

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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NXP USA, INC.,  
Petitioner,

v.

BELL NORTHERN RESEARCH, LLC,  
Patent Owner.

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IPR2024-01044  
Patent RE48,629 E

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Before JEFFREY W. ABRAHAM, JOHN D. HAMANN, and  
BRIAN D. RANGE, *Administrative Patent Judges*.

HAMANN, *Administrative Patent Judge*.

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

## I. INTRODUCTION

NXP USA, Inc. (“Petitioner”) filed a petition for *inter partes* review of claims 1, 4, 8–23, and 27 (“the challenged claims”) of U.S. Patent No. RE48,629 E (Ex. 1001, “the ’629 patent”). Paper 2 (“Pet.”). Bell Northern Research, LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

Institution of an *inter partes* review is authorized by statute when “the information presented in the petition . . . and any response . . . 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); *see* 37 C.F.R. § 42.108 (2024). Upon consideration of the papers, we conclude that the information presented shows that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one challenged claim of the ’629 patent.

### A. *Real Parties-in-Interest*

Petitioner identifies itself and NXP Semiconductors, N.V. as real parties-in-interest. Pet. 78. Patent Owner identifies itself as a real party-in-interest, and adds that it “is a wholly owned subsidiary of Hilco Patent Acquisition 56, LLC, which is owned by Hilco IP Merchant Capital, LLC, Hilco, Inc., Vulcan Ventures Inc., CDPQ Investments (U.S.) Inc., and KLIM AIV, LP.” Paper 4, 2.

### B. *Related Matters*

The parties identify the following as matters that may affect, or be affected by, a decision in this proceeding: *Bell Northern Research, LLC v. T-Mobile USA, Inc.*, 4-23-cv-00910 (EDTX); *Bell Northern Research, LLC v. AT&T Inc.*, 4-23-cv-00789 (EDTX); *Bell Northern Research, LLC v. Shenzhen Tinno Mobile Tech. Corp.*, 1-23-cv-07583

(SDNY); *Electronic Devices and Semiconductor Devices Having Wireless Communications Capabilities and Components Thereof*, Inv. No. 337-TA-1367 (ITC); *Bell Northern Research, LLC v. ASUSTek Computer, Inc.*, 4-23-cv-00573 (EDTX); *Bell Northern Research, LLC v. Qualcomm Inc.*, 8-23-cv-01065 (CDCA); *Bell Northern Research, LLC v. NXP Semiconductors, N.V.*, 1:23-cv-633 (WDTX); *Bell Northern Research, LLC v. Huaquin Co.*, 1-22-cv-24026 (SDFL); *Bell Northern Research, LLC v. HMD America, Inc.*, 1-22-cv-22706 (SDFL); *Bell Northern Research, LLC v. HMD America, Inc.*, 1-22-cv-21035 (SDFL); *Bell Northern Research, LLC v. BLU Products Inc.*, 1-21-cv-23484 (SDFL); *Bell Northern Research, LLC v. OnePlus Technology (Shenzhen) Co.*, 3-21-cv-02293 (NDTX); *Certain Electronic Devices Having Wireless Communications Capabilities and Components Thereof*, Inv. No. 337-TA-1284 (ITC); *Bell Northern Research, LLC v. TTE Technology Inc.*, 2-21-cv-07323 (CDCA); *TCL Industries Holdings Company Ltd. v. Bell Northern Research, LLC*, 3-21-cv-01598 (CDCA); *Bell Northern Research, LLC v. HP Inc.*, 6-21-cv-00939 (WDTX); *Bell Northern Research, LLC v. CommScope Holding Company, Inc.*, 6-21-cv-00941 (WDTX); *Bell Northern Research, LLC v. Dell Technologies, Inc.*, 6-21-cv-00909 (WDTX); *Bell Northern Research, LLC v. Lenovo Group Ltd.*, 6-21-cv-00847 (WDTX); *Bell Northern Research, LLC v. Apple Inc.*, 6-21-00833 (WDTX). Pet. 78–79; Paper 4, 2–3.

