

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC., DISH NETWORK, LLC,
COMCAST CABLE COMMUNICATIONS, LLC,
COX COMMUNICATIONS, INC.,
TIME WARNER CABLE ENTERPRISES LLC,
VERIZON SERVICES CORP., and ARRIS GROUP, INC.,
Petitioner,

v.

TQ DELTA, LLC,
Patent Owner.

Case IPR2016-01020¹
Patent 9,014,243 B2

Before SALLY C. MEDLEY, TREVOR M. JEFFERSON, and
MATTHEW R. CLEMENTS, *Administrative Patent Judges*.

CLEMENTS, *Administrative Patent Judge*.

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

¹ DISH Network, LLC, who filed IPR2017-00254, and Comcast Cable Communications, LLC, Cox Communications, Inc., Time Warner Cable Enterprises LLC, Verizon Services Corp., and ARRIS Group, Inc., who filed IPR2017-00418, have been joined in this proceeding. Paper 14; Paper 15.

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Cisco Systems, Inc. (“Petitioner”) challenges claims 1–25 (“the challenged claims”) of U.S. Patent No. 9,014,243 B2 (Ex. 1001, “the ’243 patent”), owned by TQ Delta, LLC (“Patent Owner”). We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, Petitioner has shown by a preponderance of the evidence that the challenged claims are unpatentable. Patent Owner’s Motion to Exclude is *dismissed*.

A. Procedural History

Petitioner filed a Petition requesting an *inter partes* review of claims 1–25 of the ’243 patent. Paper 2 (“Pet.”). Patent Owner filed a Preliminary Response. Paper 6. On November 4, 2016, we instituted *inter partes* review of claims 1–25 of the ’243 patent under 35 U.S.C. § 103(a)² on the following grounds. Paper 7 (“Inst. Dec.”), 16.

References	Claims
Shively ³ and Stopler ⁴	1–3, 7–9, 13–16, and 20–22
Shively, Stopler, and Gerszberg ⁵	4–6, 10–12, 17–19, and 23–25

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103. Because the ’243 patent has an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of 35 U.S.C. §§ 102 and 103.

³ U.S. Patent No. 6,144,696; issued Nov. 7, 2000 (Ex. 1011, “Shively”).

⁴ U.S. Patent No. 6,625,219 B1; issued Sept. 23, 2003 (Ex. 1012, “Stopler”).

⁵ U.S. Patent No. 6,424,646 B1; issued July 23, 2002 (Ex. 1013, “Gerszberg”).

Thereafter, Patent Owner filed a Patent Owner Response (Paper 12, “PO Resp.”), to which Petitioner filed a Reply (Paper 17, “Reply”). Pursuant to an Order (Paper 21), Patent Owner filed a listing of alleged statements and evidence in connection with Petitioner’s Reply deemed to be beyond the proper scope of a reply. Paper 22. Petitioner filed a response to Patent Owner’s listing. Paper 29.

Patent Owner filed a Motion to Exclude (Paper 28), Petitioner filed an Opposition (Paper 33), and Patent Owner filed a Reply (Paper 37). Patent Owner also filed a Motion for Observation (Paper 27) to which Petitioner filed a Response (Paper 34).

We held a consolidated hearing on August 3, 2017, for this case and related Case IPR2016-01021, and a transcript of the hearing is included in the record. Paper 39 (“Tr.”).

B. Related Proceedings

The parties indicate that the ’243 patent is the subject of several district court cases. Pet. 1; Paper 5, 2–3; Paper 10.

C. The ’243 patent (Ex. 1001)

The ’243 patent discloses multicarrier communication systems that lower the peak-to-average power ratio (PAR) of transmitted signals. Ex. 1001, 1:26–29. A value is associated with each carrier signal, and a phase shift is computed for each carrier signal based on the value associated with that carrier signal. *Id.* at 2:36–40. The computed phase shift value is combined with the phase characteristic of that carrier signal to substantially scramble the phase characteristics of the carrier signals. *Id.* at 2:40–43.

Figure 1 illustrates the multicarrier communication system and is reproduced below:

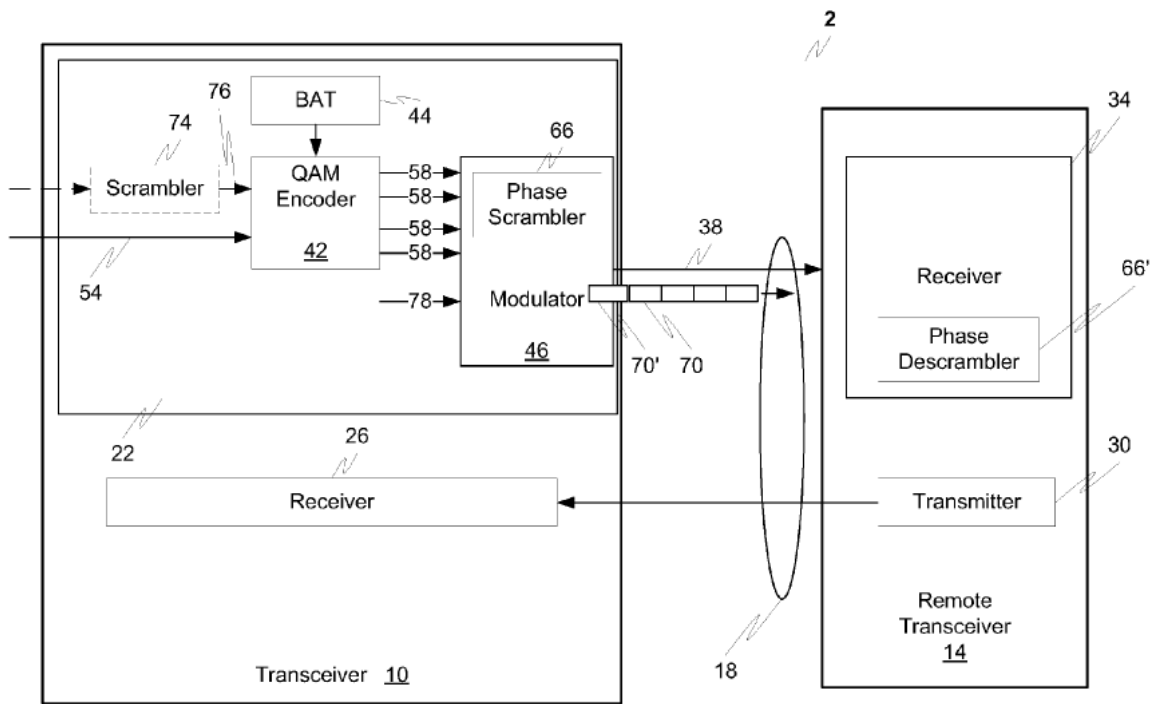


FIG. 1

Figure 1 illustrates the multicarrier communication system, digital subscriber line (DSL) communication system 2 includes discrete multitone (DMT) transceiver 10 communicating with remote transceiver 14 over communication channel 18 using transmission signal 38 having a plurality of carrier signals. *Id.* at 3:25–29. DMT transceiver 10 includes DMT transmitter 22 and DMT receiver 26. *Id.* at 3:29–30. Remote transceiver also includes transmitter 30 and receiver 34. *Id.* at 3:30–32. DMT transmitter 22 transmits signals over communication channel 18 to receiver 34. *Id.* at 3:38–41.

DMT transmitter 22 includes quadrature amplitude modulation (QAM) encoder 42, modulator 46, bit allocation table (BAT) 44, and phase scrambler 66. QAM encoder 42 has a single input for receiving serial data bit stream 54 and multiple parallel outputs to transmit QAM symbols 58

generated by QAM encoder 42 from bit stream 54. Modulator 46 provides DMT modulation functionality and transforms QAM symbols 58 into DMT symbols 70. *Id.* at 4:10–13. Modulator 46 modulates each carrier signal with a different QAM symbol 58, and, therefore, this modulation results in carrier signals having phase and amplitude characteristics based on QAM symbol 58. *Id.* at 4:13–16. Modulator 46 also includes phase scrambler 66 that combines a phase shift computed for each QAM-modulated carrier signal with the phase characteristics of that carrier signal. *Id.* at 4:29–32.

