

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DISH NETWORK L.L.C., DISH NETWORK SERVICE L.L.C.,
DISH NETWORK CORPORATION, and
DISH NETWORK CALIFORNIA SERVICE CORPORATION,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

IPR2024-00555
Patent 8,320,566 B2

Before LYNNE H. BROWNE, BARBARA A. PARVIS, and
FREDERICK C. LANEY, *Administrative Patent Judges*.

PARVIS, *Administrative Patent Judge*.

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

I. INTRODUCTION

DISH Network L.L.C., DISH Network Service L.L.C., DISH Network Corporation, and DISH Network California Service Corporation (collectively, “Petitioner”) filed a Petition (Paper 2 (“Pet.”)) requesting *inter partes* review of claims 1–6 and 12 (“challenged claims”) of U.S. Patent No. 8,320,566 B2 (Ex. 1001, “the ’566 patent”). Entropic Communications, LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

Under 35 U.S.C. § 314, an *inter partes* review may not be instituted unless 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.” For the reasons provided below, we determine that Petitioner has not demonstrated a reasonable likelihood that it will prevail in showing the unpatentability of at least one challenged claim. Accordingly, we do not institute *inter partes* review of the ’566 patent.

II. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies DISH Network L.L.C., DISH Network Corporation, DISH Network Service L.L.C., and DISH Network California Service Corporation as the real parties-in-interest. Pet. 99. Patent Owner names itself as the real party-in-interest. Paper 4, 1.

B. *Related Matters*

Both parties identify the following district court proceeding involving assertion of patents against Petitioner: *Entropic Communications, LLC v. DISH Network Corporation et al.*, Case No. 2-23-cv-01043 (C.D. Cal.). Pet. 100, Paper 4, 1. Patent Owner also identifies the following patents and

application related to the '566 patent: U.S. Patent Application No. 12/579,312; U.S. Patent No. 8,363,681; and U.S. Patent No. 8,418,036. Paper 4, 2.

C. The '566 Patent

The '566 patent is titled “Method and Apparatus for Performing Constellation Scrambling in a Multimedia Home Network.” Ex. 1001, code (54). The '566 patent describes systems and methods “that allow multiple transmitting network devices to transmit under a[n] orthogonal frequency divisional multiple access (OFDMA) mode to a receiving network device.” *Id.* at 2:18–22. According to the '566 patent, “[t]he multiple transmitting network devices may be configured to perform constellation scrambling on the symbols they will be transmitting using a predetermined scrambling sequence,” and “further configured to synchronize their use of the sequence, for example, by advancing the sequence for each available subcarrier, such that the receiving device may view the payload as if it were sent by a single transmitter.” *Id.* at 2:22–29.

Figure 1 of the '566 patent, reproduced below, shows an example home network. *Id.* at 3:13–16.

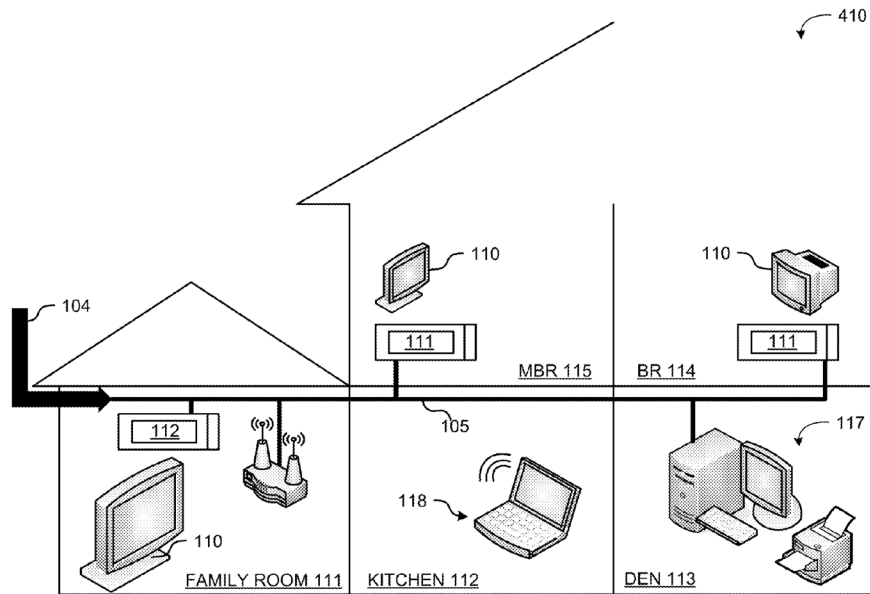


Fig. 1

As shown in Figure 1, the home network includes set top boxes 111, televisions 110, desktop computing system 117, and laptop computer 118. *Id.* at 3:65–4:4.

The '566 patent describes that the home network may be defined by the Multimedia over Coax Alliance (“MoCA”) technical standard. *Id.* at 3:61–65. The MoCA technical standard defines a protocol for distributing digital entertainment over the available bandwidth on coaxial cable previously installed in households for cable or satellite TV service. *Id.* at 1:59–66. According to the '566 patent,

upon setting up a MoCA network, one of the client nodes is automatically selected to be a network coordinator (NC). For the purpose of establishing a system to allocate network bandwidth, the NC schedules times during which communication occurs over the network. The NC communicates the schedule to each client node in “Media Access Packets” (MAPs). Each MAP is a packet of information. One MAP is sent by the NC during each “MAP cycle”. To enable the NC to perform these scheduling duties, the NC provides an opportunity for network devices to

transmit a “Reservation Request” (RR) that comprises a request for a certain amount of bandwidth at a certain time.

Id. at 4:35–46.

The ’566 patent explains that “[i]n many communications networks, physical layer (PHY) packets are transmitted using orthogonal frequency division multiplexing (OFDM),” where “data is modulated onto a plurality of frequency subcarriers.” *Id.* at 4:6–9. According to the ’566 patent, “[e]ach subcarrier is modulated using quadrature amplitude modulation (QAM),” where “the phases of two carrier waves at the same frequency are modulated.” *Id.* at 4:9–12. “The two subcarriers are termed the quadrature (Q) component and the in phase (I) component.” *Id.* at 4:12–13.

According to the ’566 patent, only “a subset of subcarriers within [a] frequency band may be available subcarriers for OFDM.” *Id.* at 5:4–6. “In an OFDMA communications environment, further subsets of the available subcarriers are assigned to network nodes” and “[t]hese network[] nodes may then communicate simultaneously on their assigned subcarriers.” *Id.* at 5:6–10.

Figure 5 of the ’566 patent, reproduced below, illustrates a scrambling operation. *Id.* at 6:22–23.

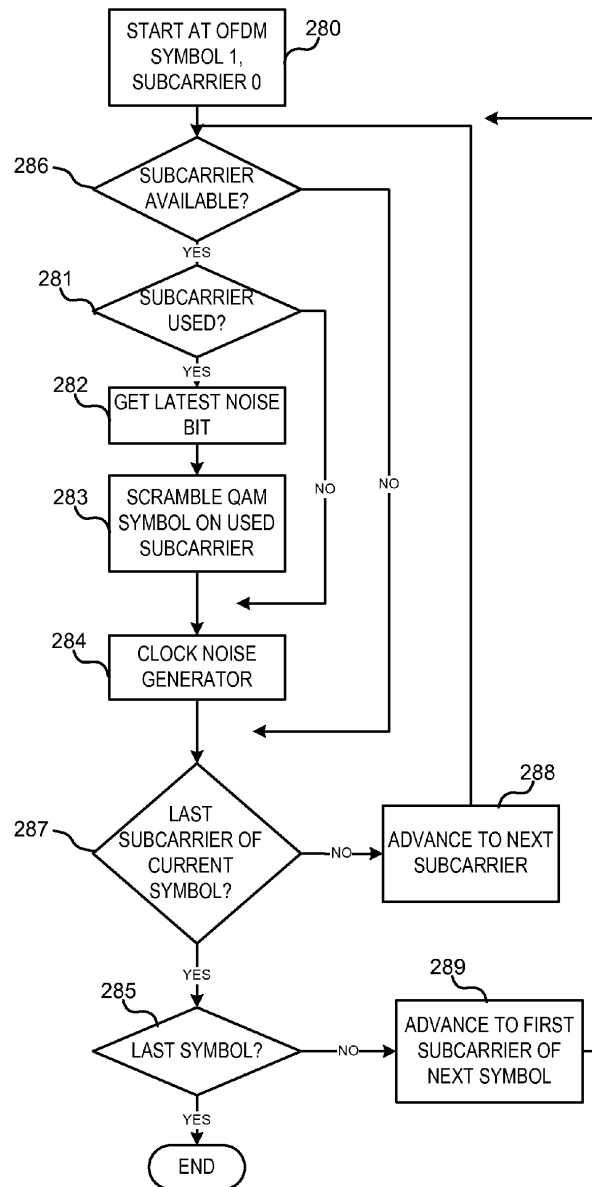


Fig. 5

In accordance with the scrambling operation shown in Figure 5 “a shared pseudorandom sequence that is used for constellation scrambling is provided to each network device that will be simultaneously transmitting during an OFDMA communications period.” *Id.* at 6:23–27. The ’566 patent describes the scrambling process shown in Figure 5 in further detail as follows:

when the constellation scrambling process begins (STEP 280), beginning with the first OFDM symbol and first subcarrier in the frequency range, a transmitting network device inspects the

current subcarrier to determine if the subcarrier is available for OFDMA communications (STEP 286). If the subcarrier is available, then the device determines whether the current subcarrier is being used by the device for OFDMA communications (STEP 281) (i.e., the subcarrier will be transmitting a QAM symbol on the current subcarrier). If so, then the node obtains the latest element of the pseudorandom sequence (STEP 282) and scrambles the QAM symbol on the used subcarrier (STEP 283) using the obtained element of the pseudorandom sequence. After STEP 283, or after STEP 281 if the subcarrier is not used, the device clocks the noise generator to advance [t]he pseudorandom sequence to the next element (STEP 284). In STEP 287, the device determines if the current subcarrier is the last subcarrier of the current symbol. In the illustrated embodiment, this step is performed after STEP 284 if it is determined in STEP 286 that the current subcarrier is not available. If STEP 287 determines that the current subcarrier is not the last subcarrier of the current symbol, then the network devices advances to the next subcarrier (STEP 288) and the method repeats from STEP 286. On the other hand, if the subcarrier is the last subcarrier, then the device determines if current symbol is the last symbol (STEP 285). If not, the device advances to the first subcarrier of the next symbol and the method again repeats from STEP 286. If the current symbol is the last symbol, then all symbols in the message have been scrambled, and the method ends.