### *C. The Challenged Patent*

The '629 patent “relates generally to wireless communication systems and more particularly to long training sequences of minimum peak-to-average power ratio which may be used by legacy systems.” Ex. 1001, 1:29–32. More specifically, the '629 patent teaches “[a] network device for generating an expanded long training sequence with a minimal

peak-to-average ratio.” *Id.* at code (57). “The network device includes a signal generating circuit for generating the expanded long training sequence,” and “an Inverse Fourier Transform [(“IFT”)] for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio.” *Id.* “The expanded long training sequence and the optimal expanded long training sequence are stored on more than 52 subcarriers.” *Id.*

*D. The Challenged Claims*

Petitioner challenges claims 1, 4, 8–23, and 27 in this proceeding. Claim 1 is the only independent, challenged claim. Claim 1 is illustrative of the challenged claims and is reproduced below:

1. A wireless communications device, comprising:
  - a signal generator that generates an extended long training sequence; and
  - an Inverse Fourier Transformer operatively coupled to the signal generator,
    - wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and
    - wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme,
    - wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers, and
    - wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers  $-28$  to  $+28$ , excluding indexed sub-carrier 0 which is set to zero, as follows:

|             |     |     |     |     |     |     |     |
|-------------|-----|-----|-----|-----|-----|-----|-----|
| Sub-carrier | -28 | -27 | -26 | -25 | -24 | -23 | -22 |
| Encoding    | +1  | +1  | +1  | +1  | -1  | -1  | +1  |
| Sub-carrier | -14 | -13 | -12 | -11 | -10 | -9  | -8  |
| Encoding    | +1  | +1  | +1  | -1  | -1  | +1  | +1  |
| Sub-carrier | 1   | 2   | 3   | 4   | 5   | 6   | 7   |
| Encoding    | +1  | -1  | -1  | +1  | +1  | -1  | +1  |
| Sub-carrier | 15  | 16  | 17  | 18  | 19  | 20  | 21  |
| Encoding    | +1  | +1  | -1  | -1  | +1  | -1  | +1  |
| Sub-carrier | -21 | -20 | -19 | -18 | -17 | -16 | -15 |
| Encoding    | +1  | -1  | +1  | -1  | +1  | +1  | +1  |
| Sub-carrier | -7  | -6  | -5  | -4  | -3  | -2  | -1  |
| Encoding    | -1  | +1  | -1  | +1  | +1  | +1  | +1  |
| Sub-carrier | 8   | 9   | 10  | 11  | 12  | 13  | 14  |
| Encoding    | -1  | +1  | -1  | -1  | -1  | -1  | -1  |
| Sub-carrier | 22  | 23  | 24  | 25  | 26  | 27  | 28  |
| Encoding    | -1  | +1  | +1  | +1  | +1  | -1  | -1. |

Ex. 1001, 5:54–6:22.

*E. Asserted Grounds of Unpatentability*

Petitioner asserts that the challenged claims of the '629 patent are unpatentable based on the following grounds:

| Claim(s) Challenged | 35 U.S.C. § <sup>1</sup> | Reference(s)/Basis                                                                                        |
|---------------------|--------------------------|-----------------------------------------------------------------------------------------------------------|
| 1, 4, 8–23, 27      | 103(a)                   | Jones, <sup>2</sup> 802.11a, <sup>3</sup> 802.11-1999, <sup>4</sup> Zelst, <sup>5</sup> Boer <sup>6</sup> |
| 1, 4, 8–23, 27      | 103(a)                   | Jones, 802.11a, 802.11-1999, Boer                                                                         |

<sup>1</sup> The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the '629 patent issued from an application having an effective filing date before March 16, 2013, we apply the pre-AIA version of the statutory basis for unpatentability.

<sup>2</sup> US 7,453,793 B1, issued Nov. 18, 2008 (Ex. 1014, “Jones”).

<sup>3</sup> IEEE 802.11a-1999 Standard (Ex. 1008, “802.11a”).

<sup>4</sup> IEEE 802.11-1999 Standard (Ex. 1006, “802.11-1999”).

<sup>5</sup> US 7,599,332 B2, issued Oct. 6, 2009 (Ex. 1010, “Zelst”).

<sup>6</sup> US 8,014,267 B2, issued Sept. 6, 2011 (Ex. 1012, “Boer”).

Pet. 1, 21–77. Petitioner submits in support of its arguments the Declaration of R. Michael Buehrer (Ex. 1005), the Declaration of Gordon MacPherson (Ex. 1007), and the Declaration of David Ringle (Ex. 1009). Patent Owner submits in support of its arguments the Declaration of Dr. Todor Cooklev (Ex. 2001).

