

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMMSCOPE, INC.,
Petitioner,

v.

TQ DELTA, LLC,
Patent Owner.

IPR2022-00697
Patent 8,468,411 B2

Before JEAN R. HOMERE, LYNNE E. PETTIGREW, and
KARA L. SZPONDOWSKI, *Administrative Patent Judges*.

PETTIGREW, *Administrative Patent Judge*.

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

I. INTRODUCTION

Petitioner, CommScope, Inc., filed a Petition for *inter partes* review of claims 1, 2, 9–11, 17–19, and 25 of U.S. Patent No. 8,468,411 B2 (Ex. 1001, “the ’411 patent”). Paper 2 (“Pet.”). Patent Owner, TQ Delta, LLC, filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). Pursuant to our authorization, Petitioner filed a Reply (Paper 9), and Patent Owner filed a Sur-reply (Paper 11).

Under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a), we have authority to institute an *inter partes* review if “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). After considering the parties’ briefing and the evidence of record, we conclude the information presented does not show there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one of the challenged claims of the ’411 patent. Accordingly, we do not institute an *inter partes* review.

II. BACKGROUND

A. Real Parties in Interest

Petitioner identifies CommScope Holding Company, CommScope, Inc., ARRIS US Holdings, Inc., ARRIS Solutions, Inc., ARRIS Technology, Inc., and ARRIS Enterprises, Inc. as the real parties in interest. Pet. 74; Paper 6 (Petitioner’s Updated Mandatory Notices). Patent Owner identifies itself as the only real party in interest. Paper 4, 1 (Patent Owner’s Mandatory Notices).

B. Related Matters

The parties indicate that the '411 patent is involved in the following proceedings: *TQ Delta, LLC v. CommScope Holding Co.*, Case No. 2:21-cv-00310 (E.D. Tex.); *TQ Delta, LLC v. Nokia Corp.*, Case No. 2:21-cv-00309 (E.D. Tex.); *TQ Delta, LLC v. ADTRAN, Inc.*, Case No. 1:14-cv-00954 (D. Del.); and *ADTRAN, Inc. v. TQ Delta, LLC*, Case No. 1:15-cv-00121 (D. Del.). Pet. 74; Paper 4, 1–2.

C. Overview of the '411 Patent

The '411 patent relates to transceivers for retransmitting packets in a communications environment. Ex. 1001, code (57), 1:24–27. The '411 patent describes a system and method for sharing memory between retransmission functions and other transceiver functions, such as interleaving and deinterleaving. *Id.* at code (57), 1:27–29, 2:15–22, 17:36–38.

One embodiment of a communications system described in the '411 patent uses both retransmission protocols and interleaving with Reed-Solomon (RS) coding for correcting channel errors caused by, for example, impulse noise. *Id.* at 17:28–54. The '411 patent describes a memory with one portion dynamically allocated to interleaving/deinterleaving functions and a second portion allocated to retransmission functions. *Id.* at 18:4–16. The '411 patent also describes a method in which transceivers exchange messages indicating how memory should be allocated between interleaving/deinterleaving and retransmission functions. *Id.* at 18:44–19:3, 21:30–52.

The '411 patent describes exemplary embodiments in relation to multicarrier modems (e.g., digital subscriber line (xDSL) and very-high-speed DSL (VDSL) modems), and incorporates by reference the following protocols: ADSL2 ITU-T G.992.3, ADSL2++ ITU-T G.992.5, and VDSL2

ITU-T G.993.2. *Id.* at 8:54–56, 10:1–5. The '411 patent also states that the disclosed systems and methods will work equally well for any type of communication system. *See id.* at 8:56–59.

D. Illustrative Claim

Among the challenged claims, claims 1, 10, and 18 are independent. Claims 2 and 9 depend from claim 1, claims 11 and 17 depend from claim 10, and claims 19 and 25 depend from claim 18. Claim 1 is illustrative of the claimed subject matter:

1. [pre] A method of packet retransmission comprising:
 - [a] transmitting or receiving, using a transceiver, a plurality of packets;
 - [b] identifying at least one packet of the plurality of packets as a packet that should be retransmitted;
 - [c] *allocating a memory between a retransmission function and an interleaving and/or deinterleaving function*; and
 - [d] transmitting or receiving a message during initialization,
 - [e] *wherein the message indicates how the memory is to be allocated between the retransmission function and the interleaving and/or deinterleaving function*, and
 - [f] wherein at least a portion of the memory may be allocated to the retransmission function or the interleaving and/or deinterleaving function at any one particular time.

