Filed on behalf of TQ Delta, LLC
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC. and ARRIS GROUP, INC.,
Petitioners,

v.

TQ DELTA, LLC
Patent Owner

Case No. IPR2016-01007[1]
Patent No. 8,432,956

PATENT OWNER'S NOTICE OF APPEAL

[1] ARRIS Group, Inc., who filed a Petition in IPR2017-00422, has been joined in this proceeding.

Pursuant to 35 U.S.C. §§ 141, 142, and 319, 37 C.F.R. §§ 90.2, 90.3, and 104.2, and Rule 4(a) of the Federal Rules of Appellate Procedure, Patent Owner TQ Delta, LLC ("Patent Owner") hereby appeals to the United States Court of Appeals for the Federal Circuit from the Decision Denying Patent Owner's Request for Rehearing (Paper 40) entered by the Patent Trial and Appeal Board on March 28, 2018 and the Final Written Decision (Paper 38) entered by the Patent Trial and Appeal Board on October 27, 2017, and all rulings leading up to those decisions.

In particular, and in accordance with 37 C.F.R. § 90.2(a)(3)(ii), Patent Owner identifies at least the following issues on appeal:

- The Board's finding that Claims 1-10 of U.S. Patent No. 8,432,956 are unpatentable as obvious over Milbrandt, Hwang, and ANSI TI.413; and
- The Board's claim construction; and
- Any Board finding, determination, judgment, or order supporting or related to the aforementioned issues as well as all other issues decided adversely to Patent Owner in any orders, decisions, ruling, and opinions.

Patent Owner is concurrently filing a copy of this Notice of Appeal with the Director of the United States Patent and Trademark Office and the Patent Trial and Appeal Board, and a copy of the same, along with the required fees, with the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

Dated: May 7, 2018

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CERTIFICATE OF FILING

The undersigned hereby certifies that, in addition to being electronically filed through PTAB E2E, a true and correct copy of the above-captioned **NOTICE OF APPEAL** is being filed by hand with the Director on May 7, 2018, at the following address:

Director of the U.S. Patent & Trademark Office
c/o Office of the General Counsel, 10B20
Madison Building East
600 Dulany Street
Alexandria, VA 22314

The undersigned also hereby certifies that a true and correct copy of the above-captioned **NOTICE OF APPEAL** and the filing fee is being filed via CM/ECF with the Clerk's Office of the United States Court of Appeals for the Federal Circuit on May 7, 2018.

Dated: May 7, 2018

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing **NOTICE OF APPEAL** was served electronically via email on May 7, 2018 in its entirety on the following:

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Paper No. 38
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC. and ARRIS GROUP, INC.,
Petitioner,

v.

TQ DELTA, LLC,
Patent Owner.

Case IPR2016-01007[1]
Patent 8,432,956 B2

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

JEFFERSON, *Administrative Patent Judge*.

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

[1] ARRIS Group, Inc., who filed a Petition in IPR2017-00422, has been joined in this proceeding.

I. INTRODUCTION

On November 4, 2016, we instituted *inter partes* review based upon the ground asserted in the Petition (Paper 2, "Pet.") by Cisco Systems, Inc. ("Petitioner"), challenging claims 1–10 of U.S. Patent No. 8,432,956 B2 (Ex. 1001, "the '956 patent") and a Preliminary Response to the Petition (Paper 7, "Prelim. Resp.") filed by TQ Delta, LLC ("Patent Owner"). Decision to Institute (Paper 8, "Dec."). We instituted *inter partes* review on the ground that claims 1–10 of the '956 patent are unpatentable under 35 U.S.C. § 103(a) over Milbrandt,[2] Hwang,[3] and ANSI T1.413.[4] Dec. 22–23; *see* Pet. 7–8 (setting forth grounds).

Following institution, Patent Owner filed a Patent Owner's Response (Paper 13, "PO Resp.") and Petitioner filed a Reply (Paper 16, "Reply). With respect to the Reply, Patent Owner filed a paper listing portions of Petitioner's Reply it deemed beyond the proper scope of a reply. Paper 21. Petitioner filed a response to Patent Owner's listing. Paper 25.