## II. LEVEL OF ORDINARY SKILL IN THE ART

To determine whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962–63 (Fed. Cir. 1986)). “[O]ne or more factors may predominate.” *Id.*

Petitioner argues that one of ordinary skill in the art “would have had a bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and at least 2–4 years of experience in the field of wireless communication,” and that “[e]quivalent education, work, or experience in this field could substitute for the foregoing qualifications.” Pet. 20 (citing Ex. 1005 ¶ 82). Patent Owner adopts Petitioner’s definition. Prelim. Resp. 22.

For purposes of this Decision, we adopt Petitioner’s definition of the level of skill for one of ordinary skill in the art. Pet. 20. We view the

definition for the level of ordinary skill as consistent with the '629 patent and the asserted prior art, and we apply it in our analysis below.

### III. CLAIM CONSTRUCTION

Because the Petition was filed after November 13, 2018, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b); 83 Fed. Reg. 51,340, 51,340–41, 51,343 (Oct. 11, 2018). In applying such standard, claim terms generally are given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Here, neither party sets forth any term that we need to construe. Pet. 5–6; Prelim. Resp. 23. Thus, for purposes of our Decision on Institution, we afford the claim terms their plain and ordinary meaning. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’”).

#### IV. PRINCIPLES OF LAW

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of non-obviousness, if present.<sup>7</sup> *See Graham*, 383 U.S. at 17–18. When evaluating a claim for obviousness, we also must “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

#### V. ALLEGED OBVIOUSNESS OVER JONES, 802.11a, 802.11-1999, ZELST, AND BOER

Petitioner argues that the combination of Jones, 802.11a, 802.11-1999, Zelst, and Boer renders claims 1, 4, 8–23, and 27 obvious. Pet. 21–73. In particular, Petitioner argues that Jones teaches the limitations of claim 1, but additionally relies on the teachings of Zelst and Boer to address an anticipated argument that Jones’s teachings are insufficient to show the claimed “exactly 56 subcarriers.” *See, e.g., id.* at 23. For the reasons that follow, we determine that Petitioner establishes a reasonable likelihood that it would prevail in showing that Jones renders at least claim 1 obvious. Thus, we focus our analysis below on this showing.

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<sup>7</sup> Patent Owner does not present arguments or evidence of such objective evidence of non-obviousness. *See generally* Prelim. Resp.

*A. Summary of Jones*

Jones “relates generally to channel estimation in communication systems and in particular to channel estimation techniques for wireless communication systems using multiple subcarriers, including systems compliant with the [Institute for Electrical and Electronics Engineers (‘IEEE’)] 802.11a standard.” Ex. 1014, 1:24–28.

*B. Challenged Claim 1*

*1. Wireless Communications Device (Preamble)*

Petitioner argues that Jones teaches “[a] wireless communications device,” as recited in the preamble of claim 1. Pet. 38–40. More specifically, Petitioner argues that Jones’s transmitter system 302 is a wireless communication device. *Id.* at 38 (citing Ex. 1014, Fig. 3, 8:1 (“two transmitter MIMO device”); Ex. 1005 ¶ 118).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage, we find that Jones teaches claim 1’s preamble. In light of our finding, we need not, and thus do not, reach whether claim 1’s preamble is limiting.

*2. Signal Generator*

Claim 1 further recites “a signal generator that generates an extended long training sequence.” Ex. 1001, 5:55–56. On the present record, we agree with Petitioner and find that Jones teaches this limitation. Pet. 40–41, 44–45.

More specifically, Jones teaches a signal generator (i.e., packet formation block 314), which “prepends a preamble to each transmitted packet,” and teaches that “a preamble suitable for extended-rate 802.11a communication systems may be used.” Ex. 1014, 7:38–42; *see also id.* at 1:44–48 (explaining that in 802.11a, “[t]he preamble usually includes . . . a

known sequence of bits or symbols (referred to . . . as a ‘training sequence’) that the receiver can use for calibration”).

In particular, Jones teaches that in “an extended mode long training sequence,” long training symbol sequence “L[k] can contain more than 52 non-zero subcarriers” of the 64 subcarriers, unlike an 802.11a long training sequence. *Id.* at 8:22–27, Fig. 4 (illustrating L2, an example of a suitable long training sequence with additional non-zero subcarriers); *see also id.* at 2:28–31, 8:11–13 (explaining that an 802.11a-compliant embodiment has only 52 non-zero subcarriers (i.e., the DC subcarrier and 11 subcarriers near the edges of the 20 MHz channel are zero as they are not used for data transmission)).