D. Illustrative Claims

Petitioner challenges claims 1–25 of the '243 patent. Pet. 8–52. Claims 1, 7, 13, and 20 are independent claims. Claims 2–6 depend from independent claim 1, claims 8–12 depend from independent claim 7, claims 14–19 depend directly or indirectly from independent claim 13, and claims 21–25 depend from independent claim 20. Claim 1 is illustrative of the claims at issue and is reproduced below:

1. A method, in a multicarrier communications transceiver comprising a bit scrambler followed by a phase scrambler, comprising:
 - scrambling, using the bit scrambler, a plurality of input bits to generate a plurality of scrambled output bits, wherein at least one scrambled output bit is different than a corresponding input bit;
 - scrambling, using the phase scrambler, a plurality of carrier phases associated with the plurality of scrambled output bits;
 - transmitting at least one scrambled output bit on a first carrier; and
 - transmitting the at least one scrambled output bit on a second carrier.

Ex. 1001, 10:58–11:4.

II. ANALYSIS

A. *Claim Construction*

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *see Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142–46 (2016). Under the broadest reasonable construction standard, claim terms 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. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. “*transceiver*”

In our Decision on Institution, we construed “transceiver” to mean “a device, such as a modem, with a transmitter and a receiver.” Inst. Dec. 6. Patent Owner contends that a construction is not necessary and cites a construction from a corresponding district court matter (Ex. 2007, 8), but does not argue we should adopt this construction. PO Resp. 13–14 (“Petitioners’ arguments fail irrespective of which of the foregoing constructions for ‘transceiver’ is used.”). Petitioner contends we should maintain our construction. Reply 7–8. Based on the record developed during this proceeding, we continue to apply this construction.

2. “*scrambling . . . a plurality of carrier phases*”

Independent claim 1 recites “scrambling . . . a plurality of carrier phases.” Independent claim 7 similarly recites “scramble a plurality of carrier phases.” Independent claims 13 and 20 similarly recite “scramble[s] a plurality of phases.” Patent Owner argues that this language should be interpreted to mean “adjusting the phases of a plurality of carriers in a single

multicarrier symbol by pseudo-randomly varying amounts.” PO Resp. 14–19. Petitioner argues that the phrase does not need to be interpreted, since the prior art relied upon uses the same “phase scrambling” terminology to describe pseudo-random phase changes. Reply 7 (citing Ex. 1012, 12:24–31). Additionally, Petitioner argues, without any other explanation, that “the Board should not adopt TQ Delta’s proposed construction.” *Id.* During oral argument, however, counsel for Petitioner reiterated that it is Petitioner’s position that no construction of the term is necessary, because “[r]egarding patent owner’s proposal of the construction, we believe that is exactly how Stopler is describing his phase scrambler as operating.” Tr. 18:23–19:5.

Patent Owner argues that “scramble[e/ing . . . a plurality of carrier phases” and “scramble[] a plurality of phases” should be construed to mean “adjusting the phases of a plurality of carriers in a single multicarrier symbol by pseudo-randomly varying amounts.” PO Resp. 14. Patent Owner contends that the construction is supported by the Specification of the ’243 patent and clarifies that the claimed phase scrambling “must be performed amongst the individual carrier phases in a single multicarrier symbol” and is not met if the phase adjustment only occurs over time from one symbol to the next. PO Resp. 14 (citing Ex. 2003 ¶ 37).

In support of its proposed interpretation, Patent Owner argues that the ’243 patent describes that each of the plurality of carriers (of a multicarrier signal) corresponds to a different QAM symbol. PO Resp. 15 (citing Ex. 1001, 4:13–14). Patent Owner further argues that each carrier (or QAM symbol) has its own phase or phase characteristic, and that the combination of the carriers (or QAM symbols) is referred to as a DMT symbol. PO Resp. 16 (citing Ex. 1001, 4:7–9, 9:8–9; Ex. 2003 ¶ 39). Patent Owner further

contends that the '243 patent describes that a “phase scrambler” scrambles phases or phase characteristics of carriers within a single DMT symbol, and that PAR in the transmission signal is reduced by adjusting the carrier phases within a single DMT symbol. PO Resp. 16 (citing Ex. 1001, 6:30–8:13; Ex. 2003 ¶ 39). PAR, Patent Owner contends, would not be reduced if carrier phases were only adjusted from one symbol to the next. PO Resp. 16 (Ex. 2003 ¶¶ 41–42).

Based on the record before us, we agree with Patent Owner’s proposed construction as far as meaning “adjusting the phases of a plurality of carriers in a single multicarrier symbol.” Patent Owner, however, provides no persuasive reasoning for also adding to that construction “by pseudo-randomly varying amounts.” Rather, Patent Owner merely contends that (1) in a corresponding district court matter, the court construed the phrase to mean “adjusting the phase characteristics of the carrier signals by pseudo-randomly varying amounts;” (2) during prosecution of the '243 patent, the applicant explained that a “scrambler” operates by pseudo-randomly selecting bits to invert; and (3) there was no fundamental disagreement between parties that scrambling involves adjusting the phase characteristic of a carrier signal by pseudo-randomly varying amounts. PO Resp. 16–17 (citing Ex. 2007, 10–11; Ex. 2008, 18). Patent Owner’s explanation for why we should add “by pseudo-randomly varying amounts” to its proposed construction is conclusory. We interpret claims using the broadest reasonable construction in light of the specification of the involved patent. That standard is not the same as the standard used in district court. Patent Owner, however, provides no explanation for why we should apply the district court construction, which is not necessarily the same as used

before us, here. Moreover, the statement made during prosecution is in the context of summarizing an interview, purports to be part of a definition from Wikipedia, and is preceded by an “e.g.” (Ex. 2008, 18). Patent Owner does not explain persuasively why this statement should be interpreted as disclaiming other possible forms of scrambling. In summary, Patent Owner’s arguments are conclusory.

For all of the above reasons, and for purposes of this decision, we determine that “scrambling the phase characteristics of the carrier signals” means “adjusting the phases of a plurality of carriers in a single multicarrier symbol.”

B. Level of Ordinary Skill in the Art

Petitioner contends that a hypothetical person of ordinary skill in the art, with respect to and at the time of the ’243 patent, would have, “(i) a Master’s degree in Electrical and/or Computer Engineering, or equivalent training, and (ii) approximately five years of experience working in multicarrier telecommunications,” and that a “[l]ack of work experience can be remedied by additional education, and vice versa.” Pet. 9–10. Patent Owner’s expert, Dr. Short, agrees. Ex. 2003 ¶ 16 (“For purposes of this declaration only, I have adopted Dr. Tellado’s definition of a person of ordinary skill in the art.”)

We determine that the hypothetical person of ordinary skill in the art would have had either Master’s degree in Electrical and/or Computer Engineering, or equivalent training, and approximately five years of experience working in multicarrier telecommunications. We note also that the prior art itself often reflects an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (“[T]he level of skill in the

art is a prism or lens through which a judge, jury, or the Board views the prior art and the claimed invention.”); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991) (“The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.”).