Patent Owner filed an objection to Petitioner's evidence (Paper 18) and a Motion to Exclude (Paper 28, "PO Mot. Exc."), Petitioner filed an Opposition (Paper 32, "Pet. Opp. Exc."), and Patent Owner filed a Reply (Paper 35, "PO Reply Exc."). Patent Owner also filed a Motion for

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[2] U.S. Patent No. 6,636,603 B1; issued Oct. 21, 2003 (Ex. 1011) ("Milbrandt").
[3] U.S. Patent No. 6,590,893 B1; issued July 8, 2003 (Ex. 1013) ("Hwang").
[4] AMERICAN NATIONAL STANDARDS INSTITUTE, *Network and Customer Installation Interfaces – Asymmetric Digital Subscriber Line (ADSL) Metallic Interface*, 1–186 (1995) (ANSI T1.413-1995) (Ex. 1014) ("ANSI T1.413").

Observation (Paper 30) to which Petitioner filed a Response (Paper 33). We held a consolidated hearing on August 3, 2017, for this case and related cases, and a transcript of the hearing is included in the record. Paper 37 ("Tr.").

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. Related Proceedings

The parties state that the '956 patent has been asserted in *TQ Delta LLC v. Comcast Cable Commc'ns LLC*, Case No. 1:15-cv-00611-RGA (D. Del); *TQ Delta LLC v. Coxcom LLC et al*., Case No. 1:15-cv-00612-RGA (D. Del.); *TQ Delta LLC v. DirecTV LLC*, Case No. 1:15-cv-00613-RGA (D. Del.); *TQ Delta LLC v. DISH Network Corp. et al*., Case No. 1:15-cv-00614-RGA (D. Del.); *TQ Delta LLC v. Time Warner Cable Inc*., *et al.*, Case No. 1:15-cv-00615-RGA (D. Del.); *TQ Delta LLC v. Verizon Servs. Corp*., Case No. 1:15-cv-00616-RGA (D. Del.); *TQ Delta LLC v. 2Wire, Inc*., Case No. 13-cv-1835-RGA (D. Del.); *TQ Delta LLC v. Zhone Techs., Inc*., Case No. 13-cv-1836-RGA (D. Del.); *TQ Delta LLC v. ZyXEL Commc'ns, Inc. and ZyXEL Commc'ns Corp*., Case No. 13-cv-02013-RGA (D. Del.); *TQ Delta LLC v. ADTRAN, Inc*., Case No. 1:14-cv-00954-RGA (D. Del.); *ADTRAN, Inc. v. TQ Delta LLC*, 15-cv-00121-RGA (D. Del.); *Arris Group, Inc. v. TQ Delta, LLC*, IPR2016-00428; *Arris Group, Inc. v.*

TQ Delta, LLC, IPR2016-00429; and *Arris Group, Inc. v. TQ Delta, LLC*, IPR2016-00430. Paper 6, 3–4; Pet. 1–2.

B. The '956 Patent (Ex. 1001)

The '956 patent generally describes "exchanging diagnostic and test information between transceivers over a digital subscriber line." Ex. 1001, 1:62–66. A transceiver or modem (remote terminal (RT)) is located at a customer premises downstream from a central office (CO), while a transceiver or modem is also located upstream from the customer premises at the CO. *Id*. at 2:1–5. Figure 1, below, is a functional block diagram of the communication system of the invention.

