to three-channel width, access point transceiver 110 communicates via the master channel and the adjacent secondary channels, which also become active. *Id.*

Figure 4 of Husted is reproduced below:

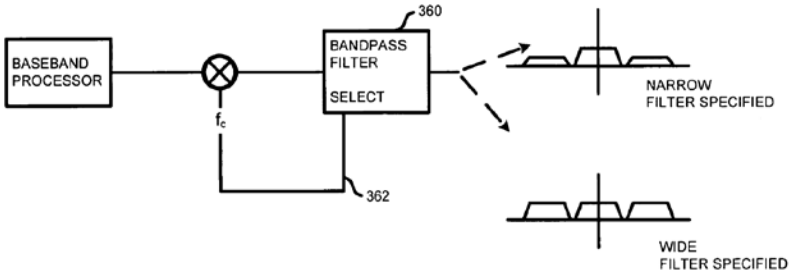

FIG. 4

Figure 4 further illustrates in block diagram form and frequency spectrum form the function of BPF 360. *Id.* ¶ 22. Select line 362 determines whether BPF 360 operates in narrow or wide mode. *Id.* ¶ 22, Fig. 4. The narrow mode imposes a single-channel-wide bandpass shape on the transmitted signal. *Id.* In this mode, BPF 360 attenuates signals in the adjacent secondary channels but does not attenuate signals in the master channel, and thus the adjacent secondary channels become inactive. *Id.*; *see also id.* ¶ 17 (explaining that when BPF 360 is set to single-channel width, only the master channel, but not the adjacent secondary channels, is active). On the other hand, the wide mode imposes a three-channel-wide bandpass

shape on the transmitted signal. *Id.* ¶ 22, Fig. 4. In this mode, BPF 360 does not attenuate the signals in any of the channels. *Id.*

Husted also discloses that both filter bandpass shapes—i.e. the single-channel-wide bandpass shape and the three-channel-wide bandpass shape—may share a common center frequency. *Id.* ¶ 22. This feature promotes an easier design and manufacture. *Id.*

3. Cheng

Cheng is directed to an apparatus and method for generating a control signal of a target beacon transmission time. Ex. 1007 ¶2. Figure 1 of Cheng is reproduced below:

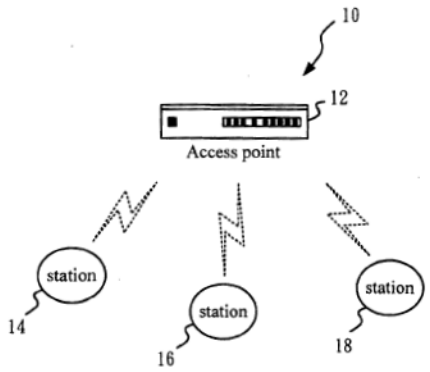

FIG. 1 (Background art)

Figure 1 shows a wireless network that comprises an access point ("AP") 12 and three stations 14, 16, and 18. *Id.* ¶ 5. AP 12 is the timing master of the wireless network and performs a timing synchronization function ("TSF"). *Id.* AP 12 periodically transmits "beacon frames that contain a copy of its TSF timer to synchronize the stations 14, 16, and 18." *Id.* The receiving stations always accept the timing information in the beacon frames. *Id.*

4. McFarland

McFarland is directed to communication systems and networks that use multi-carrier protocols such as orthogonal frequency division multiplexing (OFDM) and discrete multi-tone (DMT) protocols and to techniques for communicating using those protocols. Ex. 1008, 1:11–16. 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 "[t]he narrower sub-channels are then used simultaneously to transmit data at a high rate." *Id.* at 1:19–27. McFarland states that "[e]xisting multi-carrier systems, which maintain a fixed number of carriers, a fixed symbol rate,[3] and a fixed overall bandwidth, do not operate under optimal conditions." *Id.* at 2:62–64. McFarland describes as its objectives (1) a method for dynamically changing the number of carriers, symbol rate, and occupied bandwidth; (2) a control system that regulates the operational mode with regard to the number of carriers, symbol rate, and occupied bandwidth; and (3) a multi-carrier system in which the number of carriers, the symbol rate, and thereby the overall occupied bandwidth can be varied. *Id.* at 3:3–19.

McFarland discloses a control unit that accepts several inputs on the basis of which it will determine the appropriate symbol rate (subcarrier spacing) and the number of carriers to use. *Id.* at 5:41–46. McFarland regards the combination of symbol rate and number of carriers being used as defining an operating mode. *Id.* at 5:53–55.

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[3] Petitioner refers to "symbol rate" as equivalent to carrier spacing. Pet. 18. Patent Owner does not dispute that characterization. Hereinafter, we refer to the two terms interchangeably.

McFarland discloses several ways to change the number of carriers in active use. *Id.* 4:55–56. In one embodiment, a single iFFT (inverse Fast Fourier Transform) processor is designed to be sufficiently large enough to handle the maximum number of carriers that might ever be required, and then, in any given situation, a subset of carriers can be used by simply inputting zero magnitude signals on the carriers that are not being used. *Id.* at 4:61–67. In another embodiment, multiple complete iFFT processors of various sizes are implemented, and, for a given transmission, only one of the units would be used. *Id.* at 5:5–8. In still another embodiment, a single iFFT processor is used, which can itself disable portions of its own internal circuitry depending on how many carriers are used. *Id.* at 5:13–15. McFarland further describes that the symbol rate (carrier spacing) and the number of carriers to be used can be changed simultaneously. *Id.* at 5:30–31.

5. Husted as Analogous Art

Patent Owner contends that Husted is not analogous art. Prelim. Resp. 39. Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed; and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). If the reference satisfies either test, it is analogous. *Id.*; *see also In re Clay*, 966 F.2d 656, 658–59 (Fed. Cir. 1992); *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986).

Petitioner asserts that Husted is in the field of wireless communication systems. Pet. 21. Patent Owner asserts that Husted is not in the same field

of endeavor as the claims of the ’641 patent. Prelim. Resp. 40–41. According to Patent Owner, the ’641 patent relates to “‘multi-carrier communication with variable channel bandwidth’ in cellular systems,” which “operate using OFDMA.” *Id.* at 40. Also according to Patent Owner, Husted “relates to ‘binding a plurality of communications channels to realize an aggregate throughput improvement.’” *Id.* (quoting Ex. 1006 ¶ 1). Patent Owner argues that the ’641 patent and Husted do not even involve the same type of wireless communication systems because one relates to cellular systems and the other to wireless LAN systems. *Id.*

Patent Owner’s argument is unpersuasive. First, Patent Owner does not explain why binding a plurality of communications channels to realize an aggregate throughput improvement takes Husted out of the field of endeavor of the ’641 patent. As discussed above, Husted states that it relates to “communication systems” and discloses “binding a plurality of communication channels to realize an aggregate throughput improvement.” Ex. 1006 ¶ 1. A system and method are described in Husted, in a specific embodiment, for binding together a plurality of wireless data communications channels, whereby an aggregate throughput improvement is realized. *Id.* at Abstr. Thus, Husted’s improved technique applies to “communication systems,” without restriction, which includes wireless communications systems. Husted is not limited to communication over a local area network (LAN), as Patent Owner asserts. Prelim. Resp. 40–41. What is shown in Husted’s Figure 1 is only an exemplary embodiment.

Assuming, as Patent Owner asserts, that the ’641 patent relates to multi-carrier communication with variable channel bandwidth in cellular systems, which operate using OFDMA (Prelim. Resp. 40), its field of

endeavor is completely within and encompassed by that of Husted. That complete enveloping relationship is sufficient to meet the first prong of the two-prong test for determining what constitutes analogous art. Post institution, this issue may be further developed by the parties, if it is raised in the Patent Owner Response.

Patent Owner notes that Petitioner fails to address the second prong for determining whether a reference constitutes analogous arts. Prelim. Resp. 41–42. But Patent Owner also does not address that prong. *See id.* Also, only one prong need to be satisfied for a reference to constitute analogous art. *See In re Bigio*, 381 F.3d at 1325. Additionally, given that Husted is directed to a technique for improving communications in general by binding a plurality of communication channels to increase aggregate throughput, and that the '641 patent indisputably is directed to a specific type of wireless communication, i.e., OFDMA with variable bandwidth, Petitioner need not have initially raised and discussed the issue of analogous art in the Petition. Post institution, the second prong of the test for determining analogous art may be further developed by the parties, if it is raised in the Patent Owner Response.

For the foregoing reasons, for purposes of institution, we determine that Husted constitutes analogous art with respect to the claimed invention.

6. General Rationale for Combining the References

i. Motivation to Combine Li and Husted

Petitioner articulates several rationales for combining the teachings of Li and Husted. Pet. 21–24. All but one are sufficiently persuasive at this stage. We begin by discussing the one deficient rationale.

Petitioner asserts that both Li and Husted utilize signals of varying bandwidth. *Id.* (citing Ex. 1005, Abstract; Ex. 1006, Abstract; Ex. 1003 ¶ 83). On that basis, Petitioner argues that because Husted describes techniques directed to control signals for utilizing variable bandwidth systems, an ordinarily skilled artisan would have, when considering the system of Li, also considered the teachings of Husted regarding control signaling for utilizing variable bandwidth. *Id.* at 22 (citing Ex. 1006 ¶¶ 3, 12, 16, and 23).

We disagree that Li discloses a system implementing variable bandwidth. Although Li describes that each subscriber may be allocated different numbers of subcarrier clusters, Ex. 1005, 5:35–61, Petitioner has not identified any disclosure in Li that the full operating bandwidth from which the subcarrier clusters are allocated can be changed. Whatever is the subcarrier cluster assignment for a subscriber, it comes from the same operating bandwidth.