Moreover, we agree with Petitioner and find that 802.11a<sup>8</sup> teaches that the long training sequence is “generated.” *See* Pet. 44; Ex. 1008, 13 (teaching that the long training symbol “shall be generated” according to a given equation), 59 (“G.3.2 Generation of the long sequences”). And we agree with Petitioner that Jones teaches that packet formation block 314 can generate 802.11a compliant long training sequences, as well as extended long training sequences that can contain more than 52 non-zero subcarriers. *See* Ex. 1014, 6:11–22, 7:38–42, 8:22–27, Fig. 4 (illustrating extended long training sequence L2).

In sum, at this stage, we find that Jones teaches this limitation.

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<sup>8</sup> Jones incorporates 802.11a by reference. *See* Ex. 1014, 5:34–38. Thus, we view the combination of Jones and 802.11a as comprising a single disclosure. *See, e.g., Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000).

### *3. Inverse Fourier Transformer*

Claim 1 further recites “an Inverse Fourier Transformer operatively coupled to the signal generator.” Ex. 1001, 5:57–58. On the present record, we agree with Petitioner and find that Jones teaches this limitation. Pet. 40–41.

More specifically, Jones teaches an IFT (i.e., inverse Fast Fourier Transform (“IFFT”) transmitter 316) operatively coupled to the signal generator (i.e., packet formation block 314). Ex. 1014, Fig. 3, 5:65–6:10 (teaching that packet formation block 314 provides symbols to IFFT module 316 to modulate subcarriers), 9:21–29; Ex. 1005 ¶ 135.

In sum, at this stage, we find that Jones teaches this limitation.

### *4. IFT Processes Extended Long Training Sequence*

Claim 1 further recites “wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio.” Ex. 1001, 5:59–62. On the present record, we agree with Petitioner and find that Jones teaches this limitation. Pet. 45–46, 48–49.

In particular, Jones teaches that transmitter system 302 includes “a packet formation block 314 that formats . . . encoded data into packets for transmission, [and] an IFFT . . . block 316 that applies the symbol data as modulation to a number of subcarriers.” Ex. 1014, 5:8–16. Put differently, Jones teaches that “[p]acket formation block 314 provides groups of symbols [(e.g., an extended long training sequence)] to IFFT module 316, which uses the group of symbols to modulate a group of [Orthogonal Frequency Division Multiplexing (‘OFDM’)] subcarriers.” *Id.* at 5:65–67. Jones teaches that “[i]n general, if a group of symbols  $D[k]$ ,  $k=0, 1, \dots, 63$  is provided, IFFT module 316 generates 64 time-domain samples  $d[i]$ ,” in

accordance with a mathematical equation. *Id.* at 5:67–6:10; *see also id.* at 2:34–37 (explaining that in Jones “a sequence in the frequency domain is expressed with uppercase letters (e.g.,  $L[k]$ ), while the corresponding time sequence is expressed with lowercase letters (e.g.,  $l[i]$ )”); *see also id.* at Fig. 3 (illustrating that IFFT transmitter 316 receives  $D[k]$  symbols from packet formation block 314 and provides  $d[i]$  transformed symbols).

In addition, we agree with Petitioner that Jones’s<sup>9</sup> teaching of the claimed 56 subcarrier long training sequence (*see infra* Sections V.B.6–7 (finding that Jones teaches the claimed 56 subcarrier sequence))—in conjunction with the above teachings that the packet formation block 314 provides the extended long training sequence to IFFT transmitter 316 for transformation—teaches that IFFT transmitter 316 provides an optimal extended long training sequence with a minimal peak-to-average ratio (i.e., Jones’s 56 subcarrier long training sequence processed by IFFT 316). Pet. 48–49. More specifically, at this stage, we find persuasive Petitioner’s arguments that the specific claimed encodings for the 56 subcarriers—which Jones also teaches—dictate that the output of the IFT provides an “optimal” sequence with a minimal peak-to-average ratio. *See* Pet. 5–6, 49. Notably, the ’629 patent teaches that the claimed 56 subcarrier sequence is “the long training sequence with a minimum peak-to-average power ratio that is used in 56 active sub-carriers,” and that “[o]ut of the 16 possibilities for the four new sub-carrier positions, the [claimed] sequence . . . has the minimum

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<sup>9</sup> Petitioner often refers to the claimed 56-subcarrier sequence as Zelst’s 56-subcarrier Extended Long Training Sequence (“ELTS”), but Petitioner uses this term synonymously with its assertions that other cited references, including Jones, teach the claimed 56-subcarrier sequence. *See, e.g.,* Pet. 18–19, 28, 56.

peak-to-average power ratio, i.e., a peak-to-average power ratio of 3.6 dB.” Ex. 1001, 5:30–35; *compare id.* at Fig. 4 (illustrating 56 subcarrier sequence), *with id.* at 6:7–22 (reciting encodings in claim 1). This teaching is consistent with Administrative Law Judge Bryan F. Moore’s conclusion “that the term ‘an optimal extended long training sequence with a minimal peak-to-average ratio’ does not need to be construed because it is adequately defined by the claim itself.” Ex. 1017,<sup>10</sup> 38–40.