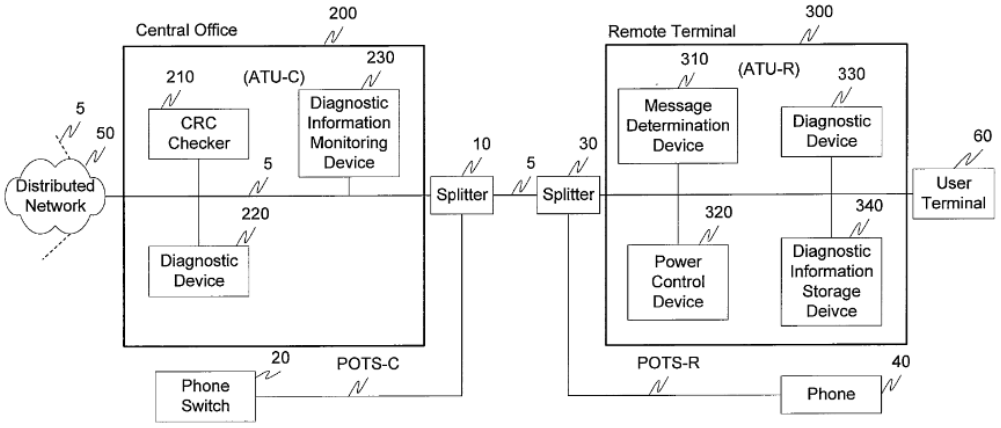

Fig. 1

Figure 1, reproduced above, shows modem components associated with the diagnostic link mode, that comprise central office (CO) modem 200 and remote terminal (RT) modem 300, both connected via link 5 to splitter 10 to phone switch 20 and splitter 30 to phone 40. *Id*. at 4:61–5:7. CO modem 200 includes CRC checker 210, diagnostic device 220, and diagnostic information monitoring device 230. *Id*. The RT modem 300 includes

message determination device 310, power control device 320, diagnostic device 330 and diagnostic information storage device 340. *Id.*

"In the diagnostic link mode, the RT modem sends diagnostic and test information in the form of a collection of information bits to the CO modem." *Id*. at 3:50–52. In one method, system diagnostic and test information are exchanged using multiple carriers with a higher order quadrature amplitude modulation (QAM) with more than 1 bit per carrier. *Id*. at 3:56–59.

C. Illustrative Claims

Claims 1, 3, 5, 7, and 9 of the '956 patent are independent. Claims 1, 5, and 9 are illustrative and reproduced below (Ex. 1001, 8:47–58, 9:8–18, 10:3–28):

> 1. A transceiver capable of transmitting diagnostic information over a communication channel using multicarrier modulation comprising:
>
> a transmitter portion capable of transmitting a message, wherein the message comprises one or more data variables that represent the diagnostic information, wherein bits in the message are modulated onto DMT symbols using Quadrature Amplitude Modulation (QAM) with more than 1 bit per subchannel and wherein at least one data variable of the one or more data variables comprises an array representing power level per subchannel information.
>
> 5. In a transceiver capable of transmitting diagnostic information over a communication channel using multicarrier modulation, a method comprising:
>
> transmitting a message, wherein the message comprises one or more data variables that represent the diagnostic information, wherein bits in the message are

modulated onto DMT symbols using Quadrature Amplitude Modulation (QAM) with more than 1 bit per subchannel and wherein at least one data variable of the one or more data variables comprises an array representing power level per subchannel information.

9. A communications system for DSL service comprising a first DSL transceiver capable of transmitting diagnostic information over a communication channel using multicarrier modulation and a second DSL transceiver capable of receiving the diagnostic information over the communication channel using multicarrier modulation comprising:

a transmitter portion of the first transceiver capable of transmitting a message, wherein the message comprises one or more data variables that represent the diagnostic information, wherein bits in the message are modulated onto DMT symbols using Quadrature Amplitude Modulation (QAM) with more than 1 bit per subchannel and wherein at least one data variable of the one or more data variables comprises an array representing Signal to Noise ratio per subchannel during Showtime information; and

a receiver portion of the second transceiver capable of receiving the message, wherein the message comprises the one or more data variables that represent the diagnostic information, wherein the bits in the message were modulated onto the DMT symbols using Quadrature Amplitude Modulation (QAM) with more than 1 bit per subchannel and wherein the at least one data variable of the one or more data variables comprises the array representing Signal to Noise ratio per subchannel during Showtime information.

II. ANALYSIS

A. Claim Interpretation

We interpret claims of an unexpired patent using the broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard as the claim construction standard to be applied in an *inter partes* review proceeding). Under the broadest reasonable interpretation standard, claim terms are generally 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. "during Showtime" (claims 9 and 10)

Our Decision on Institution construed "during Showtime" to include "during normal communications of an ANSI T1.413-compliant device." Dec. 7. Petitioner asserts that "during Showtime" as recited in claims 9 and 10 is described in the '956 patent specification by example as "e.g. the normal steady state transmission mode, or the like." Pet. 9 (citing Ex. 1001, 3:37–38). Petitioner contends that "showtime" is a term of art in DSL communication standards. Pet. 9 (citing Declaration of Dr. Sayfe Kiaei (Ex. 1009, "Kiaei Decl") 19). Petitioner cites extrinsic evidence in support of the contention that "normal communications" is known as "showtime." Pet. 9 (citing Ex. 1019, 379; Ex. 1014, 108).