Other rationales articulated by Petitioner do not depend on its assertion that Li discloses a system implementing variable bandwidth. For instance, Petitioner refers to Husted's teaching of binding additional adjacent bands of subcarriers to a center band of subcarriers to increase available system bandwidth and the aggregate data throughput as compared to utilizing just the center band. Pet. 22 (citing Ex. 1006 ¶¶ 3, 12, 16, 23). That is true whether or not Li discloses a system implementing variable bandwidth. As discussed above in Section II.D.2 and II.D.5, that improvement is applicable to all communication systems, especially wireless data communication systems. We are sufficiently persuaded that, in light of Husted's disclosure, one with ordinary skill in the art would have known to

bind additional adjacent bands of subcarriers to a pre-existing operational bandwidth, as taught by Husted, to increase available system bandwidth and aggregate data throughput.

Petitioner further asserts that Husted would have suggested to one with ordinary skill in the art that the problem of supporting legacy modes of operation, as recognized and addressed by Husted, is a problem that would occur in wireless systems such as Li's, once an improvement is developed. Pet. 22. According to Petitioner, as the devices introduced into Li's system evolved to be able to incorporate adjacent bands to achieve increased throughput according to Husted's teachings, a need would arise for Li's system to accommodate (1) legacy terminals that use one system bandwidth as well as (2) newer terminals that may use multiple bands bound together, as taught in Husted. *Id.* at 24. In that connection, Petitioner refers to the solution provided in Husted, i.e., a control scheme to enable accommodation of terminals designed for different bandwidths. *Id.* at 24. We are sufficiently persuaded that in light of Husted's disclosure, one with ordinary skill in the art would have known to adopt Husted's control scheme to enable accommodation of subscriber terminals that still use pre-existing bandwidth as well as subscriber terminals that use the increased bandwidth made possible by binding together additional adjacent bands of subcarriers.

Petitioner further asserts that to the extent that Li's system would require any modification to accommodate Husted's teachings, "such modifications would have been within the level of ordinary skill in the art." *Id.* For example, Petitioner explains that Husted's iFFT blocks are compatible with OFDM such as Li's OFDM transceiver. *Id.* Further, Petitioner contends Husted teaches to generate a beacon according to IEEE-

802.11a, which was known to use OFDM—a method that Li discloses and implements. *Id.* (citing Ex. 1003 ¶ 89). Petitioner asserts that implementing Husted's techniques into Li's system would have involved simply scaling Li's components (such as a buffer, multiplexer, and OFDM transceiver) to accommodate subcarriers in different channels in the same manner that Husted teaches. *Id.* at 24. Similarly, Petitioner asserts that incorporating Husted's selectable band-pass filter into Li's system would have been obvious to an ordinarily skilled artisan to "achieve the benefit of 'attenuat[ing] spurious signals in adjacent channels when they are not in active use.'" *Id*. 26 (quoting Ex. 1003 ¶ 90).

Petitioner also argues that combining Li's OFDMA system with the beacon that Husted's system transmits in the master channel would be "advantageous because a centered subset of subcarriers is all that is needed to transmit beacon signals, allowing the network to allocate the unused subcarriers to other mobile terminals needing increased throughput at the same time." *Id.* at 26 (citing Ex. 1003 ¶ 91). Petitioner asserts the combination would be beneficial because it would simplify processing and allow for power savings in the terminal station during reception of a beacon signal when no data is transmitted to the terminal station in adjacent channels. *Id.* at 27 (citing Ex. 1003 ¶ 92).

Petitioner further argues that its proposed combination of Li and Husted represents the use of a known technique—transmitting a control signal referred to as a "beacon" in a centered band as taught by Husted—to address a need in Li's devices to incorporate an increased frequency spectrum to increase throughput. *Id.* at 27. Further, according to Petitioner, its proposed combination of Li and Husted amounts to combining prior art

elements according to conventional methods to yield the following predictable results:

> (1) the efficient use of network bandwidth; (2) reducing mobile terminal processing and battery resources for "enhanced" mobile terminals using a narrow bandwidth for beacons; (3) accommodating legacy and "enhanced" devices at a bandwidths commensurate with their capabilities in systems that evolve to increase system bandwidth in various locations; and (4) likewise, accommodating devices designed for different system bandwidths in different geographies at initial system rollout or as a cellular system expands to add geographic coverage (i.e., adding base stations over time to fill in coverage holes).

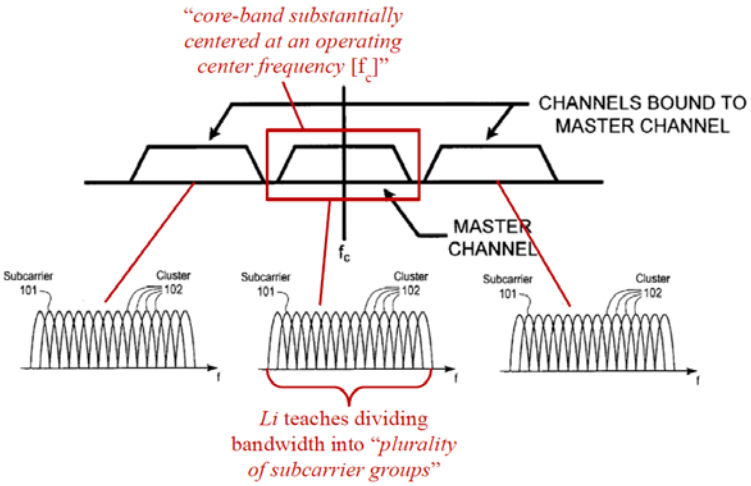
Id. at 28.

Petitioner proposes that "*Li's* division of a frequency bandwidth into subcarrier groups would have been replicated in each channel/band added according to *Husted's* teachings to yield the predictable result of multiple bands bound together to increase data throughput, with each band divided into a plurality of subcarrier groups, achieving the advantage of reduced feedback." *Id.* at 29 (citing Ex. 1003 ¶ 94).

Additionally, Petitioner proposes that, consistent with Husted's teachings, the "beacons are used to initiate communications" and facilitate "subsequent communication of control channels and data channels," but only within Husted's master channel, in order to maintain radio operation. *Id.* (citing Ex. 1006 ¶¶ 11, 14) ("Data stream 304 is allocated to the master channel and streams 302 and 306 are allocated to secondary channels."). Additionally, according to Petitioner, once the beacon facilitates the establishment of a communication session, the combination of Li and Husted "suggest[s] that control and data information would be transmitted in the

master channel [only] to mobile devices that have not been upgraded to the enhanced communication schemes." *Id.* (citing Ex. 1006 ¶ 11).

At page 50 of the Petition, Petitioner provides an annotated version of a modified combination of Li's Figure 1A and Husted's Figure 2 to illustrate the combined teachings of Li and Husted. The combination, as annotated by Petitioner, is reproduced below:



The annotated and modified combined figure provides a representation of Petitioner's proposed combination of Li and Husted. Petitioner explains the resulting combination as follows:

> Accordingly, *Husted* teaches and suggests that a POSITA, starting with the teachings of *Li*, would have been motivated to add and bind frequency bands where available and where the equipment was capable of using them in order to increase data throughput. *Li* further teaches that the subcarriers of the available frequency spectrum are divided into "clusters" (each of which is an example of the claimed "subcarrier group"), with each cluster having a plurality of subcarriers. Thus, *Li*'s division of a frequency bandwidth into clusters of subcarriers would have been replicated in each added channel/band according to *Husted*'s teachings.

Id. at 49–50.

In addition, Petitioner explains that it was known that "regulatory bodies controlled the allocation of spectrum," that "different geographic locations may use different bandwidths," and that the regulatory bodies also increased spectrum allocations over time. *Id.* at 23 (citing Ex. 1008, 7:28–33; Ex. 1012, 42–43). Petitioner thus argues that these pre-existing problems known to one with ordinary skill in the art would have provided additional independent motivation to modify Li in view of Husted in the manner it has proposed to accommodate variable operating bandwidths. *Id.* We are persuaded that this additional articulation provides further support for Petitioner's proposed combination of the teachings of Li and Husted.

Based on the record before us and notwithstanding Patent Owner's arguments to the contrary, which we address below, Petitioner has articulated reasoning with rational underpinning to support its proposed combination of the teachings of Li and Husted.

ii. Patent Owner's Arguments on the Motivation to Combine Li and Husted

Patent Owner argues that Petitioner provides no credible reason to combine Li and Husted. Prelim. Resp. 42–43. Patent Owner first argues that Li's disclosure is directed to "data traffic channels." *Id.* at 42 (citing Ex. 1005, 5:11–17). Further, Patent Owner notes that even though Li recognizes other channels used for exchanging control information, "*Li* describes a single-bandwidth system already capable of functioning." *Id.* at 42–43.

Patent Owner further argues that "[i]f a person of ordinary skill in the art then scales *Li*'s bandwidth to create a triple-bandwidth system as Petitioner alleges, there is no rational explanation as to why the previously-

existing control channels in the single-bandwidth system taught by *Li* could not simply be reused in the triple-bandwidth system." *Id.* at 43–44. "In that case, legacy mobile stations could operate using the single-bandwidth channel and existing control channels, and the so-called 'enhanced' mobile stations could operate using the triple-bandwidth channel and existing control channels." *Id.* at 44. Patent Owner concludes that Petitioner thus fails to explain "why a person of ordinary skill in the art would need *Husted* after allegedly scaling *Li*'s bandwidth." *Id.*

Patent Owner's arguments are misplaced. The question is not whether Husted's control scheme is necessary, but whether it would have been obvious to adopt. Even if the single-bandwidth control scheme of Li could be used after scaling up the single bandwidth of Li according to the teachings of Husted to increase the aggregate throughput that does not undermine a suggestion to using the control scheme disclosed in Husted. Indeed, it is Husted that discloses accommodating both unimproved (non-scaled up) legacy devices and improved devices (scaled up) devices, not Li. Thus, one with ordinary skill in the art would have known to incorporate Husted's control scheme, which accommodates both unimproved and improved devices, when applying Husted's teachings about binding together additional channels to improve aggregate throughput.