Id. at 6:33–62. According to the '566 patent, “if this method is followed by the network devices that are transmitting using OFDMA, then no two network devices will scramble a symbol using the same pseudorandom sequence element.” *Id.* at 6:63–66. The '566 patent further describes that “the receiving network device sees the transmitted payload as if it were sent by a single transmitter, and it can use a single sequence generator to descramble the received symbols.” *Id.* at 7:11–14.

D. Illustrative Claim

Petitioner challenges claims 1–6 and 12 of the '566 patent. Pet. 2–3. Claim 1 is the sole independent challenged claim. Claims 2–6 and 12 depend, directly or indirectly, from claim 1. Independent claim 1, reproduced below, is illustrative of the claimed subject matter.

1. [1pre¹] A method for communications transmission using orthogonal frequency division multiple access on a network comprising:

[1a] a) providing a plurality of transmitting network devices with a set of available subcarriers for orthogonal frequency division multiple access;

[1b] b) providing a corresponding element of a pseudorandom noise sequence for each subcarrier of the set of available subcarriers;

[1c] c) allocating a subset of the set of available subcarriers to each of the transmitting network devices;

[1d] d) [i] a transmitting network device of the plurality of devices [ii] mapping a packet onto a plurality of used subcarriers of its allocated subset of available subcarriers, wherein the step of [iii] mapping the packet comprises mapping the packet onto a plurality of quadrature amplitude modulated symbols to be transmitted on the used subcarriers;

[1e] e) the transmitting network device [i] performing a predetermined transformation on a quadrature amplitude modulated symbol [ii] using the element of the pseudorandom noise sequence corresponding to the used subcarrier;

[1f] f) the transmitting network device transmitting the transformed symbol to a receiving network device.

Ex. 1001, 11:23–45.

¹ Herein, we use Petitioner's designations for the limitations of claim 1. Pet. vi–vii.

E. Evidence

Petitioner relies on the prior art references in the table below.

Name	Reference	Exhibit
Cleveland	US 2008/0112359 A1, published May 15, 2008	1006
Hayashino	US 5,682,376, issued Oct. 28, 1997	1007
Mutagi	R.N. Mutagi, <i>Pseudo Noise Sequences for Engineers</i> , Electronics & Communication Engineering Journal 79–87 (Apr. 1996)	1014
Ting	Wei-Chia Ting, <i>Low-Complexity Inner Receiver Design for IEEE 802.16 OFDMA Systems</i> (Master of Science thesis, National Chiao-Tung University) (July 2007)	1015
Ohana	US 2008/0298241 A1, published Dec. 4, 2008	1016
Scheim	US 2008/0233966 A1, published Sept. 25, 2008	1017
Tzannes	US 6,961,369 B1, issued Nov. 1, 2005	1009

Petitioner also relies on the Declaration of Tim A. Williams, Ph.D. (Ex. 1004) to support its contentions that the challenged claims are unpatentable.

F. Asserted Grounds

Petitioner asserts that the challenged claims of the '566 patent are unpatentable based on the grounds in the table below (Pet. 2–3):

Claims Challenged	35 U.S.C. § ²	Reference/Basis
1–3	103(a)	Cleveland, Hayashino
4	103(a)	Cleveland, Hayashino, Mutagi
5	103(a)	Cleveland, Hayashino, Mutagi, Ting
6, 12	103(a)	Cleveland, Hayashino, Mutagi, Ohana
1–3	103(a)	Scheim, Tzannes

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the challenged claims of the '566 patent have an apparent effective filing date before March 16, 2013, the pre-AIA version of § 103 applies. *See* Ex. 1001, codes (22), (60).

Claims Challenged	35 U.S.C. § ²	Reference/Basis
4	103(a)	Schein, Tzannes, Mutagi
5	103(a)	Schein, Tzannes, Mutagi, Ting
6, 12	103(a)	Schein, Tzannes, Mutagi, Ohana

III. ANALYSIS

A. *Legal Standard*

A patent claim is unpatentable under 35 U.S.C. § 103 when the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness, i.e., secondary considerations.³ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. *Level of Ordinary Skill in the Art*

Petitioner asserts that a person of ordinary skill in the art would have had

a degree in electrical engineering, computer engineering, or a related field and experience working in signal processing and/or communication systems/networks, e.g., a bachelor’s and three or more years of experience; a master’s and at least one year of experience; or a doctorate and some work experience.

³ The present record does not include any objective evidence of nonobviousness.

Pet. 10 (citing Ex. 1004 ¶¶ 1–13, 68, 69). Patent Owner does not contest Petitioner’s proposed definition of the level of ordinary skill in the art. *See generally* Prelim. Resp.

For purposes of this Decision, we adopt Petitioner’s proposal, because we find, based on the preliminary record before us, that Petitioner’s proposed definition is reasonable and consistent with the level of skill reflected in the specification of the ’566 patent and the asserted prior art references.

C. Claim Construction

We interpret the challenged claims

using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b). Under that standard, we generally give claim terms their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history.

Phillips v. AWH Corp., 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”

Realtime Data, LLC v. Iancu, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner states that “[b]ecause the Challenged Claims are obvious under any reasonable interpretation, no express constructions are required

here.” Pet. 4 (citing *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011)). Patent Owner does not propose any express construction at this time. *See* Prelim. Resp. 23. For purposes of this Decision, no claim terms require express construction.

D. Overview of the Asserted Art

1. Cleveland

Cleveland is titled “Spectrum Sharing in a Wireless Communication Network.” Ex. 1006, code (54). Cleveland discloses “[a] system and method for synchronous spectrum sharing for use in a wireless communication system based on orthogonal frequency-division multiplexing (OFDM) or orthogonal frequency division multiple access (OFDMA) signaling.” *Id.* at code (57).

By way of background, Cleveland notes that “[c]onventional fixed spectrum allocation schemes lead to significant spectrum under-utilization” and “[s]uch under-utilization and increasing demand for the radio spectrum suggest that a more effective spectrum allocation and utilization policy is necessary.” Ex. 1006 ¶ 3. Cleveland further notes “spectrum sharing systems for use in dynamic spectrum sharing networks” are needed. *Id.* ¶ 5.

Figure 1 of Cleveland, reproduced below, depicts exemplary wireless network 100 suitable for synchronous spectrum sharing. Ex. 1006 ¶ 25.

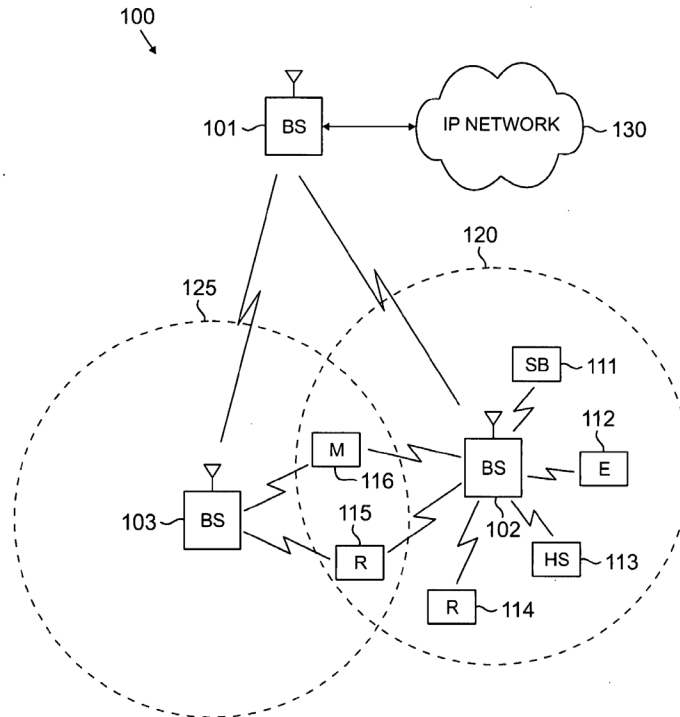


FIG. 1

As shown in Figure 1, wireless network 100 includes base stations (BSs) 101, 102, 103. *Id.* Base station 102 provides wireless broadband access to network 130, via base station 101, to a first plurality of subscriber stations (SSs) 111, 112, 113, 114, 115, 116 within coverage area 120 of base station 102. *Id.* ¶ 26. Base station 103 provides wireless broadband access to network 130, via base station 101, to a second plurality of subscriber stations (SS) 115, 116 within coverage area 125 of base station 103. *Id.* ¶ 27. According to Cleveland, subscriber stations 111–116 may use the broadband access to network 130 to access voice, data, video, video teleconferencing, and/or other broadband services. *Id.* ¶ 31.

Figure 2 of Cleveland, reproduced below, is a block diagram of OFDM/OFDMA transmitter 200. Ex. 1006 ¶ 36.