Patent Owner argues that "during Showtime" should be construed to mean "during normal data communications that occurs after initialization."

PO Resp. 7–8 (citing Declaration of Dr. Douglas Chrissan (Ex. 2001, "Chrissan Decl") ¶ 31). Patent Owner cites the testimony of its declarant to support the contention that "during Showtime" excludes "any modem initialization or modem training." *Id*. at 6 (citing Chrissan Decl. ¶ 31). Further, Patent Owner asserts that the term showtime is used with "many different communication protocols to refer to a state of communications reached after initialization and training." PO Resp. 7 (citing Chrissan Decl. ¶ 31). In addition, Patent Owner argues that Petitioner's declarant, Dr. Kiaei supports the contention that "during Showtime" refers to a mode that follows initialization. PO Resp. 6 (citing Kiaei Decl. ¶ 43).

Petitioner replies that Patent Owner's declarant agrees that "during Showtime" is a term of art specific to DSL technology (Chrissan Deposition, Ex. 1110, 79:12–24), and that Dr. Kiaei acknowledges that this term is applicable to additional communication standards beyond the ANSI standard (Chrissan Decl. ¶ 31; Ex. 1110, 80:2). Reply 10. Accordingly, Petitioner maintains that "during Showtime" should be construed as during normal communications of a device compliant with the ANSI T1.413, ITU-T G.992.1, G.992.2, ADSL2, or VDSL2 communication standards." Reply 10 (citing Declaration of Dr. Sayfe Kiaei in support of Petitioner's Reply, Ex. 1100 ¶12).

The parties agree that "during Showtime" is a term of art that encompasses normal communication, which follows the completion of initialization and handshaking, for known DSL standards and protocols. PO Resp. 6–7; Reply 10; Kiaei Decl. ¶ 43. The parties' arguments are not based on or do not depend on the various DSL standards identified in Petitioner's

proposed construction. There is also no dispute that "during Showtime" is intended to distinguish initialization and training. PO Resp. 7–8; Reply 9; Tr. 21:19–23:11. We are not persuaded by Patent Owner's negative construction, which excludes initialization from normal communication. Accordingly, based on review of the parties' evidence and arguments, we determine that the broadest reasonable interpretation in light of the '956 patent specification for "during Showtime" is "during normal communications of a DSL transceiver."

2. "array" and "transceiver" (claims 1–10)

Our Decision on Institution construed "array" as "an ordered collection of multiple data items of the same type." Dec. 7–8. We also construed "transceiver" as "a device, such as a modem, with a transmitter and receiver." *Id*. at 8. Patent Owner does not contest the constructions for "array" and "transceiver," but instead contends that no construction of these terms is necessary as they are not dispositive for the challenged claims. PO Resp. 8. Based on the parties' contentions we maintain the constructions from the Decision on Institution for the reasons discussed in our Decision. Dec. 7–8.

3. "subchannel" (claims 1–10)

Patent Owner contends that "subchannel" should be construed as a "carrier of a multicarrier communication channel." PO Resp. 9. Patent Owner contends that "the '956 patent claims . . . recite a 'subchannel' in the context of a 'communication channel using multicarrier modulation.'" PO REsp. 8–9 (citing claims of Ex. 1001). Patent Owner argues that the '956 patent specification describes communication between ADSL transceivers

that modulates multiple discrete frequency carriers summed together transmitted over the subscriber loop where "the carriers form discrete non-overlapping communication subchannels of limited bandwidth." PO Resp. 9 (quoting Ex. 1001, 1:44–47). Patent Owner argues that because "[c]ollectively, the carriers form what is effectively a broadband communications channel," the subchannel of the claims refers to "a carrier of a multicarrier communication channel." PO Resp. 9 (quoting Ex. 1001, 1:47–50).