Thus, we are persuaded that, when considering Li's disclosure, an ordinarily skilled artisan would have been motivated to "consider Husted, which more fully describes control signaling for utilizing variable bandwidth systems." *Id.* at 22 (citing Ex. 1006 ¶¶ 3, 12, 16, 23).

Patent Owner also argues that Petitioner's proposed motivation to combine "suffers from circular reasoning and flawed logic." Prelim. Resp. 44. Patent Owner takes issue with the following articulation in the Petition:

> As devices introduced into *Li*'s system evolved to be able to incorporate adjacent bands to achieve increased throughput according to *Husted*'s teachings, *Li*'s system would have faced the problem of how to accommodate legacy terminals that utilized one system bandwidth for transmission of all control and data channels and newer terminals that were able to bind multiple bands together to achieve a greater system bandwidth.

Prelim. Resp. 44 (quoting Pet. 23–24).

Patent Owner argues that "only after the combination is made would these other alleged 'problems' regarding legacy terminals have arisen, which Petitioner then claims would further support combining *Li* and *Husted*." *Id.* at 45. As Patent Owner explains, "Petitioner relies on circular reasoning to state that a POSITA would have allegedly combined *Li* and *Husted* (for some unknown reason) and after doing so, new problems would have arisen, which would support combining *Li* and *Husted* (again) to reach the claimed invention." *Id.*

Patent Owner also argues that "Petitioner's reasoning is flawed because it relies on some unexplained 'evolution' of products and an unknown length of time." *Id.* Further, "Petitioner provides no explanation as to how long this evolution would take, why it would take place, why the systems would 'evolve' in the manner Petitioner claims, why *Li* could not address this 'evolution' itself, and whether the new 'problems would materialize before the claimed invention was made." *Id.*

Patent Owner's arguments are directed more to form than substance. Petitioner's articulation must be read in the context of the specific and actual

teachings of Husted. The idea of some terminal units incorporating the improved technique, while some other terminal units do not, comes directly and expressly from the disclosure of Husted and is not a matter of speculation, double obviousness analysis, or evolution in the future. Figure 2 of Husted specifically illustrates base station access point 110 communicating with (1) terminal unit 120, which does not implement or incorporate Husted's channel binding technique, and (2) terminal unit 130, which does incorporate the improved technique. There simply is nothing to predict and no evolution to occur at some time in the future. Petitioner also asserts that "[i]t was common in wireless communication systems to accommodate legacy modes of operation." Pet. 22 n.2 (citing Ex. 1003 ¶ 85 n.4). In short, Petitioner's obviousness contention is a one-step analysis, is non-circular, and does not depend on passage of time in some unspecified evolution in the future.

For the foregoing reasons, we find unpersuasive Patent Owner's arguments alleging circular reasoning, flawed logic, and unexplained evolution. As noted above, Petitioner has articulated reasoning with rational underpinning to support its proposed combination of the teachings of Li and Husted.

iii. Motivation to Combine Husted and Cheng

Petitioner asserts Husted describes a beacon associated with the master channel and generated according to existing IEEE-802.11 standards. Pet. 30 (citing Ex. 1006 ¶ 16). Petitioner also asserts Cheng "describes how a beacon was transmitted and formatted in existing standard IEEE-802.11." *Id.* (citing Ex. 1007 ¶¶ 4–6). Petitioner also asserts Husted "provides a

specific teaching and motivation to look to the beacons in IEEE 802.11, which are described by *Cheng*." *Id.*

Petitioner also argues that "incorporating *Cheng*'s teachings about beacons into the *Li/Husted* system provides an advantage of providing synchronization (in beacons) to allow terminals to save energy by sleeping and waking for known periods of transmission/reception." *Id.* at 32. Petitioner also argues that Cheng provides the benefit of reducing errors caused by terminals transmitting or receiving information outside of their allocated time slots. *Id.* Petitioner further asserts that providing access point ID in beacons, per Cheng, would yield the beneficial result of realizing mobility management in the combined Li and Husted system. *Id.* (citing Ex. 1003 ¶ 100). Petitioner asserts that using Cheng's specific teachings about beacons in the combined system of Li and Husted constitutes using conventional methods to yield predictable results. *Id.* (citing Ex. 1003 ¶¶ 101–102).

Patent Owner does not dispute Petitioner's assertions regarding the disclosures of Cheng. Nor does Patent Owner present arguments against applying Cheng's specific teachings about use of beacons in the combined system of Li and Husted. Petitioner's above-noted assertions are supported by the cited evidence. We are sufficiently persuaded Petitioner has presented reasoning with rational underpinning to support applying Cheng's specific teachings about use of beacons in the combined system of Li and Husted.

iv. Motivation to Combine (Li/Husted) with McFarland

Petitioner asserts that one with ordinary skill in the art would have been motivated to combine the combined teachings of Li and Husted

(Li/Husted) with the teachings of McFarland. Pet. 60. In that regard, Petitioner notes that each of Li, Husted, and McFarland describes transmitting variable numbers of subcarriers in a multiple access OFDM system. *Id.* (citing Ex. 1005, Abstract, 6:42-48; Ex. 1006, Figs. 1, 3A-3C, ¶ 16; Ex. 1008, 4:4-11). Petitioner argues that McFarland describes specific implementations of the iFFT processing used in Li and Husted. *Id.*

Petitioner also notes that while Husted "teaches varying spectral bandwidth by varying the number of bands of subcarriers being used," McFarland "teaches circuitry for varying the number of subcarriers (simply by setting some subcarriers to zero) to vary bandwidth while keeping symbol rate (and therefore subcarrier spacing) constant . . . ." *Id.* at 59–60.

According to Petitioner, modifying the combination of Li and Husted with McFarland's teachings would provide various benefits such as having an iFFT processor that is sufficiently large to handle the maximum number of carriers that might ever be required and reducing complexity as a result of using a fixed subcarrier spacing. *Id.* at 60.

Patent Owner does not dispute the motivation to combine the combined teachings of Li/Husted with the teachings of McFarland. The evidence cited by Petitioner supports its positions and assertions and arguments regarding motivation to combine teachings. We discern no deficiency, for purposes of institution, in Petitioner's reasoning as to why one of ordinary skill in the art would have been prompted to combine the teachings of Li/Husted with the teachings of McFarland.

7. Independent Claim 1

Claim 1 recites: "A cellular base station, comprising." Ex. 1001, 9:12. Petitioner argues that Li's Figure 8 and its associated teachings

disclose base stations in a cellular network, which in turn disclose the claimed cellular base station. Pet. 33 (citing Ex. 1005, 12:66–13:5, Fig. 8; Ex. 1003 ¶¶ 104–106). Patent Owner does not dispute that Li discloses this claim limitation, and we determine that the evidence supports Petitioner's assertions. Accordingly, we are persuaded that the cited portions of Li disclose "a cellular base station."

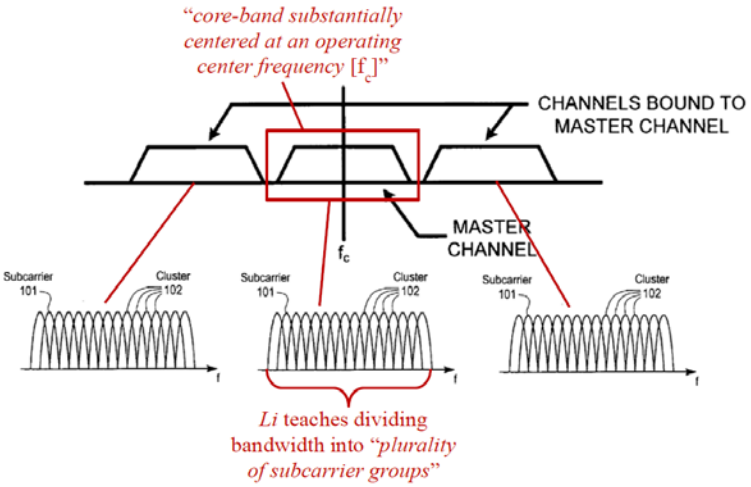
Claim 1 further recites: "circuitry configured to transmit a broadcast channel in an orthogonal frequency division multiple access (OFDMA) core-band." Petitioner asserts that Husted's master channel is an example of a "core-band," referring to Husted's Figure 2 which illustrates the master channel in the middle, and respective channels bound to the master channel on either side of the master channel. Pet. 34–35. Petitioner cites Husted, which states:

> FIG. 2 illustrates a comparison of the prior art spectrum 140 with a spectrum generated and received in one embodiment 152. The spectrum 152 shows three adjacent, non-overlapping transmission channels wherein the center channel is designated the master channel 156. The secondary channels 158, 159 occupy channels substantially equally above and below the master channel's center frequency.

Id. (citing Ex. 1006 ¶ 12). Patent Owner does not dispute that Husted discloses a core-band. Instead, Patent Owner argues (1) Li does not teach or suggest a core-band; (2) Husted does not teach or suggest OFDMA or any other multiple access scheme; and (3) "because Li's disclosure is not directed to control signals (i.e., "other channels"), when combined with Husted, the alleged master channel in Li's system would not result in an "OFDMA core-band" as claimed. Prelim. Resp. 37–38.

Patent Owner's arguments are misplaced. One cannot show non-obviousness by attacking references individually where the unpatentability is asserted based on combinations of references. *In re Merck*, 800 F.2d 1091, 1097 (Fed. Cir. 1986); *In re Keller*, 642 F.2d 413, 426 (CCPA 1981). Li discloses an OFDMA communication system and Husted discloses a core-band. When Husted's master channel and surrounding secondary channels are adapted for use in Li, in the manner they are used in Husted, for the disclosed OFDMA communication in Li, the resulting combination is an OFDMA core-band.