C. The Parties’ Post-Institution Arguments

In our Decision on Institution, we concluded that the arguments and evidence advanced by Petitioner demonstrated a reasonable likelihood that claims 1–3, 7–9, 13–16, and 20–22 of the ’243 patent are unpatentable under 35 U.S.C. § 103(a) over Shively and Stopler, and that claims 4–6, 10–12, 17–19, and 23–25 of the ’243 patent are unpatentable under 35 U.S.C. § 103(a) over Shively, Stopler, and Gerszberg. Inst. Dec. 16. We must now determine whether Petitioner has established by a preponderance of the evidence that the specified claims are unpatentable over the cited prior art. 35 U.S.C. § 316(e). We previously instructed Patent Owner that “any arguments for patentability not raised in the [Patent Owner Response] will be deemed waived.” Paper 8, 6; *see also* 37 C.F.R. § 42.23(a) (“Any material fact not specifically denied may be considered admitted.”); *In re Nuvasive, Inc.*, 842 F.3d 1376, 1379–1382 (Fed. Cir. 2016) (holding Patent Owner waived argument addressed in Preliminary Response by not raising argument in the Patent Owner Response). Additionally, the Board’s Trial Practice Guide states that the Patent Owner Response “should identify all the involved claims that are believed to be patentable and state the basis for that belief.” Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012).

With a complete record before us, we note that we have reviewed arguments and evidence advanced by Petitioner to support its unpatentability contentions where Patent Owner chose not to address certain limitations in its Patent Owner Response. In this regard, the record now contains persuasive, unrebutted arguments and evidence presented by Petitioner regarding the manner in which the asserted prior art teaches corresponding limitations of the claims against which that prior art is asserted. Based on the preponderance of the evidence before us, we conclude that the prior art identified by Petitioner teaches or suggests all uncontested limitations of the reviewed claims. The limitations that Patent Owner contests in the Patent Owner Response are addressed below.

*D. Obviousness of Claims 1–3, 7–9, 13–16,
and 20–22 over Shively and Stopler*

Petitioner contends that claims 1–3, 7–9, 13–16, and 20–22 of the '243 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Shively and Stopler. Pet. 10–42.

1. Principles of Law

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness

(i.e., secondary considerations). *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze this asserted ground based on obviousness with the principles identified above in mind.

2. *Shively Overview*

Shively discloses discrete multitone transmission (DMT) of data by digital subscriber loop (DSL) modems and the allocation of bits to the discrete multitones. Ex. 1011, 1:5–8. Bit allocation is performed to optimize throughput within aggregate power and power spectral density mask limits. *Id.* at 4:17–19. The system includes a transmitting modem and a receiving modem connected by a cable having four twisted pairs of conductors. *Id.* at 9:63–65. The modems include a source encoder, a channel decoder, and a digital modulator to take in and transmit data from a data source. *Id.* at 10:9–12. The modems also include a digital demodulator, a channel decoder, and a source decoder to receive the data and supply it to a data sink. *Id.* at 10:12–14. The source encoder compresses data, applies the compressed data to the channel decoder, which performs error correction. *Id.* at 10:15–19. The error corrected data is applied to the digital modulator, which acts as the interface with the communication channel. *Id.* at 10:15–22. The digital demodulator constructs a data stream from the modulated signal and applies it to the channel decoder, which performs error correction, and then applies the corrected data to the source decoder, which decompresses the data. *Id.* at 10:22–26.

In the QAM multitone modulation, the spectrum is broken into multiple sub-bands or QAM channels. *Id.* at 10:27–29. The digital modulator generates N QAM signal tones, one for each QAM channel. *Id.*

at 10:29–30. The serial stream is segmented into N frames, each having allocated to it k_i bits of data. *Id.* at 10:30–31. The multi-carrier modulator generates N QAM tones, one for each channel, at the same symbol rate but with a respective constellation for each channel. *Id.* at 10:35–37.

3. Stopler Overview

Stopler discloses a method and apparatus for encoding/framing a data stream of multitone modulated signals to improve impulse burst immunity. Ex. 1012, 1:8–11. The encoding/framing scheme allows efficient operation in multipoint to point channels affected by ingress and impulsive interference. *Id.* at 5:11–14. Two dimensional interleaving is performed, with one dimension being time and the other dimension being frequency (tones or sub-channels). *Id.* at 5:18–20. Stopler further discloses a diagonalization scheme, where data packets are spread over time in a diagonal fashion, such that an impulse noise affects more than one user's packets, with the effect on each being reduced. *Id.* at 5:64–67.

4. Petitioner's Initial Positions

Petitioner contends that a combination of Shively and Stopler would have rendered obvious claims 1–3, 7–9, 13–16, and 20–22 of the '243 patent. Pet. 10–42. We have reviewed the Petition, Patent Owner's Response, and Petitioner's Reply, as well as the relevant evidence discussed in those papers and other record papers, and are persuaded that the record sufficiently establishes Petitioner's contentions for claims 1–3, 7–9, 13–16, and 20–22, and we adopt Petitioner's contentions discussed below as our own.

For example, the claim 1 preamble recites “[a] method, in a multicarrier communications transceiver comprising a bit scrambler

followed by a phase scrambler.” Petitioner argues that the combination of Shively and Stopler disclose the preamble. Pet. 15–19. Petitioner argues that Shively discloses a “method for transmission in a multitone communication system,” and Shively teaches the use of modems to transmit and receive communications. *Id.* at 15–16 (quoting Ex. 1011, 3:28–29; citing 9:42, 9:63–64, Fig. 2). Petitioner argues that Stopler discloses that “[m]ultitone modulation is a signal transmission scheme which uses a number of narrow-band carriers positioned at different frequencies, all transmitting simultaneously in parallel” and “[o]ne type of multitone transmission scheme is discrete multitone.” *Id.* at 16–17 (quoting Ex. 1012, 1:42–49, 1:50–58; citing Ex. 1009, 31–32) (emphasis omitted). Petitioner further argues that Stopler discloses a transmitter that includes two scramblers, a bit scrambler and a phase scrambler. *Id.* at 18 (citing Ex. 1012, 9:34–37, Fig. 5; Ex. 1009, 33–34). We are persuaded by Petitioner’s showing and find that Stopler’s scrambler 56 is a bit scrambler and Stopler’s QAM mapper and phase scrambler 82 is a phase scrambler.

Claim 1 further recites “scrambling, using the bit scrambler, a plurality of input bits to generate a plurality of scrambled output bits.” Petitioner argues that Stopler discloses that “data output by the interleaver 54 is rearranged into a serial bit stream (MSB first) and then scrambled in scrambler 56, which is used to randomize the coded and interleaved data.” *Id.* at 19 (quoting Ex. 1012, 9:34–48) (emphasis omitted). Petitioner argues that a person with ordinary skill in the art would have recognized that “Stopler’s generating a randomizing sequence that is XORed with an input bit stream constitutes ‘scrambling . . . a plurality of input bits.’” *Id.* (citing Ex. 1009, 35). We are persuaded by Petitioner’s showing and find that

Stopler's scrambler 56 scrambles a plurality of input bits to generate a plurality of scrambled output bits.

Claim 1 also recites "wherein at least one scrambled output bit is different than a corresponding input bit." Petitioner argues that Stopler discloses that "the bits of the serial bit stream are 'scrambled in scrambler 56' to 'randomize' the data." *Id.* at 20 (citing Ex. 1012, 9:34–47). Petitioner argues that a person with ordinary skill would have recognized that "the XOR operation would result in at least one input bit to be changed when the corresponding bit in the randomizing sequence has a value of 1." *Id.* at 21 (citing Ex. 1009, 37). We are persuaded by Petitioner's showing and find that a person of ordinary skill in the art would have understood that, after Stopler's XOR operation, at least one scrambled output bit is different than a corresponding input bit.

Claim 1 additionally recites "scrambling, using the phase scrambler, a plurality of carrier phases." Petitioner argues that Stopler discloses that "the phase scrambler applies 'a phase scrambling sequence' to 'data in the form of m-tuples which are to be mapped into QAM symbols.'" *Id.* at 21 (quoting Ex. 1012, 12:20–28). Petitioner argues that Stopler discloses that "the phase scrambled symbols are provided to a modulator that performs signal modulation." *Id.* at 21–22 (citing Ex. 1012, 12:55–57, Fig. 5; Ex. 1009, 39–40). Petitioner further argues that both Shively and Stopler disclose "transmitting information by modulating multiple carrier frequencies." *Id.* at 22 (citing Ex. 1011, 8:3–13; Ex. 1012, 1:42–49, 1:50–61; Ex. 1009, 40). Notwithstanding Patent Owner's arguments, which we have considered and which we address below, we are persuaded by Petitioner's showing and find

that Stopler's QAM mapper and phase scrambler 82 scrambles a plurality of carrier phases.