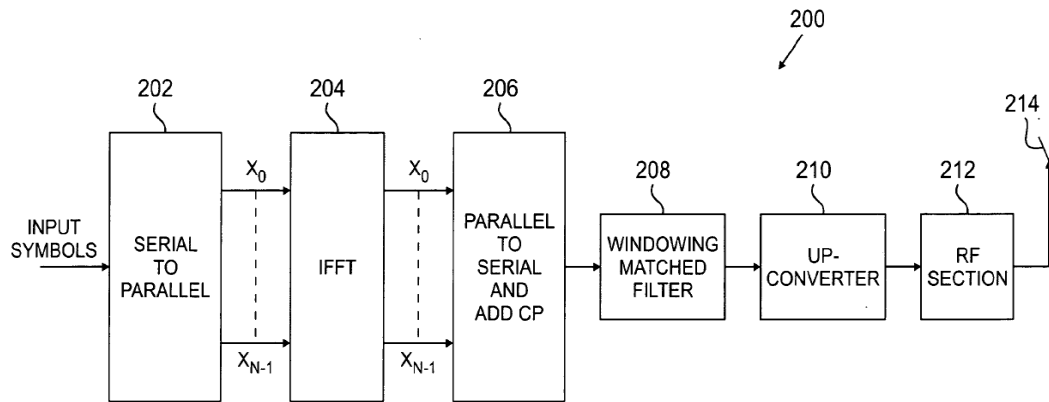


FIG. 2

As shown in Figure 2, the process performed by transmitter 200 to form an OFDM/OFDMA composite signal is as follows:

[T]he serial output of a formatted, encoded, interleaved data signal [is first passed] through serial-to-parallel converter 202. Serial-to-parallel converter 202 separates each data signal into parallel data streams (e.g., $X_0 \dots X_{N-1}$). A mapping function (MAP) within serial-to-parallel converter 202 maps each parallel data stream into I and Q modulation symbols, which are then applied to inverse fast Fourier transform (IFFT) block 204. The subcarrier separation is preferably an inverse of the OFDM symbol duration. IFFT block 204 computes the IFFT of each data stream and passes the output to parallel-to-serial and cyclic prefix (CP) block 206.

Parallel-to-serial and CP block 206 combines each parallel data stream into a data signal and introduces CP to aid in eliminating inter-symbol interference (ISI) and inter-block interference as later described in detail herein. For operation in time division duplex (TDD) mode, parallel-to-serial and CP block 206 inserts a guard interval (GI) into the signal. The output of parallel-to-serial and CP block 206 is passed to windowing matched filter 208 and then to up-converter block 210. The output of up-converter block 210 is then passed to RF section block 212 and transmitted via antenna 214.

Id. ¶¶ 36–37.

Figure 3 of Cleveland, reproduced below, is a block diagram of OFDM/OFDMA receiver 300. Ex. 1006 ¶ 38.

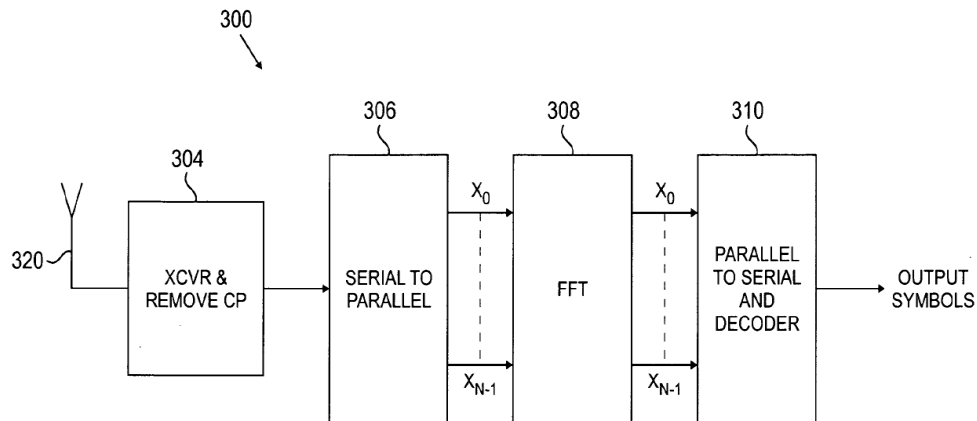


FIG. 3

As shown in Figure 3, the process performed by receiver 300 is as follows:

[T]he signal transmitted by antenna 214 is received by antenna 302. The signal is passed to transceiver and CP remove block 304. Transceiver and CP remove block 304 removes the CP from the signal and passes the signal to serial-to-parallel block 306. Serial-to-parallel block 306 separates the data signal into parallel data streams (e.g., $X_0 \dots X_{N-1}$). A MAP within serial-to-parallel converter 201 maps each parallel data stream into I and Q modulation symbols, which are then passed to fast Fourier transform (FFT) block 308. The output of FFT block 308 is then passed to parallel-to-serial and decoder block 310 and then output as desired.

Id.

Figure 5A of Cleveland, reproduced below, depicts distributed sub-carrier allocation 500a. Ex. 1006 ¶ 41.

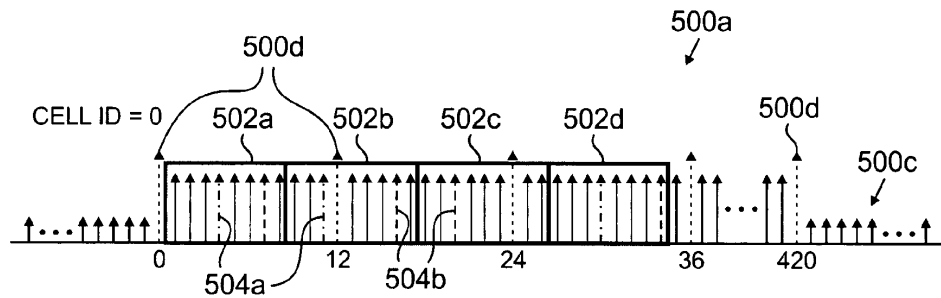


FIG. 5A

Figure 5A shows a sub-carrier allocation comprising “(a) Data sub-carriers 504 and 508 for data transmission; (b) Pilot sub-carriers 500d for estimation and synchronization purposes; and (c) Null sub-carriers 500c used for guard bands and DC carriers.” *Id.* ¶ 42. Cleveland also describes allocation of sub-carriers to sub-channels as follows:

[A] permutation process draws a sub-carrier pseudo-randomly from permutation groups 502 to form a sub-channel. This allocation of sub-carriers to sub-channels in a pseudorandom fashion is done so that there is a high probability that the sub-carriers for a given sub-channel in a certain cell are different than sub-carriers for that same sub-channel in another cell (for example the sub-carriers in sub-channel 1 in cell 1 will be different than the sub-carriers in sub-channel 1 in cell 2). This pseudorandom permutation provides an interference averaging effect further reducing the adverse effects of cell to cell interference.

Id.

2. Hayashino

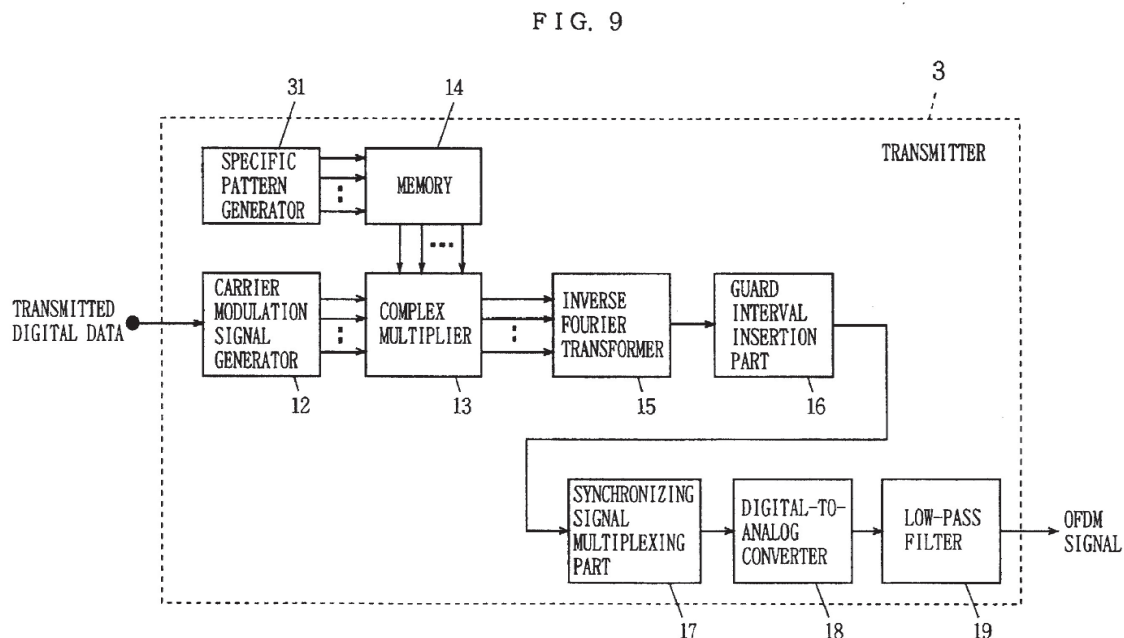
Hayashino is titled “Method of Transmitting Orthogonal Frequency Division Multiplex Signal, and Transmitter and Receiver Employed Therefor.” Ex. 1007, code (54). Hayashino

relates to an orthogonal frequency division multiplexing (hereinafter referred to as OFDM) transmission method, and more specifically, . . . to a method of transmitting data between

a transmission side and a receiving side through a wire or wireless transmission path with an orthogonal frequency division multiplex signal including symbols of prescribed lengths and guard intervals of prescribed lengths which are arranged between the symbols.

Id. at 1:7–15. According to Hayashino, “an OFDM transmission system is adapted to divide coded data and sort the same into at least hundreds of carriers, for multiplexing and transmitting the data.” *Id.* at 1:17–20.