Ex. 1001, 23:31–45 (emphasis added) (modified to include Petitioner's identification of claim limitations).

E. Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims are unpatentable based on the following grounds (Pet. 2):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2, 9–11, 17–19, 25	103(a) ¹	G.993.2, ² BI-089 ³
1, 2, 9–11, 17–19, 25	103(a)	Mazzoni, ⁴ G.993.1, ⁵ BI-089

Petitioner submits the declaration of Krista S. Jacobsen, Ph.D. in support of the Petition. Ex. 1003.

III. DISCUSSION

A. 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 ordinary

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011), amended 35 U.S.C. § 103 effective March 16, 2013. Because the ’411 patent has an effective filing date earlier than March 16, 2013, we refer to the pre-AIA version of § 103. *See* Ex. 1001, codes (22), (60).

² ITU-T Recommendation G.993.2 (Feb. 2006) (Ex. 1004, “G.993.2” or “VDSL2”).

³ ITU-T SG15/Q4 contribution BI-089 (Oct. 2000) (Ex. 1005, “BI-089”).

⁴ U.S. Patent Application Publication No. 2003/0021338 A1, published Jan. 30, 2003 (Ex. 1006, “Mazzoni”).

⁵ ITU-T Recommendation G.993.1 (June 2004) (Ex. 1007, “G.993.1” or “VDSL1”).

skill in the art; and (4) when in evidence, objective indicia of non-obviousness.⁶ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (internal quotation marks and citation omitted).

Petitioner asserts that a person of ordinary skill in the art at the time of the invention of the ’411 patent would have had

a bachelor’s degree in electrical or computer engineering, or the equivalent, and at least 5–6 years of experience; a master’s degree in electrical or computer engineering, or the equivalent, and at least 2–3 years of experience; or a Ph.D in electrical or computer engineering, or the equivalent, with at least 1–2 years of experience.

Pet. 12 (citing Ex. 1003 ¶ 38). Patent Owner states that, for purposes of its Preliminary Response only, it does not contest Petitioner’s proposed “level of ordinary skill in the art as an individual with a handful of years of experience but no specialized knowledge of DSL.” Prelim. Resp. 36 n.14.

Although Petitioner’s proposed level of ordinary skill in the art does not describe the type of experience an ordinary skilled artisan would have had, Petitioner elsewhere asserts that

[a]s of the ’411 patent’s priority date, a [person of ordinary skill in the art] would have been familiar with the DSL standards issued by [the Alliance for Telecommunication Industry

⁶ With respect to the fourth *Graham* factor, the parties do not present arguments or evidence regarding objective indicia of non-obviousness. *See generally* Pet.; Prelim. Resp.

Solutions] and the [International Telecommunication Union] including at least T1.413 Issue 1, T1.413 Issue 2, G.992.1, G.992.2, G.992.3, G.993.1, G.994.1, and G.993.2, as well as contributions to those standards bodies.

Pet. 6 (citing Ex. 1003 ¶ 224). Based on the current record, including the '411 patent, the prior art references, and the testimony of Dr. Jacobsen, we find that a person of ordinary skill in the art would have had some familiarity with DSL. The record, however, does not support defining a person of ordinary skill in the art as one who was familiar with all of the DSL standards and contributions to the standards bodies.

Accordingly, for purposes of this Decision, we apply the level of ordinary skill as articulated by Petitioner, with two exceptions. *See* Pet. 12. First, we omit the qualifier “at least,” which could expand the required amount of experience indefinitely. Second, the “experience” of a person of ordinary skill in the art would have included some familiarity with DSL technology. We note that our findings and conclusions in this Decision would not change if a person of ordinary skill in the art had “no specialized knowledge of DSL,” as Patent Owner proposes, or was familiar with DSL standards and contributions to standards bodies.

C. Claim Construction

In an *inter partes* review, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2021). In applying this 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 and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–14.

For purposes of this Decision, we determine that no claim terms require express construction. *See Realtime Data LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. Eng’g, Inc.*, 200 F.3d 795, 803) (Fed. Cir. 1999))).

D. Overview of the Asserted References

1. G.993.2

G.993.2 (VDSL2), published in 2006, is an enhancement to G.993.1 that specifies requirements for VDSL transceivers located at the central office (VTU-O transceiver) and at the subscriber’s premises (VTU-R transceiver). Ex. 1004 §§ 1, 5.1, Fig. 5-1. G.993.2 requires transceivers to support forward error correction (FEC) using Reed-Solomon coding and interleaving of RS codewords. *Id.* §§ 9.3, 9.4.