Claim 1 further recites "a plurality of carrier phases associated with the plurality of scrambled output bits." Petitioner argues that the combination of Shively and Stopler discloses that "the plurality of carrier phases are based on the symbols provided to the modulator" and Stopler further discloses "the symbols are mapped from m-tuple data . . . [where] the m-tuple data provided to QAM mapper and phase scrambler 82 are formed by processing the data output by the big scrambler 56 on an 'upper level' and a 'lower level.'" *Id.* at 23 (citing Ex. 1012, 9:48–55, 10:1–7, 10:40–11:50, 11:51–54, 12:20–22, Fig. 5; Ex. 1009, 42–43). We are persuaded by Petitioner's showing and find that the plurality of scrambled output bits are processed to become m-tuple data that is then "associated with" a plurality of carrier phases by QAM mapper and phase scrambler 82.

Claim 1 also recites "transmitting at least one scrambled output bit on a first carrier" and "transmitting the at least one scrambled output bit on a second carrier." Petitioner argues that Shively discloses determining "a respective carrier modulated to transmit one bit in each of a plurality of multitone subchannels of the channel" and "modulating a first set of respective carriers to represent respective unique portions of the data stream in at least a subset of those of the multitone subchannels." *Id.* at 24–25 (quoting Ex. 1011, 8:3–6, 8:5–13). Petitioner further argues that Stopler discloses "transmitting data bits by modulating the data bits on carriers using quadrature amplitude modulation (QAM) and multitone (multicarrier) modulation." *Id.* at 25 (citing Ex. 1012, 1:42–49, 12:20–28). Petitioner explains that it would have been obvious to a person with ordinary skill in

the art “to employ the techniques of Shively and Stopler to transmit at least one scrambled output bit that is provided to the modulator.” *Id.* (citing Ex. 1009, 49). Petitioner further argues that Shively discloses transmitting a portion of data on multiple carriers, and, therefore, meets the “second carrier” claim limitation. *Id.* at 26–27. We are persuaded by Petitioner’s showing and find that both Shively and Stopler teach transmitting at least one scrambled output data bit on a first carrier by modulating it using QAM.

Petitioner argues that “[i]t would have been obvious for a POSITA to combine Shively and Stopler because the combination is merely a use of a known technique to improve a similar device, method or product in the same way.” *Id.* at 13 (citing Ex. 1009, 26). Petitioner explains that a person of ordinary skill in the art would have recognized that “by transmitting redundant data on multiple carriers, Shively’s transmitter would suffer from an increased peak-to-average power ratio” because “the overall transmitted signal in a multicarrier system is essentially the sum of its multiple carriers.” *Id.* (citing Ex. 1009, 26). Petitioner asserts that a person of ordinary skill in the art “would have sought out an approach to reduce the [(peak-to-average power ratio)] PAR of Shively’s transmitter” and “Stopler provides a solution for reducing the PAR of a multicarrier transmitter.” *Id.* at 14 (citing Ex. 1009, 27). Petitioner argues that Stopler discloses “a phase scrambler [that] can be employed to randomize the phase of the individual subcarriers” (*id.* at 14 (quoting Ex. 1011, 12:24–28)) and “[a] POSITA would have recognized that by randomizing the phase of each subcarrier, Stopler provides a technique that allows two subcarriers in Shively’s system to transmit the same bits, but without those two subcarriers having the same phase.” *Id.* at 14. Petitioner explains that “[s]ince the two subcarriers are

out-of-phase with one another, the subcarriers will not add up coherently at the same time,” thereby reducing the peak-to-average power ratio (PAR) in Shively’s system. *Id.* at 14–15. Accordingly, Petitioner argues that “[c]ombining Stopler’s phase scrambler into Shively’s transmitter would have been a relatively simple and obvious solution to reduce Shively’s PAR.” *Id.* at 15 (citing Ex. 1009, 28). Notwithstanding Patent Owner’s arguments, which we have considered and which we address below, we are persuaded by Petitioner’s showing and find that Petitioner’s articulated reasoning has sufficient rational underpinning to support the legal conclusion of obviousness. *See KSR Int’l Co.*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

Petitioner performs a similar analysis for claims 2, 3, 7–9, 13–16, and 20–22. Pet. 28–42. Notwithstanding Patent Owner’s arguments, which we have considered and which we address below, we are persuaded by Petitioner’s showing, which we adopt as our own findings and conclusions, that claims 1–3, 7–9, 13–16, and 20–22 are unpatentable as obvious over Shively and Stopler.

*5. Patent Owner’s Argument that
Stopler Does Not Phase Scramble*

Patent Owner contends that “Stopler must be compatible with single-carrier CDMA” (PO Resp. 59) based on Stopler’s teaching that “[t]he framing scheme according to the present invention may also be performed in a CDMA system, in which case the modulator (not shown) may, for example, be a CDMA-type modulator in accordance with the TIA/EIA/IS-95 ‘Mobile Station Compatibility Standard for Dual Mode Wideband Spread Spectrum Cellular System.’” Ex. 1012, 12:58–63; PO Resp. 29–30; *see also*

id. at 29–44 (arguing Stopler’s framing scheme must be compatible with single-carrier CDMA). According to Patent Owner, “[b]ecause Stopler must be compatible with single-carrier CDMA, it makes no sense to argue that his phase scrambling must be performed within a single multicarrier symbol.” PO Resp. 59. Thus, concludes Patent Owner, “Stopler only discloses scrambling phases from one symbol⁶ to the next symbol in time, and not with respect to multiple carriers in a single multicarrier symbol.” PO Resp. 58–59; *see also id.* at 37 (“[i]t is nonsensical to scramble phases within a symbol because there is only one phase in each symbol.”).

Patent Owner also relies on Stopler’s claim 31 as corroboration for its position, contending that the phase scrambling performed by QAM Mapper and Phase Scrambler 82 “must at least be compatible with single carrier CDMA” because claim 31 is directed to a method in a “CDMA system” that includes the step of “phase scrambling.” *Id.* at 33–34 (citing Ex. 1012, 16:4–48).

The “framing scheme” of Stopler is shown as a block diagram in Figure 5, reproduced below. Ex. 1012, 8:54–55 (“A block diagram of the framing scheme according to the present invention is shown in FIG. 5.”).

⁶ Patent Owner uses “symbol” to mean “a collective multicarrier symbol in a single symbol period (*e.g.* a DMT symbol).” PO Resp. 12. Patent Owner uses “carrier” to mean “a carrier symbol (*e.g.*, a QAM symbol).” *Id.*