Petitioner provides a visual representation of the resulting combination of Li and Husted, including annotated or modified versions of Li's Figure 1A and Husted's Figure 2. Pet. 50. The illustration is reproduced here:



The illustration is an annotated visual representation of Petitioner's proposed combination of Li and Husted. Pet. 50. It includes annotated and modified versions of Li's Figure 1A and Husted's Figure 2. *Id.* In the resulting combination as shown, the entire spectrum for OFDMA communication includes Husted's master channel and two adjacent

secondary channels. Petitioner explains that "*Li*'s division of a frequency bandwidth into clusters of subcarriers would have been replicated in each added channel/band according to *Husted*'s teachings." *Id.* at 49.

Petitioner asserts that Husted's broadcast of a beacon in the master channel, where the beacon facilitates subsequent communication in the master channel, is an example of a 'broadcast channel in a core-band," as recited in claim 1. *Id.* at 40 (citing Ex. 1001, 5:7–12; Ex. 1003 ¶ 123). With regard to this assertion, Patent Owner does not present argument additional to what we already have discussed and rejected above.

Petitioner further asserts that Li discloses "circuitry" for transmitting an OFDMA signal. *Id.* at 41–42. In that regard, Li's Figure 13 presents exemplary base station circuitry for transmitting an OFDMA signal. *Id.* at 42. In Petitioner's proposed combination, that would be the circuitry adapted for transmitting a broadcast channel in an OFDMA core-band. Patent Owner has not presented arguments additional to those we already discussed and rejected above. Petitioner has sufficiently shown that its proposed combination teaches "circuitry configured to transmit a broadcast channel in an orthogonal frequency division multiple access (OFDMA) core-band."

Claim 1 further recites: "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." Ex. 1001, 9:15–19. Petitioner cites Figures 1 and 2 of Husted to argue that Husted's master channel teaches a core-band centered at an operating center frequency. Pet. 45–47. Patent Owner does

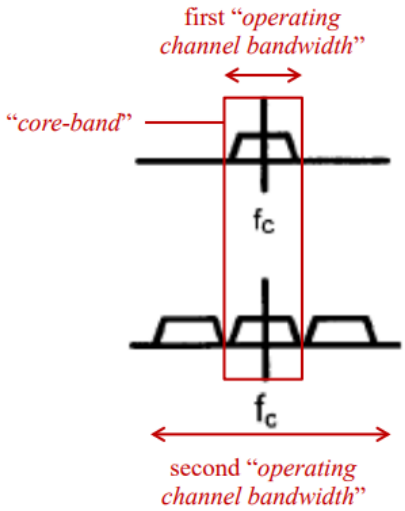
not present arguments additional to what we already have discussed and rejected above.

Petitioner asserts that "*Li* describes dividing subcarriers into groups for OFDMA transmissions, wherein each subcarrier group includes a plurality of subcarriers." *Id.* at 47 (citing Ex. 1005, 2:11–21). Li recites: "In one embodiment, a method for subcarrier selection for a system employing orthogonal frequency division multiple access (OFDMA) comprises partitioning subcarriers into groups of at least one cluster of subcarriers." Ex. 1005, 2:11–21. Petitioner further notes that in the combination of Li and Husted, "*Li*'s division of a frequency bandwidth into clusters of subcarriers would have been replicated in each added channel/band according to *Husted*'s teachings." Pet. at 49. Thus, Petitioner asserts that its proposed combination of the prior art teaches that the core-band includes "a first plurality of subcarrier groups, wherein each subcarrier group includes a plurality of subcarriers." *Id.* at 49–50.

Patent Owner has not presented arguments additional to what we already have discussed and rejected above. We are sufficiently persuaded by Petitioner that Petitioner's proposed combination of prior art teaches the limitation "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."

Claim 1 further recites: "the core-band defined as a frequency segment with a bandwidth that is not greater than a smallest operating channel bandwidth among a plurality of operating channel bandwidths, the core-band having a same value for the plurality of operating channel bandwidths." Ex. 1001, 9:19–22. Petitioner argues that in the combination

of Li and Husted, a legacy transceiver can receive a signal on only the center band (i.e. Husted's master channel as incorporated into Li), whereas an enhanced transceiver can receive a signal on three bands bound together (i.e. Husted's master channel and secondary channels as incorporated into Li (as a second operating channel bandwidth)). Pet. 50–52. The two operating channel bandwidths are illustrated on page 52 of the Petition with an annotated portion of Husted's Figure 1, and that illustration is reproduced below:



The illustration, annotated by Petitioner, shows the two operating channel bandwidths disclosed by Husted and proposed by Petitioner to be incorporated into Li. *Id.* at 52.

Petitioner thus argues that the master channel is equal to the "smallest operating channel bandwidth," which is the operating bandwidth for the legacy wireless devices that receive signals on only the center band. *Id.* at 52. According to Petitioner, this manner of operation satisfies the requirement that "the core-band" has a frequency segment with "a bandwidth that is not greater than a smallest operating channel bandwidth." *Id.* at 52–53.

Petitioner further asserts that Husted teaches that the master channel (core-band) has "a same value" of bandwidth and also "a same value" of center frequency for a plurality of operating channel bandwidths, whether or not channels are bound to the master channel. *Id.* at 53–54 (citing Ex. 1006, Fig. 1; Ex. 1003 ¶¶ 155–159).

Patent Owner has not presented arguments additional to what we already have discussed and rejected above. We are sufficiently persuaded by Petitioner that Petitioner's proposed combination of prior art teaches the limitation "the core-band defined as a frequency segment with a bandwidth that is not greater than a smallest operating channel bandwidth among a plurality of operating channel bandwidths, the core-band having a same value for the plurality of operating channel bandwidths."

Claim 1 further recites: "wherein the circuitry is further configured to maintain a fixed spacing between adjacent subcarriers and to adjust a number of usable subcarriers to realize a variable band." Ex. 1001, 9:24–26. In the illustration shown on page 50 of the Petition and already discussed above, it is shown that the operating channel bandwidth that is just the master channel includes a plurality of subcarrier groups, and in the operating channel bandwidth that is the master channel plus channels bound to the master channel on either side of the master channel, there are additional subcarrier groups. Thus, because Petitioner's proposed combination of prior art supports communication in either operating channel bandwidth depending on the structure and operation of the terminal device, it satisfies the requirement of having circuitry "to adjust a number of usable carriers to realize a variable band."

With regard to the limitation of circuitry "to maintain a fixed spacing between adjacent subcarriers," Petitioner argues that this limitation would have been obvious to one with ordinary skill in the art either over Husted alone or in light of both Husted and McFarland. Pet. 54. We do not agree with some of Petitioner's arguments directed to Husted. For instance, Petitioner asserts that Husted implies fixed spacing of carriers because it does not mention varying subcarrier spacing. *Id.* at 57. The argument is unpersuasive. By the same approach, one could similarly argue that Husted implies variable spacing, because it does not mention keeping carrier spacing fixed. Neither choice is implied by silence. Also, Petitioner asserts that adopting fixed spacing of carriers would have been "an obvious design choice between only two alternatives." *Id.* at 57. The reliance on an assertion of "obvious design choice" omits critical analysis of obviousness and oversimplifies the obviousness analysis. *See In re Zurko*, 258 F.3d 1379, 1383 (Fed. Cir. 2001) (discussing unsupported assertions of "basic knowledge" and "common sense"). Petitioner further states that use of fixed subcarrier spacing would have been obvious to try, but Petitioner does not explain why there would have been a reasonable expectation of success. *Id.*

Nevertheless, we agree with Petitioner that in light of Husted, it would have been obvious to one with ordinary skill in the art to adopt fixed spacing between subcarriers in the combined system of Li and Husted. Petitioner asserts that Husted discloses compatibility with existing standards such as IEEE-802.11a. *Id.* at 57 (citing Ex. 1006 ¶ 16). Petitioner also asserts that IEEE 802.11a "was well known as using fixed carrier spacing." *Id.* (citing Ex. 1003 ¶ 164). Patent Owner has not argued contrary to these assertions.

Furthermore, the disclosure of McFarland adds to and supports the notion that it would have been obvious to one with ordinary skill in the art to adopt fixed spacing between subcarriers in the combined system of Li and Husted.

McFarland explicitly discloses "the use of fixed subcarrier spacing in a variable-bandwidth OFDM system." *Id.* at 57–58. Petitioner also argues that McFarland teaches increasing the number of subcarriers to increase data rate. *Id.* at 58. McFarland recites: "FIG. 5 shows the transmitted spectrum of an OFDM signal in which the number of carriers is doubled, but the symbol rate remains constant. This approach also doubles the occupied bandwidth and the data rate." Ex. 1008, 4:4–11. In addition to teaching increasing the number of subcarriers, this portion of McFarland, according to Petitioner, also "teaches that the symbol rate is constant, and because the symbol rate is proportional to the symbol time, the spacing between subcarriers is constant." Pet. 58 (citing Ex. 1003 ¶ 165).