G.993.2 describes an initialization procedure between transceivers VTU-O and VTU-R that includes a channel analysis and exchange phase in which the transceivers exchange their capabilities and determine a final configuration for upstream and downstream transmission on the basis of these capabilities. *Id.* §§ 12.3, 12.3.5.1, Fig. 12-8. One of the messages exchanged during this phase is the O-PMS message, which “conveys the initial PMS-TC parameter settings that shall be used in the upstream direction during Showtime.”⁷ *Id.* § 12.3.5.2.1.3. The O-PMS message also “specifies the portion of shared interleaver memory that the VTU-R can use

⁷ “PMS-TC” is the “physical media specific transmission convergence” sub-layer. Ex. 1004, §§ 4, 5.1. “Showtime” is the state of a transceiver “that is reached after the initialization procedure has been completed in which bearer channel data are transmitted.” *Id.* § 3.52.

to de-interleave the downstream data stream.” *Id.* In response to the O-PMS message, the VTU-R sends the R-PMS message, which “conveys the initial PMC-TC parameter settings that shall be used in the downstream direction during showtime.” *Id.* § 12.3.5.2.2.3.

2. BI-089

BI-089, titled “G.gen: ARQ for ADSL Transceivers,” is a contribution to the October 23–27, 2000 meeting of the ITU-T study group SG15/Q4 held in Goa, India. Ex. 1005, 1. BI-089 describes a proposal for using Automatic Repeat Request Protocol (ARQ) together with the Reed-Solomon FEC scheme that was defined for ADSL at the time. *Id.*, Abstract. BI-089 explains that in a communication protocol with FEC and ARQ, frames that have more errors than can be corrected using FEC are retransmitted. *Id.* § 2.

Comparing ARQ and interleaving as approaches for improving performance of FEC over a bursty channel, BI-089 explains that “retransmitting a FEC frame corrupted by burst errors [i.e., ARQ] is preferable over spreading the errors across several adjacent frames and trying to correct them [i.e., interleaving].” *Id.* § 5. Due to the advantages of ARQ, BI-089 proposes using ARQ instead of interleaving in ADSL. *Id.* (“It is proposed that, when ARQ is applied, interleaving be reduced or eliminated thereby freeing memory resources for ARQ as well as to reduce or eliminate the interleaver delay so as to compensate for the delay introduced by ARQ.”). Thus, according to BI-089, “the use of ARQ should reduce or eliminate the need for interleaving,” and “the memory and delay associated with interleaving can be reapplied to ARQ.” *Id.* BI-089 concludes that “ARQ can mitigate the need for interleaving thereby allowing the memory and delay associated with interleaving to be reapplied to support ARQ.” *Id.* § 6.

3. *Mazzoni*

Mazzoni describes VDSL transceivers having a memory that can be shared between interleaving and deinterleaving processes. Ex. 1006 ¶¶ 1, 10. The memory's minimum size "is fixed as a function of the maximum bit rate of [a group of predetermined bit rates] (for example, the highest asymmetrical bit rate in the case of a VDSL system)." *Id.* ¶ 10. The memory has spaces assigned to the interleaving means and deinterleaving means, the sizes of which are based on the bit rates that are actually processed. *Id.*

Mazzoni describes two transceivers—operator terminal TO and user terminal TU—each of which has a channel coding unit in a send system and a channel decoding unit in a receive system. *Id.* ¶¶ 39–40. The channel coding unit uses Reed-Solomon coding associated with interleaving. *Id.* ¶ 41. Mazzoni teaches that "parameters I, M, I' and M' . . . define the sizes of the respective memory spaces assigned to the interleaving means and to the deinterleaving means" in each transceiver. *Id.* ¶ 49.

4. *G.993.1*

G.993.1 (VDSL1), published in 2004, provides requirements for VDSL transceivers. Ex. 1007 § 1. G.993.1 specifies the use of Reed-Solomon coding "to provide protection against random and burst errors" and interleaving "to protect the data against bursts of errors by spreading the errors over a number of Reed-Solomon codewords." *Id.* §§ 8.3, 8.4.1.