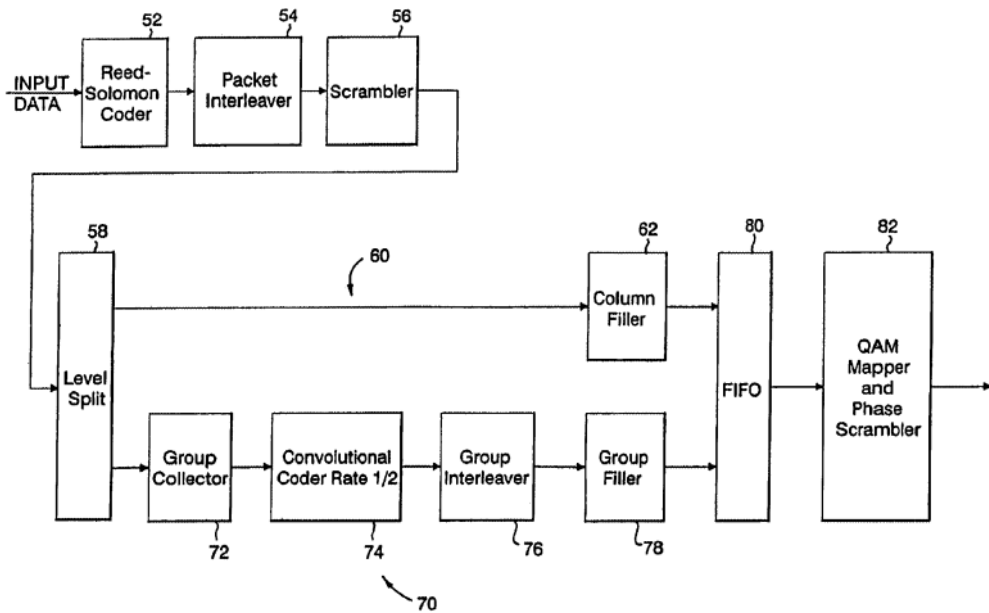
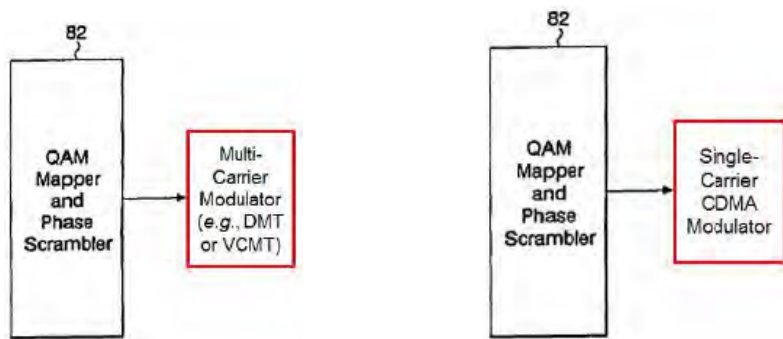


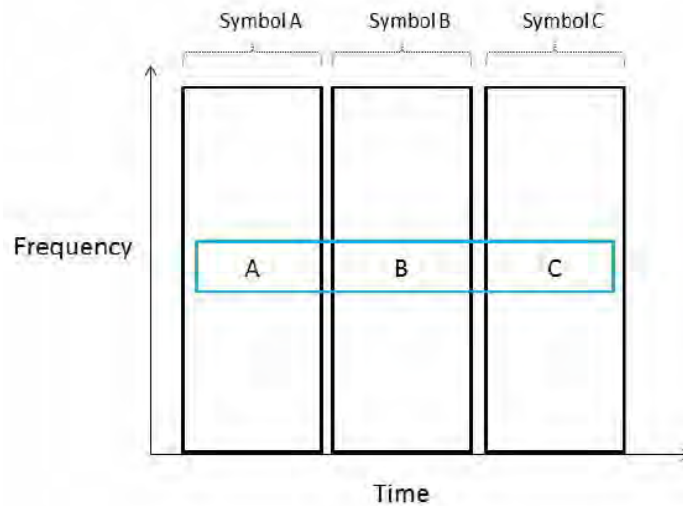
FIG. 5

To illustrate the use of Stopler’s framing scheme with either a multicarrier modulator or a single carrier modulator, Patent Owner provides the following annotated excerpts of Figure 5:



PO Resp. 33.

We are not persuaded by Patent Owner’s argument, which is based upon its assertion that “[s]ingle-carrier systems have only one carrier with only one phase” and, therefore, “[p]hase scrambling in a single-carrier system only makes sense when it is performed over time from symbol-to-symbol, as illustrated by the blue box,” in the figure reproduced below. PO Resp. 36–37.



Id. at 37. In this diagram, “Symbol A,” “Symbol B,” and “Symbol C” each represent a QAM symbol, not a DMT symbol, and each, according to Patent Owner, is phase scrambled relative to the other. Thus, Patent Owner’s diagram shows only that a single-carrier embodiment of Stopler would transmit one phase-scrambled QAM symbol at a time. It does *not* show that QAM Mapper and Phase Scrambler 82 phase scrambles a DMT symbol—i.e., rotates, by the same amount, the phase of a plurality of QAM symbols. This is consistent with the cross-examination testimony of Patent Owner’s expert, Dr. Short, who admitted that Stopler does not describe phase scrambling DMT symbols. Reply 17–18 (citing Ex. 1027, 60:11–14). Thus, Patent Owner’s own diagram is consistent with Petitioner’s position that Stopler phase scrambles individual QAM symbols, and Patent Owner identifies nothing in Stopler to suggest that, in an alternative embodiment with a multicarrier modulator, QAM Mapper and Phase Scrambler 82 do not supply a plurality of phase-scrambled QAM symbols for modulation onto the plurality of carriers in the, e.g., DMT symbol.

Whereas Patent Owner’s position relies upon inference, Petitioner’s position is supported by express disclosure in Stopler, which unambiguously

teaches “QAM symbols, for example, . . . 256-QAM” whose “constellation mapping may be the same as that used in ADSL.” Ex. 1012, 12:20–24. Stopler further teaches that, “a phase scrambling sequence is applied to the output symbols,” including “all symbols, not just the overhead symbols.” *Id.* at 12:25–28. Patent Owner’s expert, Dr. Short, agreed that Stopler is referring to phase scrambling QAM symbols. Reply 16–17 (citing Ex. 1027 (Tellado Dep.), 54:17–55:3, 55:19–24, 58:6–8, 59:9–12, 60:15–22). Stopler further teaches that a “scrambling sequence may be generated by a pseudo-random generator” that generates pairs whose sum “is used to select the amount of rotation to be applied to the symbol,” singular; not “symbols” plural. Ex. 1012, 12:28–36. Thus, the most intuitive reading of Stopler supports Petitioner’s contention that QAM Mapper and Phase Scrambler 82 determines an amount of rotation and rotates the phase of a *single* QAM symbol by that amount. Patent Owner, in contrast, identifies nothing in Stopler to suggest that QAM Mapper and Phase Scrambler 82 rotates the phase of a *plurality* of QAM symbols (e.g., every QAM symbol of a DMT symbol) by the same amount. Finally, we agree with Petitioner’s argument that because “a CDMA modulator does not employ DMT symbols, . . . there is no reason for Stopler’s phase scrambler to operate on DMT symbols,” whereas “both DMT and CDMA modulators employ QAM symbols,” so “applying the phase scrambler to individual QAM symbols [] is the only possible reading that is logically and technically coherent.” *Id.* at 18–19 (citing Ex. 1026 (Tellado Reply Decl.) ¶ 58).

Patent Owner also argues that a person of ordinary skill in the art would have understood Stopler to be scrambling phase from symbol-to-symbol over time in order to reduce narrowband noise at the frequency of an

overhead pilot carrier. PO Resp. 39; *see also id.* at 38–44 (citing Ex. 2004 (U.S. Patent 6,370,156, “the ’156 patent”). According to Patent Owner, “Petitioners’ argument that Stopler discloses phase scrambling within one symbol is based on the premise that the symbol can have multiple pilot tones.” *Id.* at 40. We understand Patent Owner to be alluding to pages 12 to 13 of the Petition, which state

Stopler also explains that some of the available carriers may be reserved for the transmission of overhead signals, such as pilot tones. Ex. 1012, 10:60-62 & 12:51-54. To randomize these overhead channels, Stopler employs a phase scrambler. Ex. 1012, 12:24-26.

Pet. 12–13. In the claim-by-claim analysis of the Petition, however, Petitioner cites lines 20 to 28 of column 12, which include Stopler’s teaching that “the phase scrambler is applied to all symbols, not just the overhead symbols.” Pet. 21 (quoting Ex. 1012, 12:27–28). Thus, Petitioner is relying not just on the scrambling of “overhead signals, such as pilot tones,” (Pet. 12) but on the scrambling of *all* QAM symbols. Because neither Petitioner’s argument nor Stopler’s teaching of phase scrambling is limited to pilot tones, Patent Owner’s argument is not persuasive.