Claim 1 further recites: "wherein the number of usable subcarriers is determined based on the plurality of operating channel bandwidths." Ex. 1001, 9:27–28. Petitioner asserts that this limitation is rendered obvious by Husted alone or by Husted in view of McFarland. Pet. 61. Petitioner states: "It follows directly from basic wireless engineering that usable system bandwidth (an '*operating channel bandwidth*') is approximately equal to [the] number of usable subcarriers multiplied by subcarrier spacing." *Id.* (citing Ex. 1003 ¶ 175). On that basis, according to Petitioner, because Husted teaches a system that operates in two operating channel bandwidths with constant carrier spacing, i.e., the master channel alone as one operating channel bandwidth and the master channel together with

secondary channels on either side of the master channel as a second operating channel bandwidth, Husted renders obvious the limitation "wherein the number of usable subcarriers is determined based on the plurality of operating channel bandwidths." *Id.*

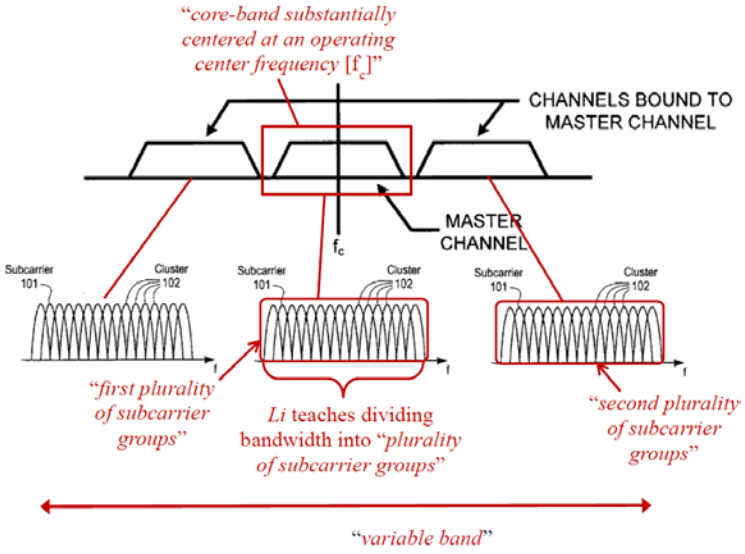
Petitioner cites McFarland to bolster its obviousness contention with regard to determining the number of usable subcarriers based on the plurality of operating channel bandwidths. *Id.* at 61–63 (citing Ex. 1008, 2:1–3). The cited portion of McFarland describes: "[T]he overall bandwidth occupied by the signal is roughly equivalent to the number of carriers multiplied by the carrier spacing." Ex. 1008, 2:1–3. Petitioner asserts that in view of McFarland's teachings, a POSITA would have understood that each of the two operating channel bandwidths of Husted is achieved by a number of subcarriers roughly equal to the operating channel bandwidth divided by subcarrier spacing. Pet. at 63 (citing Ex. 1003 ¶¶ 174–179).

Patent Owner has not argued anything to the contrary regarding determining the number of usable subcarriers. We are sufficiently persuaded by Petitioner that its proposed combination of prior art renders obvious the limitation "wherein the number of usable subcarriers is determined based on the plurality of operating channel bandwidths."

Claim 1 further recites: "circuitry configured to transmit control and data channels using the variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band." Ex. 1001, 9:30–33. Petitioner argues that Li discloses data channels and control channels. Pet. at 63. Li recites: "The techniques described herein are directed to subcarrier allocation for data traffic channels. In a cellular system, there are typically other channels, pre-allocated for the

exchange of control information and other purposes. These channels often include down link and up link control channels." Ex. 1005, 5:11–17.

Petitioner then uses an annotated illustration including a modified version of Li's Figure 1A and Husted's Figure 2 to show that its proposed combination of Li and Husted teaches the limitation "circuitry configured to transmit control and data channels using the variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band." Pet. 67. The illustration is reproduced below:



The figure reproduced above is an illustration including a modified version of Li's Figure 1A and Husted's Figure 2 to show Petitioner's proposed combination of Li and Husted. *Id.* Petitioner argues that "*Li*'s division of frequency bandwidth into subcarriers would have been replicated in each channel/band added according to *Husted*'s teachings, with bands outside the 'core-band' divided into a '*second plurality of subcarrier groups*' to transmit *Li*'s control and data channels." *Id.* at 65 (citing Ex. 1003 ¶ 185). Petitioner explains that the spectrum of the variable band encompasses all of the subcarriers in the entire system bandwidth. *Id.* at 66.

Petitioner also notes that Li discloses periodic broadcasts of pilot OFDM symbols to every subscriber within a cell. *Id.* at 65 (citing Ex. 1005, 5:35–37). According to Li's disclosure, the pilot symbols are used for time and frequency synchronization, channel estimation and signal-to-interference / noise ratio measurements for cluster allocations. Ex. 1005, 5:42–45. Petitioner asserts that "*Li*'s pilot symbol is an example 'control channel,'" and that "[t]he next pilot signal is a second 'control channel,' and so on." Pet. 66 (citing Ex. 1003 ¶ 186).

Finally Petitioner addresses the requirement for "circuitry," stating:

> In summary, *Li* teaches circuitry for dividing available bandwidth into subcarrier groups, transmitting control channels and data channels within the available bandwidth, and varying the number of subcarriers in use (thereby varying the signal bandwidth within the available bandwidth), and Husted teaches circuitry for binding multiple bands together (a "*variable band*"), including various iFFT processors and selectable bandpass filter to transmit beacons and data packets, rendering obvious [the claimed circuitry].

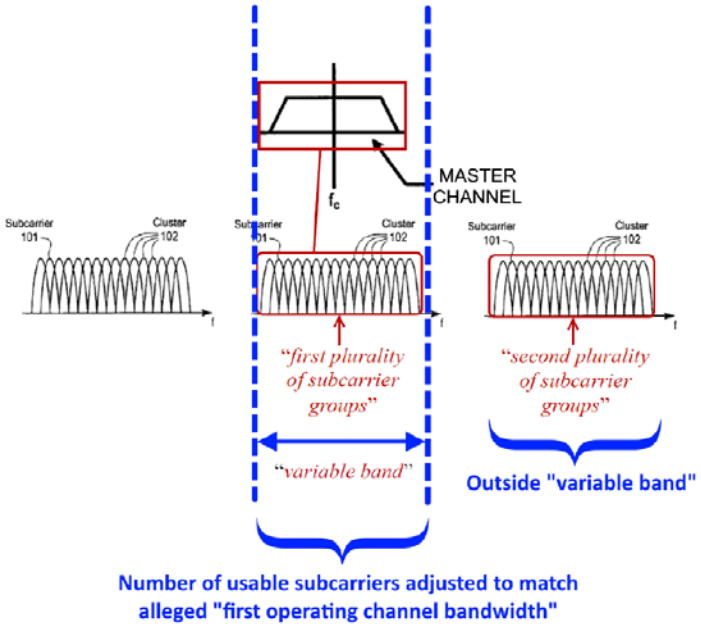
Id. at 68 (citing Ex. 1003 ¶¶ 191–193).

Notwithstanding Patent Owner's contrary arguments, which we discuss below, Petitioner has sufficiently shown that its proposed combination of prior art renders obvious the limitation "circuitry configured to transmit control and data channels using the variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band."

Patent Owner argues that Husted fails to teach or suggest "a plurality of operating channel bandwidths" or a "variable band including a second plurality of subcarrier groups," as recited in claim 1. Prelim. Resp. 30. Patent Owner argues that because Petitioner identified Husted's master

channel as a "first '*operating channel bandwidth*,'" Petitioner's combination cannot meet every claim limitation. *Id.* Patent Owner asserts that Petitioner's combination does not teach both "the core-band includes a first plurality of subcarrier groups" and "the variable band including a second plurality of subcarrier groups." *Id.*

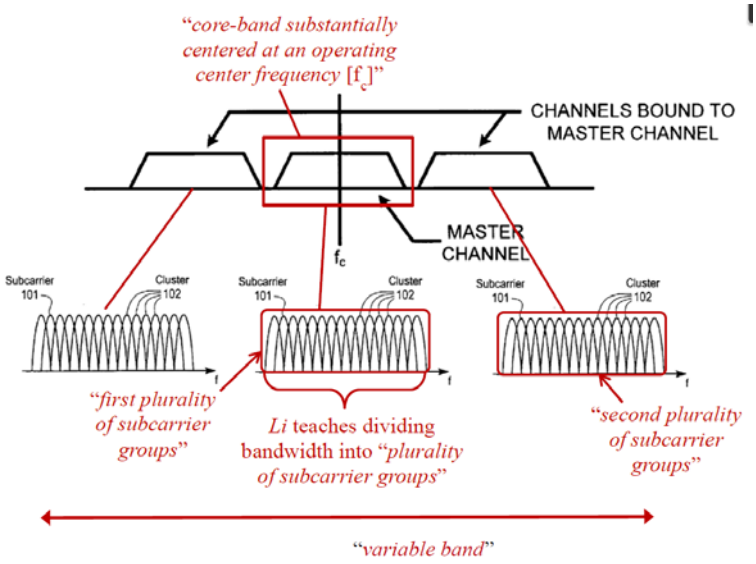
Patent Owner provides its own annotated and modified version of Petitioner's annotated combination of Li's Figure 1A and Husted's Figure 2 to show what it believes is the resulting combination of Li and Husted. Prelim. Resp. 35. The illustration, with annotations in blue provided by Patent Owner on top of Petitioner's annotations in red, is reproduced below:



The illustration is Patent Owner's annotated and modified versions of Li's Figure 1A and Husted's Figure 2. *Id.* According to Patent Owner, this illustration shows that "*Husted*'s master channel (i.e., alleged 'core-band') is not and cannot be an 'operating channel bandwidth' within the context of the challenged claims because *Husted* does not disclose the master channel as having the claimed 'second plurality of subcarrier groups.'" *Id.* at 35.