G.993.1 describes an initialization procedure to allow the VTU-O and VTU-R to exchange parameters such as RS settings and interleaver parameters. *Id.* § 12.4.1. During this phase, the VTU-R sends a message called R-MSG2, which transfers, among other things, the RS capabilities of the VTU-R, the interleaver settings supported by the VTU-R, and the

“maximal interleaver memory.” *Id.* §§ 12.4.6.1, 12.4.6.3.1.1, Fig. 12-7. After receiving the R-MSG2, the VTU-O sends a message called O-MSG2, which transfers, among other things, the RS capabilities of the VTU-O, the interleaver settings supported by the VTU-O, and the “maximum interleaver delay.” *Id.* §§ 12.4.6.1, 12.4.6.2.1.1, Fig. 12-7. After receiving the O-MSG2, the VTU-R sends a message called R-CONTRACT1, which contains a proposed downstream contract specifying, among other things, the bit rate for the slow channel, the Reed-Solomon settings for the slow channel, and the interleaver settings (i.e., the interleaver depths and block length). *Id.* § 12.4.6.3.1.2. The VTU-O responds with a message called O-CONTRACTn, which contains a proposed upstream and downstream contract specifying, among other things, the Reed-Solomon settings for the slow channel, and the interleaver settings (i.e., the interleaver depths and block length). *Id.* § 12.4.6.2.1.2.

E. Asserted Obviousness over G.993.2 and BI-089

Petitioner contends that claims 1, 2, 9–11, 17–19, and 25 of the ’411 patent are unpatentable under 35 U.S.C. § 103 as obvious over the combination of G.993.2 and BI-089. Pet. 27–46. Patent Owner opposes. Prelim. Resp. 36–50. For the reasons discussed below, we conclude that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that the challenged claims are unpatentable on this asserted ground.

1. Summary of Petitioner’s Arguments

We begin with Petitioner’s arguments regarding independent claim 1. The preamble of claim 1 recites “[a] method of packet retransmission.” Ex. 1001, 23:31. Petitioner contends that, to the extent this preamble is limiting, BI-089 teaches a transmitting transceiver that retransmits a frame

(i.e., a packet) to a receiving transceiver if the receiving transceiver determines that the frame contains more errors than it could correct with FEC. Pet. 33 (citing Ex. 1005 § 2; Ex. 1003 ¶ 328).

Limitation 1[a] recites “transmitting or receiving, using a transceiver, a plurality of packets.” Ex. 1001, 23:32–33. For this limitation, Petitioner cites VTU-O and VTU-R in G.993.2 as transceivers capable of transmitting and receiving packets. Pet. 33–34 (citing, e.g., Ex. 1004 § 8.3, Fig. 5-4, Annex K; Ex. 1003 ¶¶ 332–336).

Limitation 1[b] recites “identifying at least one packet of the plurality of packets as a packet that should be retransmitted.” Ex. 1001, 23:34–35. Petitioner relies on BI-089 for teaching this limitation. Pet. 35. Specifically, Petitioner asserts that BI-089 teaches that when a cyclic redundancy check (CRC) determines that a frame includes more than the maximum number of errors that the FEC algorithm is designed to correct, the receiving station sends a negative acknowledgement frame to the transmitting station indicating that the frame should be retransmitted. *Id.* (citing Ex. 1005 § 2).

The remaining limitations require, among other things, “allocating a memory between a retransmission function and an interleaving and/or deinterleaving function” (limitation 1[c]) and transmitting or receiving a message during initialization indicating how the memory is to be allocated between those two functions (limitations 1[d] and 1[e]). Ex. 1001, 23:36–45. For these limitations involving both a retransmission function and an interleaving/deinterleaving function, Petitioner relies on a combination of G.993.2 and BI-089 and argues that a person of ordinary skill in the art would have been motivated to combine the references in a particular manner to achieve the claimed invention. Pet. 27–33, 35–38.

First, Petitioner contends that a person of ordinary skill in the art would have been motivated to incorporate ARQ retransmission techniques, such as those disclosed in BI-089, into G.993.2 “as an additional tool that transceivers could use to combat impulse noise.” *Id.* at 27 (citing Ex. 1002 ¶ 297). Petitioner begins by pointing out that G.993.2 discloses using Reed-Solomon FEC coding in VDSL2 systems to protect against random and burst errors. *Id.* at 28 (citing Ex. 1004 § 9.3). G.993.2 also discloses using interleaving with Reed-Solomon FEC coding “to protect the data against bursts of errors by spreading the errors over a number of Reed-Solomon codewords.” *Id.* (emphasis omitted) (quoting Ex. 1004 § 9.4). Thus, according to Petitioner, a person of ordinary skill in the art would have understood error bursts to have been a significant concern in VDSL2. *Id.* (citing Ex. 1002 ¶ 302).