Finally, we are not persuaded by Patent Owner’s argument that only its interpretation—i.e., adjusting the phase of an entire DMT symbol—would “simplify implementation,” as Stopler teaches (Ex. 1012, 12:26), whereas Petitioner’s interpretation would add complexity. PO Resp. 44 (citing Ex. 2003 ¶ 90). Patent Owner provides no explanation or analysis to support its conclusory assertions regarding simplicity and complexity, and the cited portion of Dr. Short’s declaration merely repeats what is written in the Patent Owner’s Response.

For the foregoing reasons, we are persuaded that Stopler teaches “scrambling, using the phase scrambler, a plurality of carrier phases,” as recited in independent claim 1 and similarly recited in independent claims 7, 13, and 20.

*6. Patent Owner’s Assertions
Concerning Reason to Combine*

Patent Owner argues that the combined teachings of Shively and Stopler do not render obvious the challenged claims. PO Resp. 44. In particular, Patent Owner argues that (1) Petitioner provides no explanation for the “use of a known technique to improve a similar device” rationale to combine Shively and Stopler (*id.* at 45–47); (2) Petitioner wrongly claims that Shively’s transmitter suffers from an increased PAR (*id.* at 47–49); (3) Petitioner’s combination of Shively and Stopler suffers from hindsight (*id.* at 49–50); (4) there is no need to solve Shively’s non-existent PAR problem (*id.* at 50); (5) Stopler does not reduce PAR in a multicarrier transmitter (*id.* at 51); (6) Stopler and Shively could not be combined (*id.* at 51–55); and (7) there were no “market forces” in effect to prompt Shively/Stopler combination (*id.* at 55–57). We address each argument in turn.⁷

⁷ Patent Owner lists several portions of Petitioner’s Reply and evidence allegedly beyond the scope of what can be considered appropriate for a reply. *See* Paper 22. We have considered Patent Owner’s listing, but disagree that the cited portions of Petitioner’s Reply and reply evidence are beyond the scope of what is appropriate for a reply. Replies are a vehicle for responding to arguments raised in a corresponding patent owner response. Petitioner’s arguments and evidence that Patent Owner objects to (Paper 22, 1–2) are not beyond the proper scope of a reply because we find that they fairly respond to Patent Owner’s arguments raised in Patent Owner’s Response. *See Idemitsu Kosan Co. v. SFC Co. Ltd.*, 870 F.3d 1376, 1381

*a. Use of a known technique to
improve a similar device rationale*

Patent Owner argues that in making the contention that the combination of Shively and Stopler is a use of a known technique to improve a similar device, method or product in the same way, Petitioner fails to explain what is the known technique, what device/method/product is similar, and how is the alleged known technique used for improvement in the same way. PO Resp. 45–47.

In the Petition, Petitioner provides sufficient explanation regarding the reasons to combine Shively and Stopler. Pet. 13–15. The explanation provided in the Petition is not conclusory or confusing as Patent Owner asserts. The known technique is identified as phase scrambling. Pet. 14–15 (citing Ex. 1009, 27–28). The similar device is Shively’s modem. Pet. 16. And the improvement to it is the same as in Stopler—to reduce PAR. Pet. 15 (citing Ex. 1009, 28–29).

*b. Whether Shively’s transmitter suffers from increased PAR
and whether there is a reason to reduce PAR in Shively*

Patent Owner argues that “Shively does not suffer from an increased PAR, much less one that would be recognized as a problem. Rather, Shively’s disclosed embodiment results in a substantially reduced PAR (and one that is very far below a level that is problematic).” PO Resp. 47–49.

(Fed. Cir. 2017) (“This back-and-forth shows that what Idemitsu characterizes as an argument raised ‘too late’ is simply the by-product of one party necessarily getting the last word. If anything, Idemitsu is the party that first raised this issue, by arguing—at least implicitly—that Arakane teaches away from non-energy-gap combinations. SFC simply countered, as it was entitled to do.”).

Patent Owner also argues that because Shively does not disclose a problem with PAR, one having ordinary skill in the art would have had no reason to look for a solution. PO Resp. 50. We are not persuaded by these arguments.

Specifically, Patent Owner argues Shively's system is unlikely to suffer from clipping⁸ based on its analysis of a hypothetical 18,000 foot wire. PO Resp. 19–28. According to Patent Owner, the power of signals transmitted in Shively's proposed system would be “only 40% of maximum” in the normal mode for ADSL-1995 and “only 49% of maximum” in the power-boost mode of ADSL-1995. PO Resp. 19–28. Based on these figures, Patent Owner concludes that “the clipping probability for both normal and power-boost modes is virtually zero” because “[w]hile Shively's ‘spreading’ technique will contribute a small uptick in clipping probability, any increase would be negated by the enormous reduction in clipping probability achieved by reducing signal power by more than half.” *Id.* at 28.

Petitioner argues that Dr. Short's analysis is flawed because (1) the teachings of Shively are not applicable only to 18,000 foot cables; and (2) Dr. Short “grossly underestimates the likelihood of phase alignment” in Shively because he wrongly assumes a Gaussian distribution. Reply 26–31. According to Petitioner, a proper analysis shows that Shively's techniques “significantly increases PAR and the likelihood of clipping.” Reply 32–36 (emphasis omitted).

⁸ Patent Owner explains that, “[w]hen the maximum dynamic range of a component is exceeded, the signal will become distorted or will ‘clip.’” PO Resp. 8. This is consistent with how the '243 patent uses “clipping.” *See, e.g.,* Ex. 1001, 8:27–35.

We need not determine the exact probability of clipping in Shively's proposed system because, even assuming Patent Owner's analysis is accurate, it does not rebut Petitioner's reason to combine. Petitioner does not allege that Shively's proposed system causes clipping, or that a person of ordinary skill in the art would have been motivated to reduce PAR only if it caused clipping. Instead, Petitioner alleges that Shively's proposed system would have an "increased" or "high" PAR:

A POSITA would have recognized that by transmitting redundant data on multiple carriers, *Shively's transmitter would suffer from an increased peak-to-average power ratio*. Ex. 1009, p. 26. This increase is due to the fact that the overall transmitted signal in a multicarrier system is essentially the sum of its multiple subcarriers. *Id.* When N subcarrier signals with the same phase are added together, they have a peak power which is N times greater than their individual maximum powers. *Id.*

Since Shively's subcarriers use quadrature amplitude modulation (QAM) . . . transmitting the same bits on two different subcarriers causes those subcarriers to have the same phase and amplitude. *Id.* By transmitting the same bits on multiple subcarriers, Shively creates a situation where those multiple subcarriers will be phase-aligned. *Id.* *Having phase-aligned subcarriers causes a high peak-to-average power ratio (PAR), since all of the subcarriers add up coherently at the same time.* *Id.*

Pet. 13–14 (emphases added).

Patent Owner criticizes Petitioner's declarant for not providing "calculations or data that illustrate to what degree there is an 'increase' in PAR with Shively's transmitter" (PO Resp. 48), but we are not persuaded that such calculations and data are necessary. Petitioner's reason to combine does not depend on the PAR increase exceeding some specific numeric threshold. There is no dispute that transmitting the same data on multiple

carriers increases PAR (Reply 10 (citing PO Resp. 6–7; Ex. 2003 (Short Decl.) ¶ 22)) or that Shively’s technique, specifically, will increase PAR (PO Resp. 28 (“Shively’s ‘spreading’ technique will contribute a small uptick in clipping probability”). There also is no dispute that equipment designed to handle a higher PAR can be larger, more expensive, and more power hungry than equipment designed to handle a lower PAR (Reply 37; Ex. 2003 (Short Decl.) ¶ 26; Ex. 1027 (Short Depo.) 45:21–19). Patent Owner’s declarant, Dr. Short, testified that, given such issues, system designers or engineers would be interested in using techniques that could reduce PAR. Ex. 1027, 46:23–47:3. This is consistent with the reason to combine given in the Petition and supports Petitioner’s position that “numerous problems” other than clipping “would have motivated a [person of ordinary skill in the art] to look for ways to reduce the PAR of Shively’s technique.” Reply 37.