Accordingly, we agree with Petitioner that Jones teaches that the IFT (IFFT transmitter 316) processes the extended long training sequence (56 non-zero subcarriers) from the signal generator (packet formation block 314), and provides an optimal extended long training sequence with a minimal peak-to-average ratio (the transformed 56 subcarrier sequence). Pet. 48–49.

We find unavailing Patent Owner’s argument that “the Petition does not identify *any* process in Jones . . . performed by an IFT, or otherwise describe how any IFT . . . *processes* the extended long training sequence from the signal generator.” Prelim. Resp. 25. Rather, Petitioner points to Jones’s process of IFFT 316 generating time-domain samples  $d[i]$  from symbols  $D[k]$ —a sequence in the frequency domain is transformed into a corresponding time domain sequence. Pet. 45–46 (citing Ex. 1014, 5:67–6:10, Fig. 3).

We also find unavailing Patent Owner’s argument that “the Petition is entirely silent as to how any IFT in Jones . . . ‘*provides*’ an optimal extended long training sequence.” Prelim. Resp. 26. Rather, as we discuss above,

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<sup>10</sup> Order No. 29, Construing Certain Claim Terms, ITC Inv. No. 337-TA-1367.

Petitioner points to Jones's IFFT module 316, which generates 64 time-domain samples  $d[i]$  that are an optimal extended long training sequence because Jones teaches the claimed encodings for the 56 subcarriers. Pet. 45–46, 48–49.

We also find unavailing Patent Owner's argument that Petitioner asserts that Jones's 56 subcarrier training sequence "is both the output of the 'signal generator' and the output of the IFFT." Prelim. Resp. 27. Rather, Petitioner clearly states that the output of the signal generator (i.e., packet formation block 314) is the 56 subcarrier training sequence (which is in the frequency domain), and the output of the IFFT is the 56 subcarrier training sequence "*processed by the IFFT*" (which is in the time domain). Pet. 48–49 (emphasis added).

In sum, at this stage, we find that Jones teaches this limitation.

5. *Greater Number of Subcarriers Than Standard*

Claim 1 further recites "wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme." Ex. 1001, 5:63–67. On this record, we agree with Petitioner and find that Jones teaches this limitation. Pet. 50–51.

In particular, Jones teaches increasing the number of active subcarriers above the 52 subcarriers used in 802.11a, which is a standard wireless networking configuration for an OFDM scheme. See Ex. 1014, 6:11–20; Ex. 1008, 1; Ex. 1005 ¶¶ 144–145.

In sum, at this stage, we find that Jones teaches this limitation.

6. *Exactly 56 Active Sub-carriers*

Claim 1 further recites "wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers." Ex. 1001, 6:1–2. On

this record, we agree with Petitioner and find that Jones teaches this limitation. Pet. 18, 22–23, 29, 34, 36–38, 41, 44, 51.

More specifically, Jones teaches that in 802.11a-compliant systems, 52 subcarriers are used while “the DC subcarrier and 11 subcarriers near the edges of the 20 MHz channel are not used for data transmission” (i.e., are set to zero). Ex. 1014, 2:14–30 (explaining the long training sequence for a conventional 802.11a preamble), 6:11–15. Notably, Jones also teaches that “packet formation block 314 may insert appropriate complex values at unused . . . subcarrier locations in each group of symbols  $D[k]$ ,” and that “*any or all* of the subcarriers  $k$  may be used to transmit data, thereby increasing the data rate.” *Id.* at 6:15–20 (emphasis added); *see also id.* at 8:22–24 (teaching that an extended long training sequence “can contain more than 52 non-zero subcarriers”). At this stage, we credit Dr. Buehrer’s testimony that one of ordinary skill in the art would have been motivated to “add[] four subcarriers to 802.11a data and training fields [to] increase[] data rate throughput as taught in . . . Jones,” as this testimony is consistent with Jones’s teachings. Ex. 1005 ¶ 107.