Petitioner then asserts that BI-089 teaches that impulse noise causes burst errors in ADSL. *Id.* (citing Ex. 1005 § 3). Petitioner also asserts that BI-089 teaches that “ARQ and interleaving are two common approaches to improving performance over a bursty channel.” *Id.* (quoting Ex. 1005 § 5). In comparing the two approaches, Petitioner contends that “BI-089 teaches that ‘retransmitting a FEC frame corrupted by burst errors is preferable over spreading the errors across several adjacent frames and trying to correct them,’ as interleaving does.” *Id.* at 29 (quoting Ex. 1005 § 5). Thus, BI-089 provides that, “relative to interleaving, ‘[f]rom the information theoretic point of view, ARQ is the preferred method of burst error correction because of its ability to preserve and exploit the information in the noise correlation.’” *Id.* (quoting Ex. 1005 § 5). Therefore, Petitioner contends, “BI-089 proposes to add ARQ to ADSL because ‘ARQ is a natural and convenient method to fight the impulse noise.’” *Id.* (quoting Ex. 1005 § 3).

Petitioner further contends that a person of ordinary skill in the art would have understood that “ARQ is superior to interleaving in the presence of burst errors” and would have recognized that the rationale in BI-089, described in the context of ADSL, also would apply to VDSL. *Id.* (citing Ex. 1003 ¶¶ 306–307; Ex. 1005 § 5). Thus, Petitioner contends, a person of ordinary skill in the art would have been motivated, based on BI-089, to include ARQ in G.993.2 to improve the performance of G.993.2 transceivers in the presence of burst errors. *Id.* at 30 (citing Ex. 1003 ¶ 308).

When including ARQ in G.993.2, Petitioner contends that a person of ordinary skill in the art would have added ARQ to the G.993.2 suite of tools to provide as much flexibility as possible and as many tools as possible to combat impulse noise. *Id.* at 30 (citing Ex. 1003 ¶ 311). According to Petitioner, a person of ordinary skill in the art would have recognized that, for some connections and some kinds of services, ARQ could be used instead of interleaving to provide better impulse noise immunity. *Id.* at 27 (citing Ex. 1003 ¶ 297). “Because it was known in the art that ARQ introduces ‘delay jitter,’ which some types of services cannot tolerate,” Petitioner contends that a person of ordinary skill in the art “would have added ARQ to G.993.2 as an additional technique, but not as a wholesale replacement for interleaving.” *Id.* (citing Ex. 1003 ¶ 297).

Next, turning to the issue of memory allocation, Petitioner contends that a person of ordinary skill in the art would have known that memory was an expensive resource. *Id.* at 30 (citing Ex. 1003 ¶ 313). In view of BI-089’s disclosure that when ARQ is used, the amount of interleaving can be reduced or eliminated and “the memory and delay associated with interleaving can be reapplied to ARQ,” Petitioner contends that a person of ordinary skill in the art adding ARQ to G.993.2 would have reapplied the

memory and delay associated with interleaving to ARQ. *Id.* (citing Ex. 1003 ¶ 314; Ex. 1005 § 5).

Petitioner then points to G.993.2's disclosure that the VTU-R transceiver can use a shared interleaver memory for its interleaving of upstream data and its deinterleaving of downstream data. *Id.* at 31 (citing Ex. 1004 § 12.3.5.2.1.3). Petitioner explains that, during initialization, the VTU-O transceiver "sends the O-PMS message to the VTU-R, and the O-PMS message 'specifies the portion of shared interleaver memory that that VTU-R can use to de-interleave the downstream data stream.'" *Id.* (quoting Ex. 1004 § 12.3.5.2.1.3). Petitioner contends that a person of ordinary skill in the art would have recognized that the O-PMS message also specifies the portion of the shared interleaver memory that is "left over." *Id.* (citing Ex. 1003 ¶ 316). Accordingly, Petitioner contends, a person of ordinary skill in the art "would have understood that (a) the portion of shared interleaver memory that the VTU-R can use to de-interleave the downstream data stream and/or (b) the leftover portion of the shared interleaver memory, both of which are conveyed by O-PMS, could be reapplied to ARQ as taught by BI-089." *Id.* (citing Ex. 1003 ¶ 317).

Petitioner then argues that a person of ordinary skill in the art "would have been motivated to add a field to the O-PMS message to allow the VTU-O to instruct the VTU-R whether it should use ARQ or interleaving in one or both directions of transmission." *Id.* (citing Ex. 1003 ¶ 318). Petitioner asserts that this modified message "would indicate to the VTU-R whether the connection will use (a) interleaving in both directions, (b) interleaving downstream and ARQ upstream, (c) ARQ downstream and interleaving upstream, or (d) ARQ in both directions." *Id.* at 31–32 (citing Ex. 1003 ¶ 318). Petitioner contends that a person of ordinary skill in the art

would have wanted the VTU-O to have the flexibility to choose to use ARQ or not in each direction because some services can tolerate the delay jitter of ARQ while others cannot. *Id.* at 32 (citing Ex. 1003 ¶ 318).