Figure 9 of Hayashino, reproduced below, is a block diagram showing the structure of transmitter 3. Ex. 1007, 12:22–24.



As shown in Figure 9, transmitter 3 comprises, among other things, carrier modulation signal generator 12, complex multiplier 13, memory 14, and inverse Fourier transformer 15. *Id.* at 7:45–47. As is further shown in Figure 9, transmitter 3 also includes specific pattern generator 31 that provides an output, which is held in memory 14. *Id.* at 12:26–29. The output is “a complex signal group DO having a predetermined specific pattern with

signals which mutually vary in phase at random.” *Id.* at 12:29–31.

Hayashino describes that:

[s]uch a complex signal group DO can be formed by a pseudo-noise signal generator comprising a PN series pseudo-random signal generator for generating a pseudo-random signal which is at a level between zero and 1 and a multiplier for multiplying the pseudo-random signal by 2π for generating a unit vector signal in a phase having a random value in the range of zero to 2π and an amplitude of 1, for example. Alternatively, the complex signal group DO can be formed by a frequency sweep signal generator for generating a known frequency sweep signal in a phase having a random value in the range of zero to 2π .

Id. at 12:31–42. Hayashino explains that complex multiplier 13 “complex-multiplies data D_m of each symbol interval by data DO on the frequency axis every time data D_m is inputted for forming data D'_m ($D'_m = D_m \times D_0$), thereby randomizing mutual phases of respective carrier modulation signals included in a carrier modulation signal group to specific patterns.” *Id.* at 12:43–48.

3. *Schein*

Schein is titled “Resource Allocation Apparatus and Method in an Orthogonal Frequency Division Multiple Access Communication System.” Ex. 1017, code (54). Schein discloses a “method and system for resource allocation in OFDM communication systems,” which “reduces inter-cell interference by randomizing the inter-cell interference experienced in each cell” and “effectively spreads the resource allocation in each cell in a random manner resulting in statistical-like inter-cell interference behavior.” *Id.* at code (57).

Figure 1 of Schein, reproduced below, illustrates multiple access wireless communications system 10. Ex. 1017 ¶ 55.

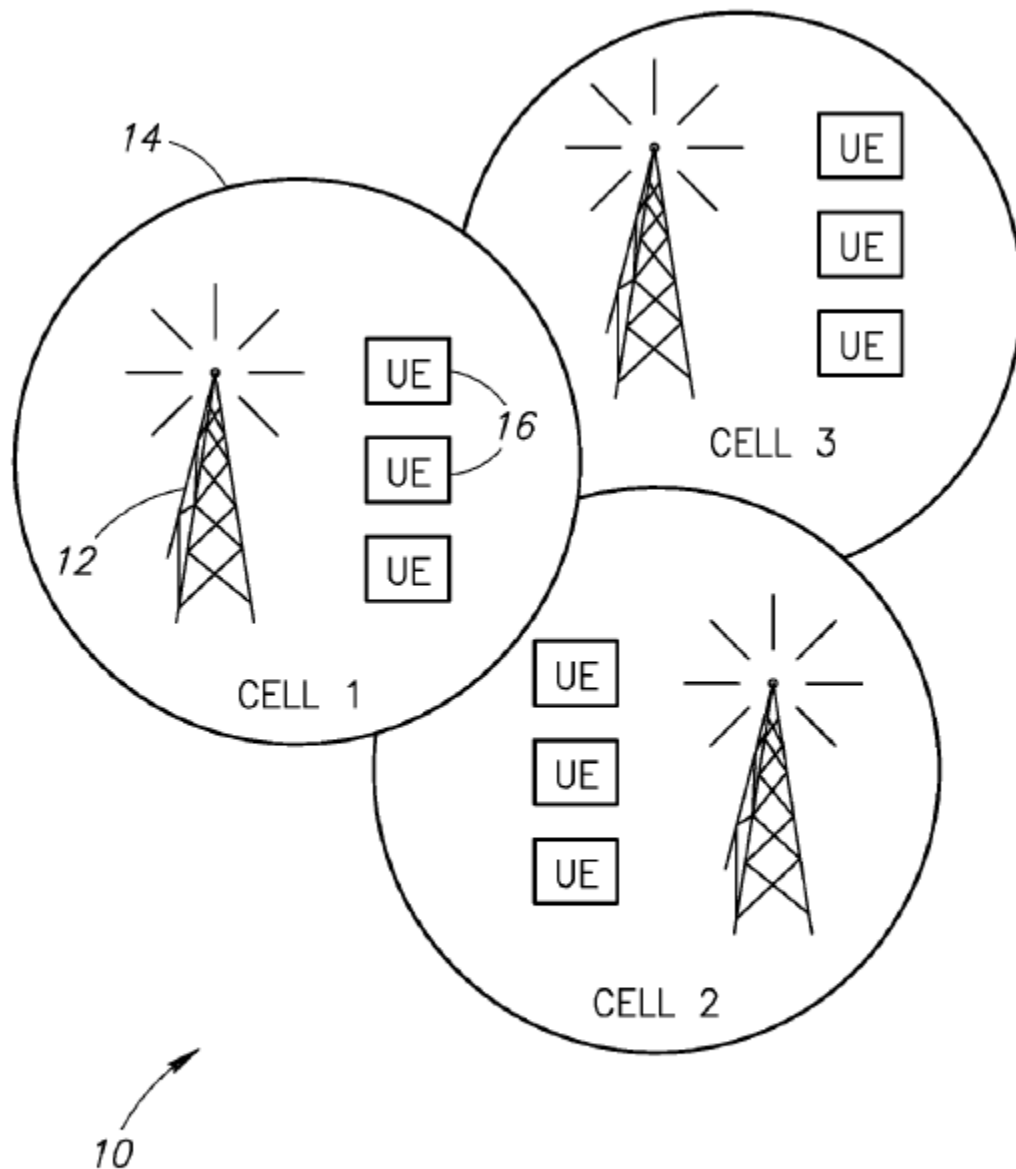


FIG.1
PRIOR ART

As shown in Figure 1, system 10 comprises a plurality of cells 14, where each cell comprises base station 12 and user equipment (UE) or mobile stations 16. *Id.* ¶ 16. Base station 12 transmits frames to the UEs, which

comprise control information and data. *Id.* Cells 14 overlap each other and provide an overlap in cell coverage, which can cause interference. *Id.*

Figure 2 of Scheim, reproduced below, is a block diagram illustrating OFDMA transceiver 20. Ex. 1017 ¶ 56.

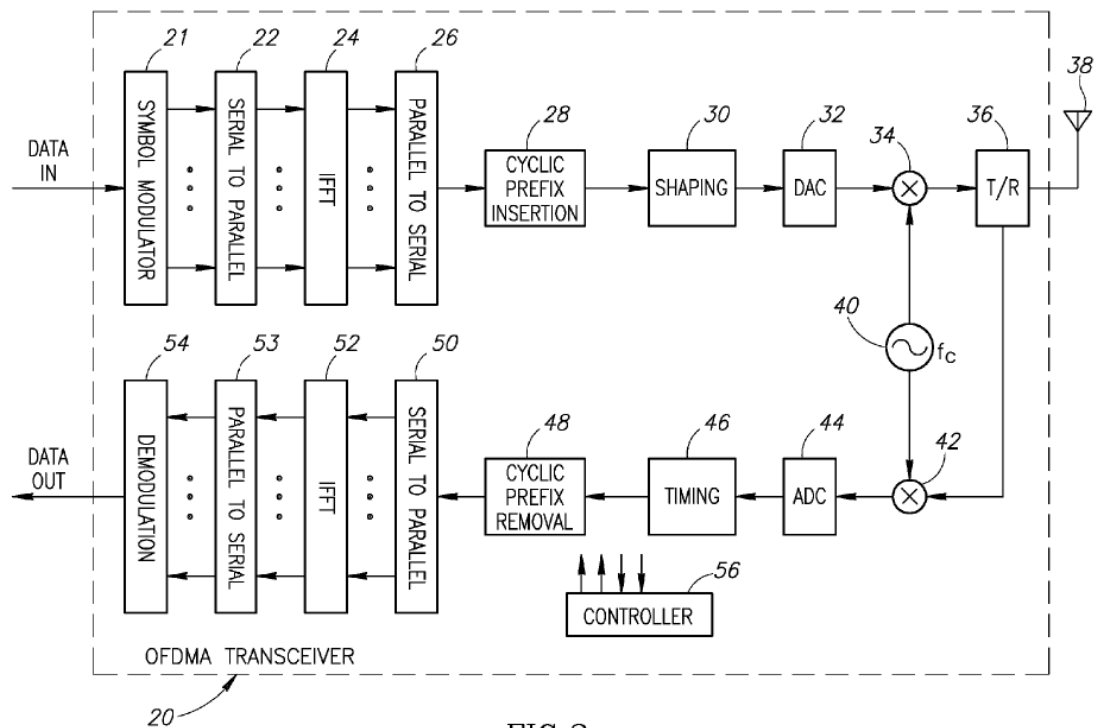


FIG. 2
PRIOR ART

As shown in Figure 2, OFDMA transceiver 20 comprises transmit path that includes, among other things, symbol modulator block 21, serial to parallel conversion 22, IFFT block 24, parallel to serial conversion 26, digital to analog converter (DAC) 32, and antenna 38. *Id.* ¶ 18. The receive path shown in Figure 2 comprises, among other things, analog to digital converter (ADC) 44, serial to parallel conversion 50, FFT block 52, parallel to serial conversion 53, and demodulator 54. *Id.*

4. *Tzannes*

Tzannes is titled “System and Method for Scrambling the Phase of the Carriers in a Multicarrier Communications System.” Ex. 1009, code (54).

Tzannes discloses “a system and method that scrambles the phase characteristics of the modulated carrier signals in a transmission signal.” *Id.* at 2:30–32.