For several reasons, Patent Owner's contention is unpersuasive. Patent Owner has both misread the language of claim 1 as well as Petitioner's application of the prior art references. According to Patent Owner, in Petitioner's proposed combination of prior art, the "variable band" is only the master channel, and the secondary channels, which include the second plurality of subcarrier groups, fall outside the variable band. *Id.*

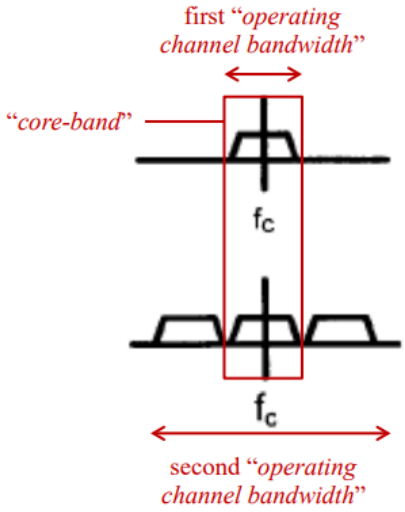
Petitioner's proposed combination teaches a "variable band" that varies between a frequency segment that encompasses the master channel only and a frequency segment that encompasses both the master channel and the secondary channels on either side of the master channel. Pet. 67. For clarity, the annotated illustration presented at page 67 of the Petition is reproduced below:



The illustration, annotated by Petitioner, depicts the resulting combination of Li and Husted according to Petitioner. *Id.*

As shown, the "variable band," is not just the master channel, which is the core-band, but includes both the first plurality of subcarrier groups in the master channel and the second plurality of subcarrier groups in the

secondary channels outside of the master channel. Petitioner identifies the master channel as a "first operating channel bandwidth" and the master channel together with the adjacent secondary channels bound to the master channel as the "second operating channel bandwidth." Pet. 52. An illustration is provided by Petitioner on page 52 of the Petition and is reproduced below (as annotated by Petitioner):



It illustrates what Petitioner regards as a plurality of operating channel bandwidths. *Id.* Patent Owner is mistaken in asserting that Petitioner relies on Husted's master channel alone to teach the claimed "variable band including a second plurality of subcarrier groups, wherein the variable band includes at least the core-band." Prelim. Resp. 36. Petitioner explains that when combining Li and Husted, "*Li*'s division of frequency bandwidth into subcarriers would have been replicated in each channel/band added according to *Husted*'s teachings, with bands outside the 'core-band' divided into a '*second plurality of subcarrier groups*' to transmit *Li*'s control and data channels." Pet. 65 (citing Ex. 1003 ¶ 185). Further, as shown in the illustration on page 67 of the Petition, reproduced above, the "variable band"

includes both first plurality of subcarrier groups and second plurality of subcarrier groups, as is required by claim 1.

Finally, we note that claim 1 does not require a first operating channel bandwidth or the core-band to include "a second plurality of subcarrier groups," as Patent Owner evidently contends. *See* Prelim. Resp. 36. Instead, claim 1 recites: "circuitry configured to transmit control and data channels using the *variable band including a second plurality of subcarrier groups*." Ex. 1001, 9:30–32 (emphasis added). It is the entire variable band, not just the core-band (or first operating channel bandwidth), that must include a second plurality of subcarrier groups. According to Petitioner's proposed combination of prior art as discussed above, in particular the illustration on page 67 of the Petition, the identified variable band does include a second plurality of subcarrier groups, which are not the same as the first plurality of subcarrier groups.

Thus, we are not persuaded by Patent Owner's arguments that Petitioner's proposed combination fails to teach "a plurality of operating channel bandwidths" or a "variable band including a second plurality of subcarrier groups." We are sufficiently persuaded by Petitioner's assertions that the combination of Li, Husted, Cheng, and McFarland teaches both "a plurality of operating channel bandwidths" and a "variable band including a second plurality of subcarrier groups."

For the foregoing reasons, Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of claim 1 as obvious over Li, Husted, Cheng, and McFarland.

8. Dependent Claims 2–4

Claim 2 recites: "The cellular base station of claim 1, wherein the circuitry configured to transmit the broadcast channel is further configured to transmit radio network information in the broadcast channel." Ex. 1001, 9:34–37. For the limitations of claim 1, which are incorporated into claim 2 by reason of claim 2's dependency from claim 1, Petitioner relies on the arguments it presented for claim 1. Pet. 69. The same analysis provided above for claim 1 applies here in the context of claim 2. For the limitation additionally recited in claim 2, Petitioner explains that it is met by the combined teachings of Husted and Cheng. *Id.* at 70.

Petitioner notes that in its combination of Li, Husted, Cheng, and McFarland, "the beacons of *Husted* are transmitted only in the 'master channel.'" Pet. 70. Petitioner asserts that Cheng discloses use of beacons and describes their use in more detail, including the use of beacons to transmit "radio network information," which Petitioner asserts includes an identifier of the access point (AP). *Id.* Cheng describes: "As shown in FIG. 2, the beacon frame 20 comprises a timestamp field 22, a beacon interval field 24 and a service set identifier (SSID) field 26. . . . The SSID field 26 is used to record the identifier of the AP 12." Ex. 1007 ¶ 6 (cited at Pet. 70).

Patent Owner does not dispute Petitioner's assertions about Cheng's disclosure on the use of beacons. We have discussed above, in Section II.D.6.iii, how Petitioner has articulated reasoning with rational underpinning for one of ordinary skill in the art to apply Cheng's specific teachings about use of beacons in the combined system of Li and Husted.

For the foregoing reasons, we determine that Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of claim 2 as obvious over Li, Husted, Cheng, and McFarland.

Claim 3 recites: "The cellular base station of claim 1, further comprising circuitry configured to transmit synchronization information in the core-band." Ex. 1001, 9:38–40. For the limitations of claim 1, which are incorporated into claim 3 by reason of claim 3's dependency from claim 1, Petitioner relies on the arguments it presented for claim 1. Pet. 71. The same analysis provided above for claim 1 applies here in the context of claim 3. With regard to the limitation additionally recited in claim 3, Petitioner explains that it is accounted for by its proposed combination of Husted and Cheng. *Id.* at 71–72.

Petitioner asserts that Cheng discloses a periodic beacon that includes a timing synchronization function (TSF) timer to synchronize mobile stations. Pet. 71 (citing Ex. 1007 ¶ 5). Petitioner also notes that in the combination of Li, Husted, Cheng, and McFarland, Cheng's beacon is broadcast in Husted's master channel. *Id.* Thus, Petitioner asserts that its proposed combination of the prior art references teaches that the transmitted beacon signal includes timing/synchronization information to synchronize mobile stations, and that that is an example of "transmit[ting] synchronization information in the core-band." *Id.* Petitioner further notes that Cheng teaches circuitry for generating the synchronization information, citing Cheng's "TSF timer" (Ex. 1007 ¶ 8) as an example of circuitry for generating the synchronization information to be transmitted. *Id.*

Patent Owner does not dispute Petitioner's assertions about Husted's and Cheng's disclosure on the use and content of beacons. We also have

discussed above, in Section II.D.6.iii, how Petitioner has articulated reasoning with rational underpinning for one of ordinary skill in the art to apply Cheng's specific teachings about use of beacons in the combined system of Li and Husted.

For the foregoing reasons, we determine that Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of claim 3 as obvious over Li, Husted, Cheng, and McFarland.

Claim 4 recites: "The cellular base station of claim 1, wherein the circuitry configured to transmit the broadcast channel is further configured to transmit in a time slot format." Ex. 1001, 9:40–43. For the limitations of claim 1, which are incorporated into claim 4 by reason of claim 4's dependency from claim 1, Petitioner relies on the arguments it presented for claim 1. Pet. 72. The same analysis provided above for claim 1 applies here in the context of claim 4. For the limitation additionally recited in claim 4, Petitioner asserts that it is disclosed by Li. Pet. 72–73.

Petitioner asserts Li discloses that "frames contain multiple time slots, with different subcarrier allocations at different time slots." *Id.* at 72 (citing Ex. 1005, 15:18–23). In that regard, Li describes following:

> More frequency diversity can be obtained through subcarrier hopping over time in which a subscriber occupies a set of subcarriers at one time slot and another different set of subcarriers at a different time slot. One coding unit (frame) contains multiple such time slots and the transmitted bits are encoded across the entire frame.

Ex. 1005, 15:18–23. Petitioner further explains that, in the context of claim 1, it has already explained why Li includes circuitry for OFDMA transmissions. Pet. 73.

Patent Owner does not present contrary arguments with regard to Petitioner's assertions on how Li discloses the limitation additionally recited in claim 4. We are sufficiently persuaded that the evidence cited by Petitioner supports Petitioner's assertion that Li discloses the limitation additionally recited in claim 4.

In the alternative, Petitioner argues that the limitation added by claim 4 would have been obvious to one with ordinary skill in the art. Pet. 72. Specifically, Petitioner states: "By the time the '641 Patent was filed, it was common in the art to transmit using time slots. For example, basic textbook presentations of OFDMA reflect a time slotted format." *Id.* (citing Ex. 1003 ¶ 216 (citing Ex. 1017)). This alternative argument is supported by the cited evidence. Patent Owner also has not presented contrary arguments with respect to this alternative position of Petitioner. On this record, we are sufficiently persuaded by Petitioner on this alternative contention.

For the foregoing reasons, we determine that Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of claim 4 as obvious over Li, Husted, Cheng, and McFarland.

E. Alleged Unpatentability of Claim 5 as Obvious over Li, Husted, Cheng, McFarland, and Dulin

Claim 5 depends from claim 1 and further recites: "wherein the base station operates in an OFDMA frequency division duplex (FDD) or time division duplex (TDD) mode." Ex. 1001, 9:44–6. For the limitations of claim 1, which are incorporated into claim 5 by reason of claim 5's dependency from claim 1, Petitioner relies on the arguments it presented for claim 1. Pet. 73. With regard to the limitation additionally recited in claim 5, Petitioner makes two arguments.

First, Petitioner asserts:

> A wireless communication system, such as those OFDMA systems discussed in *Li*, that uses bi-directional communication with "uplink" and "downlink" communication used duplexing between uplink and downlink to allow base stations and mobile stations to access radio frequency resources. This teaching was implicit in *Li* in view of the background of a POSITA, as demonstrated by basic textbooks at the time, such as Rappaport. Ex. 1003, ¶ 223 (discussing Ex. 1012).

Id. at 74. Dr. Madisetti has testified to the same. Ex. 1003 ¶ 223.

Dr. Madisetti further explains:

> For example, Rappaport teaches that to "talk and listen simultaneously" to facilitate a voice conversation is "called *duplexing*" and "**is generally required in wireless telephone systems**." *Rappaport*, p. 395. *Rappaport* describes the two types of duplexing: (1) "*[f]requency division duplexing (FDD)*" and (2) "*[t]ime division duplexing*." *Rappaport*, p. 395 (emphasis in original). Every major cellular standard at the time of *Rappaport* used either TDD or FDD. *See Rappaport*, p. 398, Table 8.1.

Id.