Petitioner further contends that, when the modified O-PMS message indicates using ARQ in one direction and interleaving in the other direction (i.e., option (b) or (c)), “the O-PMS message would instruct the VTU-R to allocate its shared interleaver memory between a retransmission function and an interleaving and/or deinterleaving function,” satisfying limitation 1[e], “and the VTU-R would allocate the memory between the functions as specified in the O-PMS message,” satisfying limitation 1[c]. *Id.* at 35–36 (citing Ex. 1003 ¶ 349); *id.* at 36–37 (citing Ex. 1003 ¶ 360).

Petitioner argues it would have been straightforward for a person of ordinary skill in the art to add ARQ to G.993.2 because G.993.2 specifies a retransmission protocol (the “RQ” protocol) that can be used during some phases of initialization to allow the receiving VTU to request retransmission of an incorrectly received or missing message. *Id.* at 32 (citing Ex. 1003 ¶ 321; Ex. 1004 §§ 12.3.3.1, 12.3.4.1); *see id.* at 17 (citing Ex. 1003 ¶ 217; Ex. 1004 §§ 12.3.3.1, 12.3.4.1). In Petitioner’s view, a person of ordinary skill in the art would have found it simple to add the RQ protocol to G.993.2 for use during Showtime and would have had a reasonable expectation of success in doing so. *Id.* at 32 (citing Ex. 1003 ¶ 321). Furthermore, Petitioner argues that adding ARQ to G.993.2 “would merely have combined known methods that, in combination, would perform the same functions as they would perform separately.” *Id.* (citing Ex. 1003 ¶ 323). Moreover, Petitioner argues, allowing G.993.2 transceivers to use ARQ instead of interleaving in one or both transmission directions “would simply substitute one known method—ARQ—for another known method—

interleaving, which is exactly what BI-089 suggests doing.” *Id.* (citing Ex. 1003 ¶ 324).

2. Analysis

Patent Owner argues, among other things, that the proposed combination does not teach allocating a memory between a retransmission function and an interleaving/deinterleaving function or a message for allocating such memory and that Petitioner does not show that a person of ordinary skill in the art would have been motivated to combine the references. Prelim. Resp. 40–46. We agree with Patent Owner for at least the following reasons.

First, claim 1 requires a memory allocated between a retransmission function and an interleaving/deinterleaving function. We agree with Patent Owner that neither G.993.2 nor BI-089⁸ teaches allocating a memory between a retransmission function and interleaving/deinterleaving functions. *See* Prelim. Resp. 41–42. As Petitioner acknowledges, G.993.2 uses

⁸ Petitioner asserts that BI-089, a contribution to a meeting of an ITU-T study group, is prior art to the ’411 patent because it “was made available at least by October 23, 2000 according to the operating rules of the ITU group.” Pet. 18 (citing Ex. 1005, 1; Ex. 1003 ¶ 263; Ex. 1053 ¶ 49). A reference qualifies as a publicly accessible printed publication if it was “disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, [could] locate it.” *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 772 (Fed. Cir. 2018) (citations omitted). In view of the Petition’s brief statement on the matter, we have some concerns as to whether Petitioner has made a sufficient showing that BI-089 was publicly accessible. *See* Pet. 18; *see also* Prelim. Resp. 46 (arguing that Petitioner fails to explain how a person of ordinary skill in the art could have located BI-089). Nevertheless, we need not address the issue fully because we determine Petitioner’s showing regarding unpatentability is insufficient for other reasons.

interleaving together with FEC to protect against error bursts. *See* Pet. 28; Ex. 1004 § 9.4. The only memory in G.993.2 that Petitioner identifies is a shared interleaver memory, e.g., the memory in the VTU-R shared between interleaving of upstream data and deinterleaving of downstream data. *See* Pet. 31 (citing Ex. 1004 § 12.3.5.2.1.3). In G.993.2, this memory is allocated between interleaving and deinterleaving during initialization when the VTU-O sends the O-PMS message to the VTU-R. *See id.* (citing Ex. 1004 § 12.3.5.2.1.3). G.993.2 does not disclose allocating this memory between retransmission and interleaving or deinterleaving functions. *See* Ex. 1004 § 12.3.5.2.1.3.