Figure 1 of Tzannes, reproduced below, is a block diagram of digital subscriber line (DSL) communications system 2. *Id.* at 3:24–25.

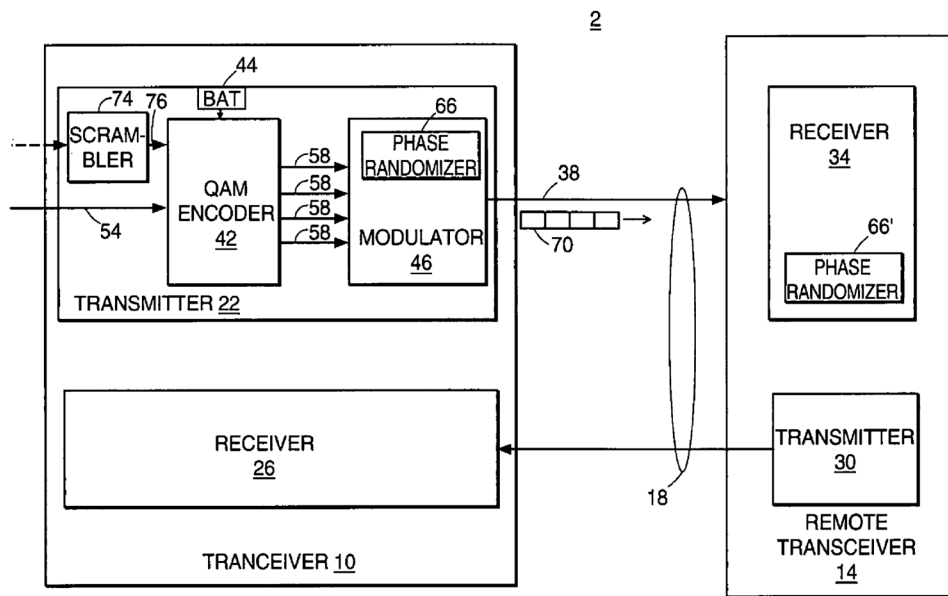


FIG. 1

As shown in Figure 1, DSL system 2 includes discrete multitone transmitter (DMT) transceiver 10 that communicates with remote transceiver 14 over communication channel 18. *Id.* at 3:24–28. DMT transceiver 10 includes DMT transmitter 22, which comprises quadrature amplitude modulation (QAM) encoder 42, modulator 46, bit allocation table (BAT) 44, phase scrambler 66, and bit scrambler 74. *Id.* at 3:52–56. According to Tzannes, “the QAM encoder 42 maps the input serial data bit stream 54 into N parallel quadrature amplitude modulation (QAM) constellation points 58, or

QAM symbols 58, where N represents the number of carrier signals generated by the modulator 46” and where “[t]he QAM symbols 58 represent the amplitude and the phase characteristic of each carrier signal.” *Id.* at 4:3–11.

According to Tzannes, phase scrambler 66 in modulator 46 “combines a phase shift computed for each QAM-modulated carrier signal with the phase characteristic of that carrier signal,” thereby substantially scrambling the phase characteristics of the carrier signals in transmission signal 38. *Id.* at 4:33–39. Tzannes explains that “[b]y scrambling the phase characteristics of the carrier signals, the resulting transmission signal 38 has a substantially minimized peak-to-average (PAR) power ratio.” *Id.* at 4:39–42. Tzannes also explains that “[t]o compute a phase shift for each carrier signal, the phase scrambler 66 associates one or more values with that carrier signal” and “determines each value for a carrier signal independently of the QAM symbols 58, and, therefore, independently of the bit value(s) modulated onto the carrier signal.” *Id.* at 4:52–57.

According to Tzannes, “the principles of the invention apply also to other types of multicarrier modulation, such as, but not limited to, orthogonally multiplexed quadrature amplitude modulation (OQAM), discrete wavelet multitone (DWTMT) modulation, and orthogonal frequency division multiplexing (OFDM).” *Id.* at 3:31–37.

5. *Mutagi*

Mutagi is titled “Pseudo Noise Sequences for Engineers.” Ex. 1014, 1.⁴ According to Mutagi, pseudo noise (PN) sequences are used for data

⁴ Citations to the pages of Mutagi are made with reference to the page numbering added by Petitioner to Exhibit 1014.

scrambling, which provides signal security. *Id.* at 9. Noting that PN sequences are widely used in digital communications, Mutagi describes generation and acquisition of PN sequences. *Id.* at 1.

According to Mutagi, “[a] PN sequence is generated using a shift register and modulo-2 adders.” *Id.* at 5. Figure 7 of Mutagi, reproduced below, shows a PN generator with polynomial $1+x^{14}+x^{15}$. *Id.*

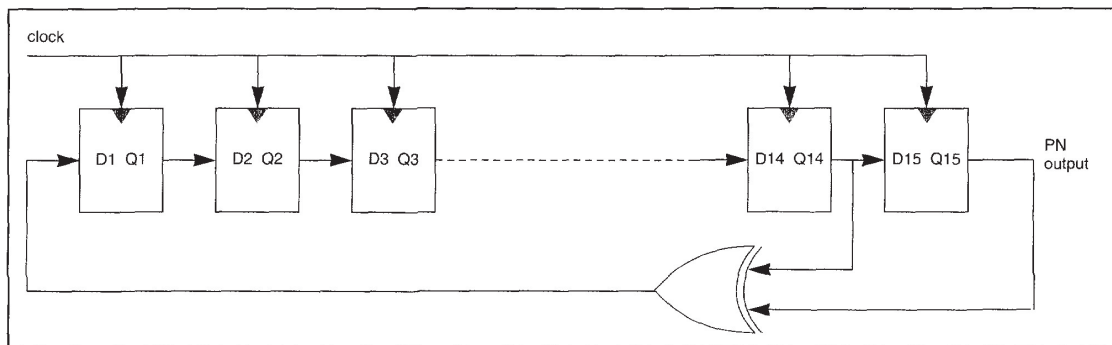


Fig. 7 A PN generator with polynomial $1 + x^{14} + x^{15}$

As shown in Figure 7, “the outputs from stages 14 and 15 are modulo-2 added and fed back to the input of first stage of a 15-stage register to get a $2^{15}-1$ length sequence.” *Id.*

6. *Ting*

Ting is titled “Low-Complexity Inner Receiver Design for IEEE 802.16 OFDMA Systems.” Ex. 1015, 1.⁵ *Ting* addresses the preamble search, which is a main operation in synchronization in the 802.16e OFDMA receiver, requiring high computational complexity. *Id.* at 4.

Ting explains that “[p]ilots . . . are inserted into data sequence and can be used by the receiver for synchronization and channel estimation.” *Id.* at 37. *Ting* describes that “[t]he subcarrier randomization is accomplished as

⁵ Citations to the pages of *Ting* are made with reference to the page numbering added by Petitioner to Exhibit 1015.

each modulated data subcarrier is multiplied by the factor $2(\frac{1}{2} - w_k)$.” *Id.* at 38.

7. *Ohana*

Ohana is titled “Apparatus and Methods for Reduction of Transmission Delay in a Communication Network.” Ex. 1016, code (54). Ohana notes that the Multimedia over Coax Alliance (“MoCA™”) provides a specification for networking of digital information, including video information, through coaxial cable. *Id.* ¶ 4. According to Ohana, the MoCA technologies “provide throughput through the existing coaxial cables to the places where the video devices are located in a structure without affecting other service signals that may be present on the cable.” *Id.* ¶ 7.

Ohana notes that networks based on MoCA technologies “are often coordinated networks, in which a processing unit serves as a network coordinator.” *Id.* ¶ 11. According to Ohana, “[t]he coordinator defines medium access plan (‘MAP’) cycles, prospectively assigns data transmission events to the cycles, and serially processes the cycles by executing or coordinating the events in each cycle.” *Id.*

E. *Asserted Obviousness over Cleveland and Hayashino*

Petitioner asserts that claims 1–3 are unpatentable as obvious over the combination of Cleveland and Hayashino. Pet. 10–47. Patent Owner disputes Petitioner’s showing for claim 1 over the combination of Cleveland and Hayashino. Prelim. Resp. 23–43.