Patent Owner has not presented contrary arguments. On this record, we are sufficiently persuaded that one with ordinary skill in the art would have understood Li as implicitly disclosing that either frequency division multiplexing or time division multiplexing is used in its system.

In the alternative, Petitioner relies on Dulin as expressly disclosing use of frequency division multiple access (FDMA) in an OFDM system, which constitutes an OFDMA system, and explains how Dulin discloses using frequency division duplexing as well as time division duplexing in its OFDMA system. Pet. 74–75.

Dulin is directed to wireless communication systems. Ex. 1011 ¶ 2. In particular, it relates to "synchronizing transmission of data between

multiple base transceiver stations and subscriber units, providing spatial multiplexing, and communication diversity." *Id.* Dulin discloses that "[a] scheduler 316 generates a map or schedule of transmission of the sub-protocol data. This includes when and at what frequency range sub-protocol data units are to be received by the [subscriber units]." *Id.* ¶ 54. Petitioner represents that Dulin discloses an OFDM system. Pet. 74. Patent Owner does not argue otherwise. Citing Paragraph 159 of Dulin, Petitioner further notes that Dulin discloses using FDMA. *Id.* at 75. According to Petitioner, applying FDMA to OFDM is an example of OFDMA, citing Paragraphs 225–227 of the Declaration of Dr. Madisetti, *Id.* Patent Owner does not argue otherwise.

Petitioner asserts that Dulin teaches the use of FDD as well as TDD with OFDMA. Pet. 75 (citing Ex. 1011 ¶¶ 130, 131 and Ex. 1003 ¶¶ 228–229). In Paragraph 130, Dulin states: "The maps 1310, 1320 of FIG. 13B are consistent with FDD transmissions." Ex. 1011 ¶ 130. In Paragraph 131, Dulin states: "The maps 1330, 1340 of FIG. 13C are consistent with TDD transmission." *Id.* ¶ 131. According to Petitioner, Dulin's teachings thus provide two ways of facilitating the uplink and downlink transmissions disclosed in Li's OFDMA system: FDD or TDD. Pet. 75 (citing Ex. 1003 ¶¶ 228–229); *see also* Ex. 1005, 5:14–18 (disclosing the downlink and uplink control channels in an OFDMA system). The assertion is supported by the cited testimony of Dr. Madisetti.

Petitioner argues that an ordinarily skilled artisan would have been motivated to combine Dulin's TDD and FDD features with Li's OFDMA system (1) to confirm that TDD or FDD were two ways of duplexing uplink and downlink signals in a cellular system, or (2) to fill in the implementation

details left out of Li's disclosure regarding how to implement uplink and downlink transmissions that share channel resources. *Id.* (citing Ex. 1003 ¶ 230).

Patent Owner does not dispute Petitioner's assertions regarding the disclosures of Dulin or Petitioner's articulated reasoning for applying the teachings of Dulin regarding frequency division duplexing or time division duplexing in Li. The assertions of Petitioner are supported by the cited testimony of Dr. Madisetti. On this record, we are persuaded by Petitioner's assertions of the disclosures of Dulin and Petitioner's articulated reasoning for applying, in Li's OFDMA system, Dulin's teachings about using FDD or TDD.

Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of claim 5 as obvious over Li, Husted, Cheng, McFarland, and Dulin.

F. Discretionary Denial of Petition under 35 U.S.C. § 314(a)

Institution of *inter partes* review is discretionary with the Director of the U.S. Patent and Trademark Office. *See* 35 U.S.C. § 314(a) ("The Director may not authorize an inter partes review to be instituted unless the Director determines that . . . ."). Thus, institution of review is never mandatory, even if Petitioner has shown a reasonable likelihood that it would prevail in establishing at least one claim of the '641 patent is unpatentable.

Citing the August 2018 Update to the Office Trial Practice Guide, 83 Fed. Reg. 39,989 (Aug. 13, 2018) ("TPG Update"),[4] Patent Owner notes

[4] A copy of TPG Update is accessible at https://go.usa.gov/xU7GP.

that a factor to consider for deciding whether to do a discretionary denial of a petition is whether other proceedings related to the same patent, either at the Office, in district courts, or before the International Trade Commission, are in advanced stages and will resolve the same or similar issues presented in the petition before the Board can. Prelim. Resp. 5 (citing TPG Update, 10). Patent Owner asserts that discretion should be exercised in this case to deny the Petition, because concurrent district court litigation "*Will Resolve the Issues Presented* Almost a Full Year Before the Board Can." *Id.* at 6. (emphasis added). Patent Owner states that "by the time the Board's institution decision is due on April 22, the parties will be only **three weeks from trial**." *Id.*

But Patent Owner in the Preliminary Response refers to no evidence to support the assertion that concurrent district court litigation will resolve the issues presented almost a full year before the board can. *See id.* In particular, the Preliminary Response does not indicate specifically what grounds of unpatentability against which claims will be tried in related district court litigation. In an Order issued on January 28, 2019, we stated: "For purposes of deciding whether to institute *inter partes* review, we require more information than that provided [by Patent Owner]." Paper 6, 2. We ordered the parties to make a joint submission that, *inter alia*, "specifically identifies which claims of the '641 patent are alleged as invalid in the civil action, based on what grounds . . . ." *Id.* at 3.

The parties made a joint submission. Paper 7. The submission informs us that Petitioner initially made invalidity contentions in April 2018 against claims of the '641 patent, including claims 1–5, based on multiple prior art references including Cheng. *Id.* at 4. The submission also informs

us that Petitioner's expert report of Dr. Kevin Negus was provided on December 12, 2018, and that the report identifies 10 prior art references including Li, Husted, and McFarland, but not Cheng or Dulin. *Id.* at 3.

We authorized Petitioner to file a Reply to Patent Owner's Preliminary Response, limited to discussing the issue of discretionary denial under 35 U.S.C. § 314(a). Paper 8. Petitioner filed the Reply. Paper 9. We authorized Patent Owner to file a Sur-Reply, also limited to the subject of discretionary denial under 35 U.S.C. § 314(a). Paper 11. Patent Owner filed the Sur-Reply. Paper 12.

Petitioner confirms that the invalidity opinions from its expert in the related litigation, Dr. Negus, who is not Petitioner's expert in this proceeding, do not include any ground of invalidity with either Cheng or Dulin. Paper 9, 1–2. Petitioner further explains:

> As is typical of district court litigation, after initial notice pleadings, positions evolve and are refined over the course of the litigation, so the references used in Dr. Negus's report are a subset of the references presented in the initial invalidity contentions referenced by Patent Owner. *See Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (In "district court litigation [] parties have greater freedom to revise and develop their arguments over time and in response to newly discovered material" than in IPR.). Furthermore, as the district court litigation proceeds and positions are further winnowed, it remains to be determined what positions will ultimately be presented to the jury during trial.

Id. at 2. Petitioner also notes that different burdens of proof and rules of claim construction apply to an *inter partes* review and to district court litigation with regard to invalidating patent claims. *Id.* at 2–3.

On the record before us, Patent Owner's assertion that "concurrent district court litigation *will resolve the issues presented* almost a full year

before the board can" (Prelim. Resp. 6 (initial caps omitted)) is not supported by evidence, and we do not determine that it is so. Specifically, both Grounds 1 and 2 in this proceeding will not be completely resolved in district court litigation because Cheng is not discussed in Dr. Negus's expert report.[5] Also, Ground 2 in this proceeding will not be resolved in district court litigation because Dulin is not discussed in Dr. Negus's expert report. Furthermore, as to both Grounds 1 and 2, it remains a speculation that the references Li, Husted, and McFarland, notwithstanding that they are discussed in Dr. Negus's expert report, actually will be raised as a combination, with or without Cheng and Dulin, at trial in the related district court action. The fact that Dr. Negus discussed Li, Husted, and McFarland in his expert report does not mean that that specific combination actually will be raised at trial. Dr. Negus's expert report discusses as many as ten prior art references. Paper 7, 3. It is presumptive to assume that the specific combination of Li, Husted, and McFarland, with or without Cheng and Dulin, actually will be raised at trial. Furthermore, it is possible that after institution of trial in this proceeding, the district court action may be simplified by removing the combination of Li, Husted, and McFarland, without Cheng and Dulin, from inclusion in the district court trial.

Additionally, the Board's decision on whether to exercise discretion to deny a petition under 35 U.S.C. § 314(a) is "part of a balanced assessment of all relevant circumstances in the case, including the merits." *See* TPG Update, 10. The merits of the alleged unpatentability of claims based on Li,

[5] Cheng is used as a backup reference in this proceeding, in case we find the combination of Li, and Husted insufficient for Ground 1. *See* Pet. 42.

Husted, Cheng, and McFarland for claims 1–4, and Li, Husted, Cheng, McFarland, and Dulin for claim 5, is such that it outweighs our concern that there may be some duplication of resources if the district court trial were also to proceed on grounds of unpatentability including the very same grounds involved in this proceeding. What concerns us more is the possibility, if we were to exercise discretion to deny review, of the district court action omitting the ground of Li, Husted, Cheng, and McFarland for claims 1–4, and Li, Husted, Cheng, McFarland, and Dulin for claim 5.

Even if there is near certainty that the combination of Li, Husted, Cheng, and McFarland for claims 1–4, and the combination of Li, Husted, Cheng, McFarland, and Dulin for claim 5, will be raised at trial in the district court action, the different burdens of proof between our proceeding and the district court action still urge us not to exercise discretion here to dismiss the Petition, based on our concern for patent quality and the integrity of the patent system. In that regard, the Trial Practice Guide Update states:

> The Director's discretion is informed by 35 U.S.C. §§ 316(b) and 326(b), which require the Director to "consider the effect of any such regulation [under this section] on the economy, *the integrity of the patent system*, the efficient administration of the Office, and the ability of the Office to timely complete proceedings instituted under this chapter." The AIA was "designed to establish a more efficient and streamlined patent system that will *improve patent quality* and limit unnecessary and counterproductive litigation costs." H.R. Rep. No. 112–98, pt. 1, at 40 (2011), 2011 U.S.C.C.A.N. 67, 69 (Post grant reviews were meant to be "quick and cost effective alternatives to litigation"); *see also* S. Rep. No. 110-259, at 20 (2008).