BI-089 also does not teach a memory allocated between retransmission and interleaving/deinterleaving functions. BI-089 is a proposal to use retransmission (i.e., ARQ) in place of interleaving, together with the Reed-Solomon FEC scheme, in the ADSL standard. Ex. 1005, Abstract, § 1. BI-089 states that “when ARQ is applied, interleaving [can] be reduced or eliminated,” but the main thrust of BI-089’s proposal is to eliminate interleaving and replace it with ARQ. *Id.* § 5 (explaining that ARQ is the “preferred method of burst error correction”); *id.* § 6 (“ARQ can mitigate the need for interleaving thereby allowing the memory . . . associated with interleaving to be reapplied to support ARQ.”). BI-089 submits that when ARQ is used instead of interleaving as proposed, the memory resources associated with interleaving will be freed and can be reapplied to support ARQ. *Id.* §§ 1, 5, 6. Even if BI-089 could be understood as reducing, not eliminating, the use of interleaving so that both retransmission and interleaving are used in an ADSL system, Petitioner does not identify, nor do we see, any teaching in BI-089 of allocating a memory

between retransmission and interleaving/deinterleaving functions. *See* Prelim. Resp. 42.

Second, we agree with Patent Owner that Petitioner has not shown with sufficient evidentiary support that a person of ordinary skill in the art would have combined the teachings of G.993.2 and BI-089 in the manner asserted. *See* Prelim. Resp. 42–45. Although BI-089 teaches or suggests replacing interleaving with ARQ in ADSL, Petitioner argues that a person of ordinary skill in the art would have added ARQ to G.993.2 as an additional tool or technique, not as a replacement for interleaving. *See* Pet. 27 (citing Ex. 1003 ¶ 297); *id.* at 30 (citing Ex. 1003 ¶ 311). Petitioner further argues that a person of ordinary skill in the art would have wanted the VTU-O transceiver in G.993.2 to be able to choose whether to use ARQ or interleaving in one or both transmission directions. *Id.* at 27 (citing Ex. 1003 ¶ 297); *id.* at 31–32 (citing Ex. 1003 ¶ 318). Petitioner contends that such “flexibility” would have been desirable because it was known in the art that ARQ introduces delay jitter, which some services can tolerate but others cannot. *Id.* at 27–28 (citing Ex. 1003 ¶ 297); *id.* at 32 (citing Ex. 1003 ¶ 318).

For all of these arguments, Petitioner cites only the testimony of its declarant, Dr. Jacobsen. *Id.* at 27–28, 31–32. Dr. Jacobsen, however, does not support her statements with any evidence, such as citation to a reference that explains delay jitter, and therefore we give her testimony little weight on this point. *See* 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”). On the record before us, particularly in view of BI-089’s teaching or suggestion of replacing interleaving with ARQ, Petitioner has not made a sufficient showing that a person of ordinary skill in

the art would have modified G.993.2 to include both retransmission and interleaving in a suite of tools and would have designed a system in which the transceiver chooses whether to use retransmission or interleaving in each direction.

Finally, even if Petitioner could overcome the deficiencies already identified to show that a person of ordinary skill in the art would have had reason to combine the teachings of G.993.2 and BI-089 to include both retransmission and interleaving techniques, Petitioner has not shown sufficiently that a person of ordinary skill in the art would have modified the O-PMS message as proposed to indicate how to allocate memory between a retransmission function and an interleaving/deinterleaving function. Relying again only on Dr. Jacobsen's testimony, which is unsupported by citation to any evidence of record, Petitioner argues that a person of ordinary skill in the art would have been motivated to add a field to the O-PMS message in G.993.2 to specify whether ARQ should be used in both directions, interleaving should be used in both directions, or ARQ should be used in one direction (upstream or downstream) and interleaving should be used in the other direction. Pet. 31–32 (citing Ex. 1003 ¶ 318). But the Petition and the cited paragraph of Dr. Jacobsen's testimony do not provide sufficient explanation or evidentiary support for why a person of ordinary skill would have considered modifying the format of a standardized message to include an additional field that the asserted references do not disclose. *See id.*; Ex. 1003 ¶ 318. Nor do the Petition and cited paragraphs of Dr. Jacobsen's testimony explain sufficiently how the modified O-PMS message would instruct the VTU-R to allocate a memory between a retransmission function and an interleaving or deinterleaving function. *See* Pet. 35–37; Ex. 1003 ¶¶ 349, 360.