1. *Independent Claim 1*

a) *Petitioner’s Arguments*

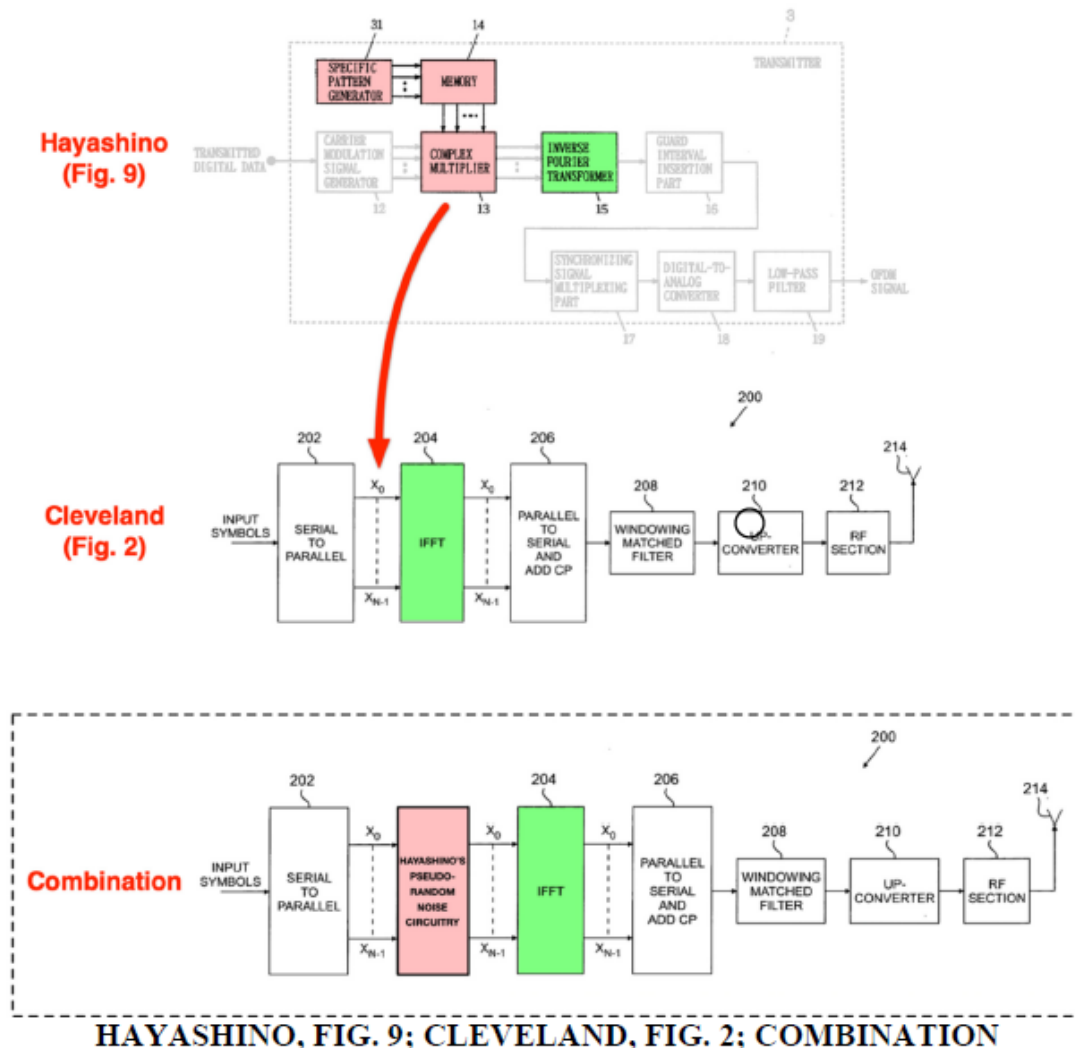
Relying on the testimony of Dr. Williams, Petitioner argues that making the proposed combination would have resulted in “an OFDMA

network with lowered interference” and would have eliminated “the need for more expensive OFDMA equipment with a larger dynamic range.” Pet. 16 (citing, e.g., Ex. 1004 ¶¶ 80–84; Ex. 1007, 2:51–3:5, 13:7–26); *see also id.* at 17 (arguing a person of ordinary skill in the art “would have looked to” Hayashino for its teachings of “methods to reduce multi-device interference and thus lower[] power concentration”), 18 (arguing the proposed combination would have enabled use “[of] lower-power and cheaper transmitters”). Dr. Williams testifies “[l]owering the interference reduces the power concentration, which in turn reduces the peak-to-average power ratio (“PAR”) and the dynamic range required by the OFDMA equipment.” Ex. 1004 ¶ 81.

Petitioner argues, more specifically, that a person having ordinary skill in the art would have looked to reduce interference by “using Hayashino’s approach *in lieu of* selecting each sub-channel in a pseudorandom manner as Cleveland does.” Pet. 17 (emphasis added). Relying on the testimony of Dr. Williams, Petitioner argues that its proposed combination “would have resulted in Cleveland’s network introducing a pseudorandom element on each used subcarrier as Hayashino teaches, thus *simplifying the process* of determining which subchannels have been used and which are available for transmission.” *Id.* (Ex. 1004 ¶ 86) (emphasis added).

Petitioner also submits an “exemplary combination” by providing annotations to figures of Hayashino and Cleveland, which indicate that Petitioner proposes that Hayashino’s techniques may be simply added into Cleveland’s network. Pet. 19–20. In particular, relying on the testimony of Dr. Williams, Petitioner provides an annotated version of Hayashino’s

Figure 9 and two annotated versions of Cleveland's Figure 2, each of which are reproduced below. *Id.*; Ex. 1004 ¶¶ 91.



HAYASHINO, FIG. 9; CLEVELAND, FIG. 2; COMBINATION

First, as shown in Petitioner's annotated version of Figure 9 of Hayashino, transmitter 3 comprises, among other things, memory 14 (highlighted in pink), specific pattern generator 31 (highlighted in pink), complex multiplier 13 (highlighted in pink), and inverse Fourier transformer 15 (highlighted in green). *Id.* Second, as shown in Petitioner's first annotated version of Figure 2 of Cleveland, OFDM/OFDMA transmitter 200 comprises, among other things, serial-to-parallel converter 202 that receives input symbols and is connected to IFFT block 204 (highlighted in green). *Id.* Third, as shown in

Petitioner's second annotated version of Figure 2 of Cleveland, Petitioner indicates that its proposed modification is to add Hayashino's circuitry, which is shown with Petitioner's addition of a block (highlighted in pink), between Cleveland's serial-to-parallel converter 202 and Cleveland's IFFT block 204 (highlighted in green). *Id.* Petitioner includes a textual annotation in its added block (highlighted in pink) that states "HAYASHINO'S PSEUDORANDOM NOISE CIRCUITRY." *Id.*

b) Patent Owner's Arguments

Patent Owner argues that the "proposed combination fails to accurately disclose aspects of the claimed method." Prelim. Resp. 25. Patent Owner argues "*Hayashino* does not disclose multiple transmitters being allocated subcarriers, and the Petition acknowledges as much in failing to provide a single citation to *Hayashino* with respect to claim element 1[c]." *Id.* at 29 (citing Pet. 31–32); *see also id.* at 34 (arguing the "pattern generator of *Hayashino* is not configured to synchronize or coordinate its application to different subcarriers allocated to different nodes or transmitters of the communication network."). Patent Owner also argues that the "Petition asserts that a POSITA⁶ would simply discard *Cleveland's* subcarrier assignment in favor of *Hayashino's* phase-shifting of the symbols inside the subcarriers." *Id.* at 41 (citing Pet. 17). Patent Owner further argues that the Petition "inconsistently describes the combination such that it is unclear what the combination actually includes." *Id.* at 38.

⁶ POSITA is person of ordinary skill in the art.

c) Overview of Analysis

We start with Patent Owner’s argument that the Petition “inconsistently describes the combination such that it is unclear what the combination actually includes.” Prelim. Resp. 38. We agree. We find that the Petition provides two possible, inconsistent combinations. Petitioner’s first proposal is that a person having ordinary skill in the art would have looked to reduce interference by “using Hayashino’s approach *in lieu of* selecting each sub-channel in a pseudorandom manner as Cleveland does.” *Id.* at 17 (emphasis added). Petitioner’s second proposal (described as an “exemplary combination”) is set forth pictorially in Petitioner’s annotated figures above and, as shown, is to simply add Hayashino’s technique to Cleveland. *Id.* at 19–20.

d) Analysis of the “in lieu of” Argument

We turn to Petitioner’s first proposal that a person having ordinary skill in the art would have looked to reduce interference by “using Hayashino’s approach *in lieu of* selecting each sub-channel in a pseudorandom manner as Cleveland does.” Pet. 17 (emphasis added). Petitioner cites to Cleveland in support of its argument. *Id.* at 16 (citing, e.g., Ex. 1006 ¶ 45), 17 (citing, e.g., Ex. 1006 ¶¶ 37, 42, 45). In Petitioner’s proposed combination, a person of ordinary skill in the art would have replaced disclosures in Cleveland relating to lowering interference because those disclosures teach selecting sub-channels in a pseudorandom manner. *See* Ex. 1006 ¶ 42 (describing “a permutation process [that] draws a sub-carrier pseudo-randomly from permutation groups 502 to form a sub-channel” and that this is an “allocation of sub-carriers to sub-channels”), ¶ 45 (describing that “[t]he two types of sub-carrier permutations for sub-

channelization are the diversity permutation and the contiguous permutation”).

Petitioner’s argument that a person of ordinary skill in the art would have used “Hayashino’s approach *in lieu of selecting each sub-channel in a pseudorandom manner as Cleveland does*,” Pet. 17 (emphasis added)), undercuts its element-by-element analysis for limitation [1c]. Limitation [1c] recites “allocating a subset of the set of available subcarriers to each of the transmitting network devices.” For limitation [1c], Petitioner relies on Cleveland’s teaching of “pseudo-random subcarrier allocation techniques” that “allocate[] subcarriers to secondary user nodes.” *Id.* at 31–32 (citing Ex. 1006, code (57), ¶¶ 4, 5, 41–44; Ex. 1004 ¶ 121). Petitioner also argues “Cleveland’s pseudo-random subcarrier allocation technique . . . discloses ‘allocating a subset of the set of available subcarriers to each of the transmitting network devices’” recited in limitation [1c]. *Id.* at 32 (citing Ex. 1004 ¶ 122).

Importantly, Cleveland’s teachings relied on by Petitioner for limitation [1c] are not part of Petitioner’s proposed combination because Petitioner argues a person of ordinary skill in the art would have used “Hayashino’s approach *in lieu of selecting each sub-channel in a pseudorandom manner as Cleveland does*.” *Id.* at 17 (emphasis added). The disclosures of Cleveland that Petitioner proposes to replace (*id.* at 16–17), however, teach selecting sub-channels in a pseudorandom manner. *See* Ex. 1006 ¶ 42 (describing “a permutation process [that] draws a sub-carrier pseudo-randomly from permutation groups 502 to form a sub-channel” and that this is an “allocation of sub-carriers to sub-channels”), ¶ 45 (describing that “[t]he two types of sub-carrier permutations for sub-channelization are

the diversity permutation and the contiguous permutation”). Those disclosures are the same as the disclosures Petitioner relies on for teaching “allocating a subset . . . to each subcarrier of the set of available subcarriers” recited in limitation [1c]. Pet. 31 (citing Ex. 1006, code (57), ¶¶ 4–5, 41–44; Ex. 1004 ¶ 121).