TPG Update, 9 (emphasis added). With regard to efficiency, it is possible that the district court action may be stayed or simplified after institution of *inter partes* review in this proceeding. We note further that with institution

of trial in this proceeding, the *inter partes* review is at a more advanced stage than the related district court action, in the sense that the Board is now providing an initial analysis and assessment of the arguments and evidence presented by Petitioner in its Petition, as well as an initial analysis and assessment of the responsive arguments made so far by Patent Owner. Nothing comparable has yet resulted in the related district court trial.

The case authorities cited by Patent Owner with respect to discretionary denial of petition are not on point, because here we have not determined that the same or substantially the same issues of unpatentability will be resolved in related district court litigation before the Board can reach them, and because the merits of Petitioner's alleged grounds of unpatentability against the challenged claims in this proceeding are unique to this proceeding. Furthermore, *NHK Spring Co. v. Intri-Plex Techs.*, Case IPR2018-00752 (PTAB Sept. 12, 2018) (Paper 8), also involved discretionary denial of under 35 U.S.C. § 325(d), and it is unclear whether considerations under 35 U.S.C. § 314(a) alone would have supported discretionary denial of the petition in that case. There, the Board stated: "Accordingly, we find that the advanced state of the district court proceeding is an additional factor that weighs in favor of denying the Petition under § 314(a)." *NHK Spring*, at 20. In *NetApp Inc. v. Realtime Data LLC*, Case IPR2017-01195, slip. op. at 11 (PTAB Oct. 12, 2017) (Paper 9), also at issue was Petitioner's learning of information from Patent Owner's briefing and Board decision in a prior *inter partes* review involving the same patent, prior to filing of the petition, which is not at issue here.

Patent Owner additionally accuses Petitioner of joining with other defendants in related district court litigation to plan and orchestrate a

significant time gap between conclusion of district court litigation and issuance of a Final Written Decision in this proceeding. Prelim. Resp. 7–8. Patent Owner asserts:

> The significant time gap between conclusion of the district court litigation and issuance of a Final Written Decision is no accident—it is the result of an orchestrated plan by Petitioners and other district court defendants. Patent Owner filed the district court complaints on September 21, 2017. *See* Exhibit 2005 (naming Petitioner); Exhibit 2006 (same). Nevertheless, Petitioner waited until September 7, 2018 to file the Petition, which challenges only claims 1–5 of the '641 patent. Other district court defendants waited until the very last day to file another petition that challenges the remaining asserted claims of the '641 patent (*i.e.*, claims 6–9, 11, 13–14, 18, 22–25, 27–28, 32, and 36–38). *See* Petition, IPR2018-01770, Paper 3 (P.T.A.B. Sept. 21, 2018). As of at least February 2018, however, all defendants knew that the district court trial would take place as early as May 2019. Exhibit 2001. The timing of their petitions thus amounts to using the IPR process as a backup plan in case the jury disagrees with them at trial, not as a cost-effective and efficient alternative to litigation.

Id. at 8. We see nothing wrong with Petitioner waiting until close to the end of its one-year period to file a petition for *inter partes* review under 35 U.S.C. § 315(b), even if that timing resulted from coordination with codefendants in the related civil action who agree to and have filed another petition for *inter partes* review of other claims the '641 patent on the very last day of the one-year period under 35 U.S.C. § 315(b).[6]

The Leahy-Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284, 329 (2011), does not guarantee increased judicial efficiency in

[6] In any event, Patent Owner has not submitted sufficient evidence to show that there was such joint planning and coordination.

resolving patent disputes in each case, and no litigant is required to adopt a strategy that increases judicial efficiency but at a cost of reducing its likelihood of prevailing in the dispute. Petitioner is free to file its Petition on or near the last day of the one-year period provided in 35 U.S.C. § 315(b) for filing a petition for *inter partes* review, at least where it is the first one filed by Petitioner against the involved patent and where there is no evidence of a joint effort by multiple petitioners to file multiple petitions in a staggered manner against the same patent to take advantage of early revelations of Patent Owner's positions or Board determinations. That is the case here. In this circumstance, filing within the one-year period provided by 35 U.S.C. § 315(b) is presumptively proper. Strategizing by Petitioner to determine its preferred timing for filing a petition for *inter partes* review within the period permitted by law is entirely reasonable.

Patent Owner further argues that Petitioner has known of the prior art references applied in the Petition for a long time. Prelim. Resp. 8–9. Specifically, Patent Owner asserts:

> In April 2018, Petitioners submitted invalidity contentions in the district court litigation containing the same references and positions of alleged obviousness that are set forth in the Petition. *See, e.g.*, Exhibit 2007 (*Li* claim chart (Petitioner's Ex. 1005)); Ex. 2008 (*Husted* claim chart (Petitioner's Ex. 1006)); Ex. 2009 (*McFarland* claim chart (Petitioner's Ex. 1008)); Exhibit 2010 (*Yamaura* claim chart (Petitioner's Ex. 1013); Ex. 2011 at 12, 63 (chart for alleged obviousness positions identifying *Cheng* (Petitioner's Ex. 1007)); Exhibit 2012 at 153-56 (chart of prior art identifying, among other references, *Hashem* (Petitioner's Ex. 1009), *van Nee* (Petitioner's Ex. 1010), *Rappaport* (Petitioner's Ex. 1012), *Prasad* (Petitioner's Ex. 2017), *IEEE 802.11-1999* (2003 version) (Petitioner's Ex. 1027)).

> In fact, Petitioners have known of some of its cited references **for years**. Indeed, Petitioner asserted *Li* over four years ago in IPR2014-01195. See Exhibit 2013 at 19. Petitioner also asserted *Dulin* and *Yamaur*a over three years ago in IPR2015-01664. *See* Exhibit 2017 at 25. Petitioner relied on *McFarland* and *van Nee* several years ago in IPR2014-00915 and IPR2014-00919. *See* Exhibit 2021 at 28–29; Exhibit 2022 at 18–19. The *van Nee* reference was also applied by the PTO during prosecution of the parent of the '641 patent. All but two of the remaining references are patents and patent applications that were published by 2005 or earlier.

Id. at 7–8 (footnote omitted). The argument is of little significance, if any. The Petition filed in this case is the first filed by Petitioner against any claim in the '641 patent. This is not a situation in which Petitioner previously filed one or more petitions for *inter partes* review of the '641 patent and withheld the prior art references it now asserts in this Petition. Patent Owner has articulated no basis to require Petitioner to have filed a petition for *inter partes* review of the '641 patent as early as four years ago or even prior to that. Also, as discussed above, Petitioner is free to wait to file the Petition until at or near the end of the one-year period provided in 35 U.S.C. § 315(b).

Finally, Patent Owner applies the seven discretionary factors identified in *General Plastic Indus. Co., Ltd. v. Canon Kobushiki Kaisha*, 2017 WL 3917706 (PTAB Sept. 6, 2017) (precedential), and contends that those factors urge in favor of discretionarily denying the Petition. Prelim. Resp. 12–20. The arguments are unpersuasive.

Factor 1 is "[w]hether the same petitioner previously filed a petition directed to the same claims of the same patent." *Id.* at *4. The Petition here is the first one filed by Petitioner on any claim in the '641 patent. Patent

Owner states that the same Petitioner had previously challenged "many of the same claim limitations currently at issue." Prelim. Resp. 13. The assertion misapplies Factor 1 of *General Plastic*, which is directed to challenge claims of a patent, not individual limitations of a claim. The argument also is misplaced because an *inter partes* review petition challenges the claims of a patent as unpatentable, not individual limitations of a patent claim, standing alone and separate from each other. Because certain limitations are contained within claims of separate patents, it is entirely proper for Petitioner to have analyzed those limitations in more than one petition.

Factor 2 is "whether at the time of filing the first petition the petitioner knew of the prior art asserted in the second petition or should have known of it." *General Plastic*, 2017 WL 3917706 at *4. Factor 3 is "whether at the time of filing of the second petition the petitioner already received the patent owner's preliminary response to the first petition or received the Board's decision on whether to institute review in the first petition." *Id.* Factor 4 is "the length of time that elapsed between the time the petitioner learned of the prior art asserted in the second petition and the filing of the second petition." *Id.* Factor 5 is "whether the petitioner provides adequate explanation for the time elapsed between the filings of multiple petitions directed to the same claims of the same patent." *Id.*

As noted above, the instant Petition is the first one filed by Petitioner against any claim of the '641 patent, and individual claim limitations are not themselves the challenged claims. Even if individual limitations are themselves claims, Patent Owner has not explained why Petitioner may not file separate petitions directed to different patents. In essence, Patent Owner

has, without support or justification, attempted to limit Petitioner to filing a single petition even though there are multiple patents to be challenged. Simply put, Factors 2, 3, 4, and 5 are inapplicable in the circumstance here.

Factor 6 is "the finite resources of the Board." *Id*. Factor 7 is "the requirement under 35 U.S.C. § 316(a)(11) to issue a final determination not later than 1 year after the date on which the Director notices institution of review." *Id.* Neither of these factors is of concern here. We expect the final written decision in this case to be issued within the time period required by statute without straining the resources of the Board.

For the foregoing reasons, we decline to exercise discretion to deny the Petition under 35 U.S.C. § 314(a).

III. CONCLUSION

Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of claims 1–4 as obvious over Li, Husted, Cheng, and McFarland.

Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of claim 5 as obvious over Li, Husted, Cheng, McFarland, and Dulin.

IV. ORDER

It is

ORDERED that an *inter partes* review is instituted on all of the challenged claims, i.e., claims 1–5 of the '641 patent, on all corresponding grounds of unpatentability as specified in the Petition and identified in the Table in Section I.E. of this Decision; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R § 42.4(b), *inter partes* review of the '641 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

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