For at least these reasons, and based on the record before us, we agree with Patent Owner that the Petition fails to show that a person of ordinary skill in the art would have combined the teachings of G.993.2 and BI-089 in the manner asserted to achieve the invention recited in claim 1. *See* Prelim. Resp. 2, 42–43. Accordingly, based on the present record, we determine that the information presented does not show a reasonable likelihood that Petitioner would prevail in establishing that independent claim 1 is unpatentable as obvious over the combined teachings of G.993.2 and BI-089.

Independent claims 10 and 18 each are directed to a transceiver and recite limitations similar to those in claim 1, including limitations 1[c]-1[e]. *See* Ex. 1001, 24:1–14; 24:33–46. Petitioner relies on substantially the same arguments as those presented for claim 1. Pet. 38–44. The remaining challenged claims depend from one of the independent claims. Accordingly, for the same reasons discussed with respect to claim 1, we determine that the information presented does not show a reasonable likelihood that Petitioner would prevail in establishing that claims 2, 9–11, 17–19, and 25 are unpatentable as obvious over the combined teachings of G.993.2 and BI-089.

F. Asserted Obviousness over Mazzoni, G.993.1, and BI-089

Petitioner contends that claims 1, 2, 9–11, 17–19, and 25 of the '411 patent are unpatentable under 35 U.S.C. § 103 as obvious over the combination of Mazzoni, G.993.1, and BI-089. Pet. 46–64. Patent Owner opposes. Prelim. Resp. 50–57. For the reasons discussed below, we conclude that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that the challenged claims are unpatentable over Mazzoni, G.993.1, and BI-089.

In this asserted ground, Petitioner first proposes combining the VDSL transceivers described in Mazzoni with aspects of the G.993.1 VDSL1 specification. Pet. 46–48. Petitioner contends that Mazzoni describes a transceiver sharing memory between interleaving and deinterleaving functions. *Id.* at 47–48 (citing Ex. 1006 ¶¶ 7, 8, 70). Mazzoni does not describe an initialization procedure for its VDSL transceivers, but Petitioner contends that a person of ordinary skill in the art would have understood that Mazzoni’s transceivers would need to undergo an initialization procedure before transferring data to set parameters such as timing and power levels. *Id.* at 47 (citing Ex. 1003 ¶ 453). Petitioner contends that a person of ordinary skill in the art would have sought out an initialization procedure such as the one in G.993.1 and incorporated it into Mazzoni’s receivers. *Id.* at 47–48 (citing Ex. 1003 ¶¶ 453, 459, 462, 463, 471). Further, Petitioner contends that a person of ordinary skill in the art would have modified the O-CONTRACTn message in G.993.1’s initialization procedure to specify with the Contract descriptor the amount of the shared memory that Mazzoni’s TU receiver should use for deinterleaving of downstream communications and interleaving of upstream communications. *Id.* at 48 (citing Ex. 1003 ¶ 491).

Petitioner then argues that a person of ordinary skill in the art would have been motivated to incorporate the ARQ techniques disclosed in BI-089 into the Mazzoni/G.993.1 VDSL transceivers as an additional that transceivers could use to combat impulse noise. *Id.* (citing Ex. 1003 ¶ 473). The remainder of Petitioner’s analysis is similar to that for the obviousness ground based on G.993.2 and BI-089, with the Mazzoni/G.993.1 combination taking the place of G.993.2. *See* Pet. 48–52 (motivation to combine); *id.* at 52–55 (analysis of claim 1). For example, in this proposed

combination, Petitioner contends that a person of ordinary skill in the art would have modified the O-CONTRACTn message in G.993.1 in a similar manner as the O-PMS message in G.993.2 discussed above. *Id.* at 51 (citing Ex. 1003 ¶ 493).

Patent Owner argues, among other things, that the proposed combination does not teach allocating a memory between a retransmission function and an interleaving/deinterleaving function or a message for allocating such memory and that Petitioner does not show that a person of ordinary skill in the art would have been motivated to combine the references. Prelim. Resp. 50–57. We agree with Patent Owner for substantially the same reasons discussed with respect to the asserted ground based on G.993.2 and BI-089. Accordingly, we determine that the information presented does not show a reasonable likelihood that Petitioner would prevail in establishing that claims 1, 2, 9–11, 17–19, and 25 are unpatentable as obvious over the combined teachings of Mazzoni, G.993.1, and BI-089.

IV. CONCLUSION

After considering the parties' evidence and arguments, we determine that the information presented does not show a reasonable likelihood that Petitioner would prevail in establishing that at least one of claims 1, 2, 9–11, 17–19, and 25 of the '411 patent is unpatentable based on any ground asserted in the Petition.

V. ORDER

Accordingly, it is

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

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