Petitioner also argues in connection with its analysis for limitation [1c] that in its proposed combination “Cleveland’s network would apply Hayashino’s scrambling technique to each subcarrier that is available for use.” *Id.* at 32; *see also* Ex. 1004 ¶ 123 (testifying that “[i]n the Cleveland and Hayashino combination, Cleveland’s network would apply Hayashino’s scrambling technique to each subcarrier that is available for use”).

Petitioner, however, does not set forth sufficient argument showing that Hayashino teaches “allocating a subset . . . to each subcarrier of the set of available subcarriers,” recited in limitation [1c]. With respect to identifying each subcarrier that is available for use, Petitioner argues that Cleveland’s “MAP 636 identifies those subcarriers that are usable by secondary users.” *Id.* (citing Ex. 1006 ¶¶ 55–57, 69–70). The Petition does not rely on identification by Cleveland’s MAP 636 for teaching “allocating a subset . . . to each of the transmitting network devices” recited in limitation [1c].

We find that Petitioner has not demonstrated sufficiently that a person of ordinary skill in the art would have combined the teachings of Cleveland and Hayashino in the manner recited in claim 1. More specifically, Petitioner has not shown sufficiently that its proposed combination teaches or suggests limitation [1c].

e) Analysis of the “Exemplary Combination” (Adding Without Replacing)

As indicated above, we also address an alternative that the Petition’s “exemplary combination” (Pet. 19–20) is a proposal to simply add Hayashino’s technique to Cleveland. *Id.* Petitioner’s argument that making the proposed combination would have resulted in “an OFDMA network with lowered interference” and would have eliminated “the need for more expensive OFDMA equipment with a larger dynamic range” (Pet. 16 (citing, e.g., Ex. 1004 ¶¶ 80–84; Ex. 1007, 2:51–3:5, 13:7–26)) requires replacing the interference causing technology in Cleveland. Similarly, Petitioner’s argument that its proposed combination “would have resulted in Cleveland’s network introducing a pseudorandom element on each used subcarrier as Hayashino teaches, thus *simplifying the process* of determining which subchannels have been used and which are available for transmission” (*id.* at 17 (Ex. 1004 ¶ 86) (emphasis added)) also requires replacing Cleveland’s selection of each sub-channel in a pseudorandom manner. We find that Petitioner has not articulated reasoning with a rational underpinning as to why one of ordinary skill in the art would have added Hayashino’s technique to Cleveland, while maintaining all of Cleveland’s techniques as part of that same proposed combination.

To support the conclusion of obviousness, it is not enough to show merely that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.*; *see also*

Orexo AB v. Actavis Elizabeth LLC, 903 F.3d 1265, 1273 (Fed. Cir. 2018) (“The question is not whether the various references separately taught components of the ’330 Patent formulation, but whether the prior art suggested the selection and combination achieved by the ’330 inventors.”). In determining whether there would have been a motivation to combine prior art references to arrive at the claimed invention, it is insufficient to simply conclude the combination would have been obvious without identifying any reason *why* a person of skill in the art would have made the combination. *Metalcraft of Mayville, Inc. v. Toro Co.*, 848 F.3d 1358, 1366 (Fed. Cir. 2017). Petitioner has not articulated reasoning with a rational underpinning as to why one of ordinary skill in the art would have simply added Hayashino’s technique to Cleveland’s transmitter. Pet. 20.⁷

f) Conclusion—Obviousness of Claim 1 Over Cleveland and Hayashino

For the foregoing reasons, based on the current record, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that claim 1 is unpatentable under 35 U.S.C. § 103 as obvious over the combination of Cleveland and Hayashino.

2. Claims 2–6 and 12

Petitioner argues that claims 2 and 3 are unpatentable as obvious over the combination of Cleveland and Hayashino. Pet. 44–47. Petitioner argues that claim 4 is unpatentable as obvious over Cleveland, Hayashino, and Mutagi. *Id.* at 47–52. Petitioner argues that claim 5 is unpatentable as

⁷ Petitioner also argues that Cleveland and Hayashino are similar. Those arguments are not sufficient to provide a reasoning to combine the references for the same reasons given for corresponding arguments made for Scheim and Tzannes. *See* § III.F.1.

obvious over Cleveland, Hayashino, Mutagi, and Ting. *Id.* at 52–54.

Petitioner also argues that claims 6 and 12 are unpatentable as obvious over Cleveland, Hayashino, Mutagi, and Ohana. *Id.* at 54–58.

Claims 2–6 and 12 depend, directly or indirectly, from claim 1. Petitioner’s arguments and evidence for dependent claims 2–6 and 12 do not remedy the deficiencies discussed with respect to claim 1. *See* Pet. 44–47, 52–54, 54–58.

Accordingly, we conclude that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that claims 2 and 3 are unpatentable as obvious over the combination of Cleveland and Hayashino; claim 4 is unpatentable as obvious over Cleveland, Hayashino, and Mutagi; claim 5 is unpatentable as obvious over Cleveland, Hayashino, Mutagi, and Ting; and claims 6 and 12 are unpatentable as obvious over Cleveland, Hayashino, Mutagi, and Ohana.

F. Asserted Obviousness over Scheim and Tzannes

Petitioner asserts that claims 1–3 are unpatentable as obvious over the combination of Scheim and Tzannes. Pet. 58–90. Patent Owner disputes Petitioner’s showing for claim 1 over the combination of Scheim and Tzannes. Prelim. Resp. 44–57.

1. Independent Claim 1

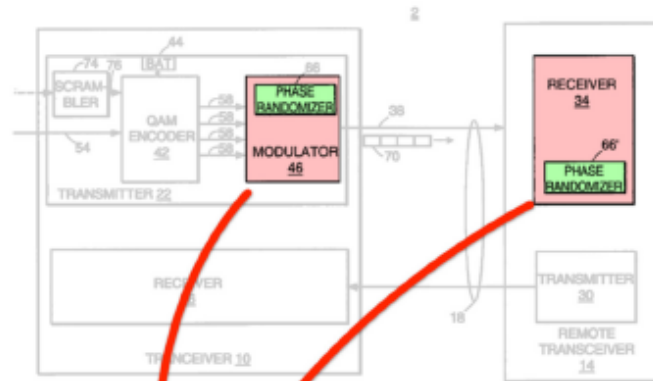
a) Petitioner’s Arguments

Petitioner proposes combining “Scheim’s OFDMA network, and associated devices, and pseudorandom distributing techniques with Tzannes’s pseudo-random phase shifting techniques.” Pet. 63–64 (citing Ex. 1009, 2:1–26, 3:1–2, 6:30–40; Ex. 1004 ¶ 200). Petitioner makes two arguments that a person of ordinary skill in the art would have made

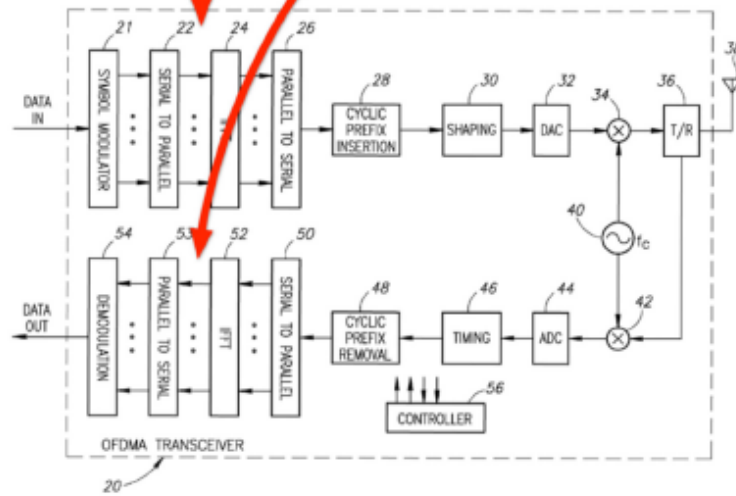
Petitioner’s proposed combination. First, Petitioner argues that a person of ordinary skill in the art would have looked to Tzannes’s teachings “to reduce PAR.” *Id.* at 65; *see also id.* at 64 (the resulting combination would have had a “reduced PAR,” which “improves power consumption and lessens signal interference in Scheim’s network”), 68 (arguing that a person of ordinary skill in the art “would have also realized that PAR reduction is beneficial because it lessens signal interference, which in turn allow[s] a POSITA to use less-powerful transmitters to reduce costs”). Second, Petitioner argues that “similarities” in the references would have motivated a person having ordinary skill in the art to make Petitioner’s proposed combination. *Id.* at 66; *see also id.* at 64 (arguing “[b]oth Scheim and Tzannes are directed to utilizing orthogonal frequency division data transmission techniques in communication networks”), 65 (arguing “both Scheim and Tzannes utilize QAM mapping”), 68 (“Scheim **explicitly** discloses” using a LFSR phase shifting circuit, which “is a type of pseudo-random permutation”).

Petitioner also provides annotations to figures of Tzannes and Scheim, which indicate that Petitioner proposes adding Tzannes’s modulator 46 and receiver 34 into Scheim’s conventional OFDMA transceiver 20. Pet. 66–67. Relying on the testimony of Dr. Williams, Petitioner provides an annotated version of Tzannes’s Figure 1 and two annotated versions of Scheim’s Figure 2, each of which are reproduced below. *Id.*; Ex. 1004 ¶ 210.