In light of the foregoing, we are persuaded that a person of ordinary skill in the art would have recognized that Shively’s technique would increase PAR and would have been motivated to reduce PAR regardless of whether Shively’s technique resulted in clipping.

*c. Whether combination of Shively and Stopler
suffers from hindsight*

Patent Owner argues that only the inventor of the ’243 patent recognized the problem of high PAR due to phase-aligned carriers. PO Resp. 49–50. Patent Owner argues that the only cited evidence that high PAR results from transmitting the same data on multiple carriers is from the ’243 patent and that Petitioner “use[s] the ’243 patent as a roadmap for arriving at their theory of obviousness” and “is a textbook case of impermissible hindsight bias.” *Id.* We are not persuaded by this argument.

First, the portions cited in the '243 patent in the Petition and in Dr. Tellado's declaration come from the "BACKGROUND OF THE INVENTION" section of the patent. That portion of the '243 patent uses words such as "conventional" indicating that what is described in the "BACKGROUND OF THE INVENTION" section is information that was known at the time of the invention, not just by the inventors, but persons of ordinary skill in the art. Patent Owner does not contend otherwise.

In addition, Dr. Tellado testified that a person having ordinary skill in the art would have recognized that the purpose of Stopler's phase scrambler to randomize data symbols would be to reduce PAR of transmitted signals and that the person would have been familiar with the problems created by a high PAR, including PAR due to phase-aligned carriers. Ex. 1009 ¶¶ 60, 66. Moreover, Patent Owner's own declarant recognized that PAR was a known problem at the time of the invention. Ex. 2003 ¶ 23 ("Conventional multicarrier systems, therefore, were designed to accommodate PAR."). The ANSI T1.413-1995 standard also confirms that PAR was known at the time of the invention by describing that "[a] DMT time-domain signal has a high peak-to-average ratio (its amplitude distribution is almost Gaussian), and large values may be clipped by the digital-to-analog converter." Ex. 1017, 36 (Section 6.5 "Tone ordering"). Based on the record evidence, we find that a person having ordinary skill in the art would have known about the problem of high PAR due to phase-aligned carriers.

d. Whether Stopler reduces PAR in a multicarrier transmitter

Patent Owner argues that Stopler does not reduce PAR because phase scrambling is performed from symbol-to-symbol and not from carrier-to-

carrier. PO Resp. 51. The argument is not persuasive for the reasons provided above.

*e. Whether Stopler and Shively
could be combined*

Patent Owner argues that Shively and Stopler are incompatible and that it would not have been possible to incorporate Shively's bit-spreading concept into Stopler. PO Resp. 51. In particular, Patent Owner argues that Shively's bit-spreading concept is not compatible with Stopler's "diagonalization" technique. PO Resp. 51–55. This argument is misplaced as Petitioner did not rely on Stopler's "diagonalization" technique. Rather, Petitioner relies on Stopler's phase scrambler and scrambling technique. Pet. 14, 21–22. Moreover, Stopler describes its "diagonalization" technique as optional. Ex. 1012, 10:17, 13:1–3. For these reasons, we are not persuaded by Patent Owner's argument that it would not be possible to combine Shively and Stopler.

*f. Whether "market forces" prompt
Shively/Stopler combination*

The Petition states that "[m]arket forces would have prompted the development of multicarrier communications devices, such as Digital Subscriber Line (DSL) modems, employing both redundant bit transmission and phase scrambling." Pet. 15 (citing Ex. 1009, 28). Patent Owner argues that neither Petitioner nor Dr. Tellado identifies a single product or standard that employs any of the ideas disclosed in Shively or Stopler. PO Resp. 55–57.

Patent Owner's arguments are misplaced. It was not incumbent on Petitioner or Dr. Tellado to identify a product or standard that employs the

ideas disclosed in Shively or Stopler in order to show that the combination of Shively and Stopler would have been obvious to a person skilled in the art. That is not the standard. Rather, 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.*, 550 U.S. at 406. Dr. Tellado testified that a person having ordinary skill in the art would have been familiar with problems caused by a high PAR, that equipment needed to cope with PAR would have been expensive and inefficient, and that less capable equipment would have caused distortion such as from amplitude clipping. Ex. 1009 ¶ 66. He further testified that combining Shively's redundant bit transmission with Stopler's phase scrambling technique would have allowed for faster DSL modems without requiring more complex and expensive circuitry for handling increased PAR. *Id.* ¶ 69. Patent Owner has not presented sufficient evidence to undermine Dr. Tellado's testimony. Indeed, Dr. Short testified that a way to address high PAR in a communication system would be to use transceiver components that could handle higher peak transmission values, which would be expensive and power hungry. Ex. 1027, 45:15–46:12. Based on the record before us, we find that at the time of the invention, a person having ordinary skill in the art would have recognized that an increase in PAR would have been associated with more expensive communication equipment. Accordingly, a drive to reduce equipment costs would have motivated a person having ordinary skill in the art to include Stopler's phase scrambler into Shively's transmitter to reduce PAR. Pet. 13–15; Ex. 1009 ¶¶ 66–70.

7. Summary

For the foregoing reasons, we are persuaded that Petitioner has established, by a preponderance of the evidence, that claims 1–3, 7–9, 13–16, and 20–22 of the '243 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Shively and Stopler.

E. Obviousness of Claims 4–6, 10–12, 17–19, and 23–25 over Shively, Stopler, and Gerszberg

Petitioner contends that claims 4–6, 10–12, 17–19, and 23–25 of the '243 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Shively, Stopler, and Gerszberg. Pet. 42–52.

1. Gerszberg Overview

Gerszberg discloses a telephone network interface unit typically disposed on the outside of a home or small business. Ex. 1013, 1:6–9. An intelligent services director (ISD) is placed near a customer's premises for multiplexing and coordinating many digital services on to a single twisted-pair line. *Id.* at 2:12–23. A facilities management platform (FMP) is placed in the local telephone network's central office for routing data to an appropriate interexchange company network. *Id.* A network server platform (NSP) is coupled to the FMP. *Id.*

2. Petitioner's Initial Contentions

Petitioner contends that a combination of Shively and Stopler would have rendered obvious claims 4–6, 10–12, 17–19, and 23–25 of the '243 patent. Pet. 42–52. We have reviewed the Petition, Patent Owner's Response, and Petitioner's Reply, as well as the relevant evidence discussed in those papers and other record papers, and are persuaded that the record sufficiently establishes Petitioner's contentions for claims 4–6, 10–12, 17–

19, and 23–25, and we adopt Petitioner’s contentions discussed below as our own.

For example, the claim 4 recites “[t]he method of claim 1, wherein the transceiver is a wireless transceiver,” claim 5 recites “[t]he method of claim 1, wherein the transceiver is operable for high speed internet access,” and claim 6 recites “[t]he method of claim 1, wherein the transceiver is operable to transport video.” Petitioner argues that, as discussed above, the combination of Shively and Stopler renders claim 1 obvious. *See* Section II.B.3. Petitioner further argues that Gerszberg discloses the additional limitations of claims 4–6. Pet. 47–49. Petitioner explains that Gerszberg discloses a “transceiver [that] is ‘coupled to a central office [] via a twisted-pair wire, hybrid fiber interconnection, wireless and/or other customer connection.’” *Id.* at 48 (quoting Ex. 1013, 2:67–3:9) (emphasis omitted). Petitioner also argues that Gerszberg discloses “[h]igh-speed access to the Internet’ and the ‘ability to offer ultra fast Internet access.’” *Id.* (quoting Ex. 1013, 7:44–60, 8:16–24). Petitioner additionally argues that Gerszberg discloses “transporting ‘video’ and providing ‘[i]nteractive video teleconferencing.’” *Id.* at 49 (quoting Ex. 1013, 8:16–36, 10:63–11:3). We are persuaded by Petitioner’s showing and find that Gerszberg teaches a wireless transceiver, a transceiver operable for high speed internet access, and a transceiver operable transport video.