In addition, we agree with Petitioner and find that one of ordinary skill in the art extending the long training sequence would want to use the same 52 center subcarriers to maintain backwards compatibility with 802.11a. Pet. 28–29. This is supported by Jones’s teaching of having a long training sequence that “is usable in a process for determining whether the packet is an 802.11a packet or an extended-mode packet.” Ex. 1014, 8:37–40. Moreover, Jones’s L2 example of an extended long training sequence maintains the same 52 center subcarriers as 802.11a, which also supports this finding. *Id.* at Fig. 4; Ex. 1005 ¶¶ 96, 113. Thus, up to 11 subcarriers unused in 802.11a could be used for an extended long training sequence.

And we again note that Jones teaches that “any or all” of these subcarriers or “more than 52 non-zero subcarriers” can be used for an extended long training sequence, which explicitly teaches that only a portion of the 11 subcarriers may be used. Ex. 1014, 6:15–20, 8:22–24. In light of the above teachings, we find that one of ordinary skill in the art would have found it obvious to use only the next 4 nearest to the center of these 11 unused subcarriers. Ex. 1005 ¶ 87. The remaining 7 subcarriers would remain at zero.

In addition, we find that one of ordinary skill in the art would have found it obvious to try using exactly four of these 11 unused subcarriers. *See KSR*, 550 U.S. at 417 (“When there is a design need or market pressure to solve a problem [(i.e., increase data rate throughput)] and there are a finite number of identified, predictable solutions, [(i.e., using any or all (e.g., 4) of the unused subcarriers)] a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103.”). In addition, we note that for these 4 additional subcarriers, Jones’s L2 long training sequence teaches the precise encodings of those extra subcarriers (1, 1, -1, -1). *See* Ex. 1014, Fig. 4; Ex. 1005 ¶ 113.

In sum, at this stage, we find that Jones teaches this limitation.

#### *7. Represented by Encodings as Follows*

Claim 1 further recites the following:

wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers -28 to +28, excluding indexed sub-carrier 0 which is set to zero, as follows:



26. Petitioner annotates the illustrated L2 training sequence by highlighting (i) subcarrier 0 in red (set to zero), (ii) the 52 subcarriers of the legacy 802.11a long training sequence in blue, and (iii) the four extra subcarriers for the claimed 56 subcarrier long training sequence in yellow. Pet. 53 (annotating L2 excerpt of Ex. 1014, Fig. 4). In addition, Petitioner numbers the 64 subcarriers based on Jones's subcarrier numbering convention. *See id.*; *see also* Ex. 1014, 2:14–30 (explaining subcarrier numbering convention). Comparing the values for the identified 56 subcarriers of Jones's L2 with the claimed encoding values shows that they are the same. *Compare* Ex. 1014, Fig. 4, *with* Ex. 1001, 6:3–6:22.

In sum, at this stage, we find that Jones teaches this limitation.

#### 8. *Summary*

In summary, based on the current record, and for purposes of this institution decision, we determine that Petitioner shows a reasonable likelihood that it would prevail in showing that claim 1 would have been obvious to one of ordinary skill in the art in view of Jones.

### VI. ANALYSIS OF OTHER CLAIMS AND GROUNDS

Because Petitioner demonstrates a reasonable likelihood of success in proving that at least one claim of the '629 patent is unpatentable, we institute on all grounds and all claims raised in the Petition. *See* 37 C.F.R.

§ 42.108(a). Therefore, at this stage of the proceeding, it is not necessary for us to provide an assessment of every challenge raised by Petitioner. Those challenges, in our view, are best left for trial after full development of the record.

### VII. CONCLUSION

For the foregoing reasons, we determine that Petitioner has shown a reasonable likelihood that it would prevail in proving the unpatentability of

at least one of the challenged claims of the '629 patent. We thus institute an *inter partes* review of all of the challenged claims of the '629 patent on all grounds asserted in the Petition.

Any findings or conclusions in this Decision are made only for the purposes of institution and are not dispositive of any issue. We have not made a final determination with respect to the patentability of any challenged claim. Our final determination will be based on the record as fully developed during trial, including any evidence or argument timely presented by the parties under our Rules.

#### VIII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of the '629 patent is instituted on all of the challenged claims and all grounds asserted in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial commences on the entry date of this Decision.

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Patent RE48,629 E

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