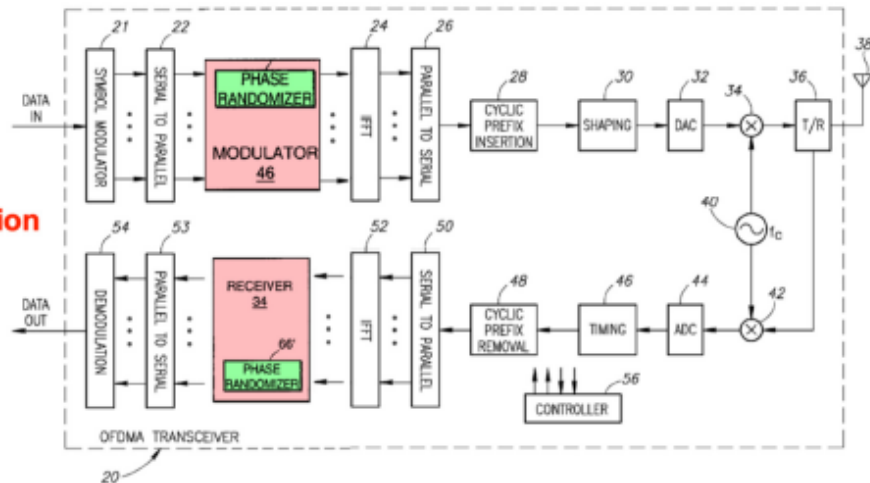
**Tzannes
(Fig. 1)**



**Scheim
(Fig. 2)**



Combination



TZANNES, FIG. 1; SCHEIM, FIG. 2; COMBINATION

First, as shown in Petitioner's annotated version of Figure 1 of Tzannes, transceiver 10 comprises, among other things, modulator 46 (highlighted in pink) with phase randomizer 66 (highlighted in green), as well as remote transceiver 14 having receiver 34 (highlighted in pink) with phase randomizer 66' (highlighted in green). *Id.* Second, as shown in Petitioner's first annotated version of Figure 2 of Scheim, OFDMA transceiver 20 comprises, among other things, transmission circuitry that transmits "DATA IN" via symbol modulator 21, serial-to-parallel converter 22, and IFFT block 24, as well as receiving circuitry that includes IFFT block 52, parallel to serial converter 53, and demodulator 54. *Id.* Third, as shown in Petitioner's second annotated version of Figure 2 of Scheim, Petitioner's proposed modification is to add Tzannes's modulator 46 (highlighted in pink) including phase randomizer 66 (highlighted in green) between Scheim's serial-to-parallel converter 22 and IFFT block 24 and add Tzannes's receiver 34 (highlighted in pink) with phase randomizer 66' (highlighted in green) between Scheim's IFFT 52 and parallel to serial converter 53.

b) Patent Owner's Arguments

Patent Owner argues that the Petition provides insufficient basis to combine the cited references to arrive at the claimed invention. Prelim. Resp. 49–56. Patent Owner argues that both Scheim and Tzannes "include 'pseudorandom' aspects, but these aspects are deployed in entirely unrelated ways," and "accomplish different goals and using different pseudorandom elements." *Id.* at 55. Patent Owner argues, thus, a person of ordinary skill in the art would not have looked "to Tzannes to improve Scheim." *Id.* at 56.

Patent Owner also argues that the combination of Scheim and Tzannes is not routine or predictable. *Id.* at 50. Patent Owner argues that Petitioner’s proposed combination “contains two modulators on the transmission side, and two demodulators on the receiving side, without any explanation for why this function would be duplicated.” *Id.* at 51. Patent Owner argues “Figure 2 of *Scheim* is a block diagram of a conventional OFDMA transceiver which includes a Symbol Modulator 21 and Demodulator 54.” *Id.* (citing Ex. 1017 ¶ 18). Patent Owner also argues “[i]n *Tzannes*, the Phase Randomizers 66 are incorporated into its Modulator 46 and Receiver 34.” *Id.* (citing Ex. 1009, 3:52–63).

*c) Petitioner’s First Argument—“to reduce PAR”*⁸

Petitioner’s argument that a person of ordinary skill in the art would have combined the teachings of Scheim and Tzannes to reduce PAR does not address that Petitioner’s proposed combination includes the conventional technology that Petitioner argues increases PAR and interference. Petitioner proposes incorporating Tzannes’s technique into the conventional transmitter of Scheim. Pet. 67, 75 (each relying on Figure 2 of Scheim), 78 (relying on Figure 2 of Scheim and, in particular, symbol modulator block 21). Scheim explains that Figure 2 shows a “block diagram illustrating a conventional OFDMA transceiver,” which is “generally referenced 20.” Ex. 1017 ¶ 18. Scheim describes that prior art resource allocation “poses a complex problem” because “from a system level perspective, resources allocated in a specific cell may cause interference to other cell

⁸ See, e.g., Pet. 65 (arguing “a POSITA seeking to improve Scheim’s network, and interference on it, would have been motivated to look to similar communications technologies, like those in Tzannes, to reduce PAR”).

transmission.” *Id.* ¶ 37. Scheim describes that its method and system “functions to reduce inter-cell interference by randomization of the inter-cell interference experience in each cell.” *Id.* ¶ 41.

Also, we agree with Patent Owner’s argument that Petitioner’s proposed combination “contains two modulators on the transmission side, and two demodulators on the receiving side, without any explanation for why this function would be duplicated.” Prelim. Resp. 51. Scheim describes that conventional OFDMA transceiver 20 in Figure 2 “comprises a transmit path that includes a symbol modulator block 21, serial to parallel conversion 22, [and] IFFT block 24,” among other things. Ex. 1017 ¶ 18. Scheim’s conventional OFDMA transceiver 20 includes a “receive path” that comprises, among other things, “FFT block 52, parallel to serial conversion 53 and demodulator 54.” *Id.*

Petitioner’s proposed combination incorporates the Tzannes modulator 46 into Scheim’s transmit path and the Tzannes receiver 34 into Scheim’s receive path. Pet. 67. Tzannes describes that “modulator 46 provides functionality associated with the DMT modulation and transforms QAM symbols 58 into DMT symbols 70.” Ex. 1009, 4:12–14. Tzannes describes that “modulator 46 uses an inverse fast Fourier transform (IFFT) to change the QAM symbols 58 into [] transmission symbols 38.” *Id.* at 4:19–22. We agree with Patent Owner that Petitioner does not articulate reasoning with a rational underpinning as to why one of ordinary skill in the art would have combined Scheim and Tzannes in the manner proposed.

For the reasons given, we find that Petitioner’s arguments relating to reduction in PAR do not provide sufficient reason to combine the cited references in the manner claimed.

*d) Petitioner’s Second Argument—“similarities”*⁹

Petitioner’s contentions pointing to similarities in Scheim and Tzannes do not suffice as an articulated reason with rational underpinning to combine their respective teachings—more is required to support the legal conclusion of obviousness. *See KSR*, 550 U.S. at 418. The Federal Circuit has concluded that merely asserting that two references were drawn from the same field of art is “simply too conclusory” to show that the skilled artisan would have combined these references in the way of the claimed invention. *Securus Techs., Inc. v. Glob. Tel*Link Corp.*, 701 F. App’x 971, 976 (Fed. Cir. 2017); *see Microsoft Corp. v. English, LLC*, 662 F. App’x 981, 990 (Fed. Cir. 2016) (determining that “the Board correctly concluded” that a petitioner “did not articulate a sufficient motivation to combine” where the only reason given was “that references were directed to the same art or same techniques”). In the same way, Petitioner’s contentions here that the references are similar, even if true, are insufficient to show why the skilled artisan would have combined Scheim and Tzannes to arrive at the subject matter recited in the claims.¹⁰

e) Conclusion—Obviousness of Claim 1 Over Scheim and Tzannes

Petitioner has not articulated reasoning with a rational underpinning as to why one of ordinary skill in the art would have combined Scheim and Tzannes in the manner proposed by Petitioner or in the manner recited in

⁹ *See, e.g.*, Pet. 66 (arguing “similarities across Scheim and Tzannes’s teachings would have led a POSITA to use Tzannes’s pseudo-random phase-randomizing techniques in Scheim’s network.”).

¹⁰ We also agree with Patent Owner that Petitioner has not shown that its proposed combination is routine and predictable. Prelim. Resp. 49–53.

claim 1. For the foregoing reasons, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that claim 1 is unpatentable under 35 U.S.C. § 103 as obvious over the combination of Scheim and Tzannes.

2. *Claims 2 and 3*

Petitioner argues that claims 2 and 3 are unpatentable as obvious over the combination of Scheim and Tzannes. Pet. 86–90. Petitioner argues that claim 4 is unpatentable as obvious over Scheim, Tzannes, and Mutagi. *Id.* at 90. Petitioner argues that claim 5 is unpatentable as obvious over Scheim, Tzannes, Mutagi, and Ting. *Id.* at 91–92. Petitioner also argues that claims 6 and 12 are unpatentable as obvious over Scheim, Tzannes, Mutagi, and Ohana. *Id.* at 92–94.

Claims 2–6 and 12 depend, directly or indirectly, from claim 1. Petitioner’s arguments and evidence for dependent claims 2–6 and 12 do not remedy the deficiencies discussed with respect to claim 1. *See* Pet. 86–94.

Accordingly, we conclude that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that claims 2 and 3 are unpatentable as obvious over the combination of Scheim and Tzannes; claim 4 is unpatentable as obvious over Scheim, Tzannes, and Mutagi; claim 5 is unpatentable as obvious over obvious over Scheim, Tzannes, Mutagi, and Ting; and claims 6 and 12 are unpatentable as obvious over Scheim, Tzannes, Mutagi, and Ohana.

IV. CONCLUSION

Based on the arguments and evidence presented by the parties, we conclude that Petitioner has not demonstrated a reasonable likelihood of

prevailing with respect to at least one claim of the '681 patent challenged in the Petition. Therefore, we do not institute an *inter partes* review.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied*, and no *inter partes* review is instituted.

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