Petitioner further argues that a person with ordinary skill in the art would have combined Gerszberg with Shively/Stopler “because Shively explicitly refers to Gerszberg and incorporates Gerszberg by reference.” *Id.* at 43–44 (citing Ex. 1011, 18:7–9; Ex. 1013, 16:52–53; Ex. 1009, 69; *Telemac Cellular Corp. v. Topp Telecom, Inc.*, 247 F.3d 1316, 1329 (Fed.

Cir. 2001) (holding “[w]hen a document is ‘incorporated by reference’ into a host document, such as a patent, the referenced document becomes effectively part of the host document as if it were explicitly contained therein.”)). Petitioner alternatively argues that “it would have been obvious to combine the teachings of Gerszberg with Shively and Stopler because the combination is merely the use of a known technique to improve a similar device, method or product in the same way.” *Id.* at 44 (citing Ex. 1009, 69). Petitioner explains that both Shively and Stopler “describe transmitting data using DSL and multitone communication technologies” and a person with ordinary skill in the art would have recognized that DSL “was intended to provide data services such as high-speed internet and video to telephone subscribers.” *Id.* (citing Ex. 1011, 1:5–8; Ex. 1012, 1:50–61, 9:37–41, 12:21–24, 12:55–57; Ex. 1009, 69). Petitioner argues that it was known that “Service Systems” that are offered by DSL technologies include “Internet access,” “Interactive video,” and “Videoconferenc[ing].” *Id.* at 44–45 (citing Ex. 1015, 100, 102, 104, Fig. 1). Accordingly, Petitioner argues, and we agree, that the “known technique for providing Internet and video services, as disclosed by Gerszberg, would be applied to the combination of Shively and Stopler to provide the advantage of addressing the market need for such services.” *Id.* at 46 (citing Ex. 1013, 7:44–60, 8:16–36, 10:63–11:3).

Patent Owner argues that “Petitioners’ assertion of unpatentability for the dependent claims . . . also falls short” for the same reasons argued above with respect to the independent claims. PO Resp. 59. We have addressed those arguments above, and, for the same reasons discussed above, are not persuaded. *See* Section II.D.5 and II.D.6.

3. Summary

For the foregoing reasons, we are persuaded that Petitioner has established, by a preponderance of the evidence, that claims 4–6, 10–12, 17–19, and 23–25 of the '243 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Shively, Stopler, and Gerzberg.

F. Patent Owner's Motion to Exclude

Patent Owner filed a Motion to Exclude (Paper 28, "Motion"). Petitioner filed an Opposition to Patent Owner's Motion (Paper 33, "Opp."), and Patent Owner filed a Reply in support of its Motion (Paper 37). Patent Owner seeks to exclude Exhibit 1022, Exhibit 1025, certain paragraphs of the Exhibit 1026 (Second Tellado Decl.), and Exhibits 1023, 1024, and 1028 and testimony regarding the same. Mot. 2–12. As movant, Patent Owner has the burden of proof to establish that it is entitled to the requested relief. *See* 37 C.F.R. § 42.20(c). For the reasons stated below, Patent Owner's Motion to Exclude is *dismissed*.

Exhibit 1022 is styled "Robert T. Short, 'Physical Layer,' *in* WIMEDIA UWB (2008)," and Exhibit 1025 is a copy of Dr. Tellado's thesis. Reply 5. Patent Owner argues that we should exclude Exhibits 1022 and 1025 as irrelevant under Federal Rule of Evidence ("FRE") 402. Motion 2–6. These exhibits were not cited or discussed in Petitioner's Reply, and we did not rely on Exhibit 1022 or 1025, or Dr. Tellado's statements with respect to Exhibits 1022 and 1025, in rendering our decision. We did not and need not consider Exhibits 1022 and 1025. We have determined that Petitioner has demonstrated, by a preponderance of the evidence, that the challenged claims are unpatentable, without considering the specific objected to evidence or the portion of Dr. Tellado's statements that discuss

Exhibits 1022 and 1025. Accordingly, we *dismiss* Patent Owner’s Motion to Exclude as to these exhibits.

Exhibit 1023 is styled “Denis J. G. Mestdagh and Paul M. P. Spruyt, ‘A Method to Reduce the Probability of Clipping in DMT-Based Transceivers,’ *IEEE Transactions on Communications*, Vol. 44, No. 10, (October 1996).” Reply 5. Exhibit 1024 is styled “Stefan H. Muller and Johannes B. Huber, ‘A Comparison of Peak Power Reduction Schemes for OFDM,’ IEEE Global Telecommunications Conference (1997).” *Id.* Exhibit 1028 is styled “T. Starr, J. M. Cioffi, P. J. Silverman, UNDERSTANDING DIGITAL SUBSCRIBER LINE TECHNOLOGY (1999) (selected pages).” *Id.* Exhibit 2013 is a copy of the cross examination transcript of Dr. Tellado.

Patent Owner argues that we should exclude Exhibits 1023, 1024, and 1028 in their entirety as irrelevant. Motion 9–12. Patent Owner also argues that we should exclude certain portions of Exhibit 2013 allegedly discussing Exhibits 1023, 124, or 1028. *Id.* Although Exhibits 1023, 1024, and 1028 are mentioned briefly in Petitioner’s Reply, we did not rely on Exhibits 1023, 1024, 1028, or the objected to portions of Exhibit 2013 in rendering our decision. We did not and need not consider Exhibits 1023, 1024, 1028, or the objected to portions of Exhibit 2013. We have determined that Petitioner has demonstrated, by a preponderance of the evidence, that the challenged claims are unpatentable, without considering the specific objected to evidence.

Finally, Patent Owner argues that we should exclude paragraphs 16 (last two sentences), 29, 42, 43 (first sentence), and 52 of Exhibit 1026 (Second Tellado Declaration), and certain portions of Dr. Tellado’s cross

examination transcript (Exhibit 2013) under FRE 702 as being based on insufficient facts or data due to an alleged undisclosed simulation. Motion 6–9. We did not rely on the objected to portions of Exhibits 1026 or 2013 in rendering our decision. We did not and need not consider the objected to portions of Exhibits 1026 or 2013. We have determined that Petitioner has demonstrated, by a preponderance of the evidence, that the challenged claims are unpatentable, without considering the specific objected to evidence. Accordingly, we *dismiss* Patent Owner’s Motion to Exclude as to these paragraphs of Exhibit 1026 and these portions of Exhibit 2013.

For all of the above reasons, we *dismiss* Patent Owner’s Motion to Exclude.

G. Motion for Observations

Patent Owner also filed a Motion for Observations (Paper 27, “Obs.”), to which Petitioner filed a Response (Paper 34, “Obs. Resp.”). To the extent Patent Owner’s Motion for Observations pertains to testimony purportedly impacting Dr. Tellado’s credibility, we have considered Patent Owner’s observations and Petitioner’s responses in rendering this Final Written Decision, and accorded Dr. Tellado’s testimony appropriate weight in view of Patent Owner’s observations and Petitioner’s response to those observations. *See* Obs. 1–13; Obs. Resp. 2–11.

III. CONCLUSION

Petitioner has demonstrated, by a preponderance of the evidence, that (1) claims 1–3, 7–9, 13–16, and 20–22 of the ’243 patent are unpatentable under 35 U.S.C. § 103(a) over Shively and Stopler; and (2) claims 4–6, 10–12, 17–19, and 23–25 of the ’243 patent are unpatentable under 35 U.S.C. § 103(a) over Shively, Stopler, and Gerszberg.

IV. ORDER

Accordingly, it is

ORDERED that claims 1–25 of the '243 patent are determined to be *unpatentable*;

FURTHER ORDERED that Patent Owner's Motion to Exclude is *dismissed*; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2016-01020
Patent 9,014,243 B2

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