Petitioner argues that Patent Owner's construction of "subchannel" is overly narrow and contradicts the '952 patent specification and the testimony of record. Reply 7. Although the '956 patent states that "carriers form discrete, non-overlapping communication subchannels of limited bandwidth" (Ex. 1001, 1:44–47), it also "use[s] the term 'tone' interchangeably with 'subchannel.'" Reply 8 (citing Ex. 1001, 4:38–40; Ex.1100 ¶¶ 6–8). Petitioner also notes that the proposed construction refers to both "channel" and "carrier," which Patent Owner's declarant admits are equivalent terms in the ADSL context (Ex. 1110, 53:20–54:1).

Petitioner offers testimony that "subchannel" would have been understood to be equivalent to and interchangeable with the terms "'tone,' 'carrier,' 'subcarrier,' 'channel,' 'band,' and 'sub-band.'" Reply 8–9 (citing Ex. 1100 ¶¶ 6–8; *see also* Ex. 1101, 69; Ex. 1102, 3; Ex. 1104, 1:41; Ex. 1105, 1:36; Ex. 1106, 13). Thus, Petitioner argues that a person of ordinary skill in the art after reviewing the patents at issue would have understood that the term subchannel includes a tone, carrier, subcarrier, band, sub-band, sub-frequency, or channel, of a multicarrier frequency spectrum (Ex. 1100

¶ 11) and in context of the '956 patent is properly construed as "a portion of a frequency spectrum used for communication." Reply 9 (quotations omitted).

Although Patent Owner's construction of "subchannels" refers to "a carrier" in a multicarrier channel, Petitioner presents evidence that a "carrier" may be described by other terms understood by a person of ordinary skill in the art. *See* Ex. 1110, 53:17–54:5 (noting equivalence of terms in context); *see* Reply 8; Ex. 1100 ¶ 8; Ex. 1110, 43:13–49:15, 53:20–54:1. Petitioner's proposed construction is overly broad because "a portion of a frequency spectrum used for communication" is not limited to one carrier or channel.

Patent Owner contends that a "subchannel" is "the smallest division of the data transmission in a multicarrier communication system that uses DMT modulation," and gives, as examples, the 256 subchannels of ADSL1, the 512 subchannels of ADSL2+, and the 4096 subchannels of VDSL2. PO Resp. 14 (citing Chrissan Decl. ¶¶ 38; Ex. 1001, 1:42–51). Petitioner, likewise, contends a "subchannel" is "a discrete non-overlapping portion (e.g., one of 256 carriers) of a frequency spectrum . . . that uses DMT/QAM modulation for communication." Reply 14 (emphasis omitted). Both parties, therefore, appear to agree that a "subchannel" is a single carrier, such as one of the 256 carriers in ADSL1; they disagree, however, on how to describe it.

Petitioner's proposed construction is overly broad because "a portion of a frequency spectrum used for communication" is not limited to one carrier. For example, "a portion of a frequency spectrum used for

communication" could encompass the group of carriers used for upstream communication. Patent Owner's proposed construction, in contrast, is limited to a single "carrier." For the sake of clarity, however, we determine explicitly that a "subchannel" is a single carrier within a multicarrier communication system that, by definition, has a plurality of carriers.

Accordingly, we construe "subchannel" to mean "one of a plurality of carriers of a multicarrier communication channel."

B. 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.

C. Level of Skill in the Art

Petitioner states that "the person of ordinary skill in the art is someone knowledgeable concerning multicarrier communications. That person 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 digital telecommunications." Pet. 8 (citing Ex. 1009, 15–16). Petitioner adds, that a "[l]ack of work experience can be remedied by additional education, and vice versa." *Id*.

Patent Owner's declarant, Dr. Chrissan, indicated that "a person of skill in the art would be a person with a bachelor's degree in electrical engineering (or a similar technical degree or equivalent work experience) and at least three years of experience working with such multicarrier communication systems." Chrissan Decl. ¶ 34. We find that the parties proposed levels of skill in the art do not differ in material ways. For purposes of this Decision, we adopt Petitioner's proposed definition. We further find that the level of ordinary skill in the art is also reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

D. Obviousness Based on Milbrandt (Ex. 1011), Hwang (Ex. 1013), and ANSI TI.413 (Ex. 1014)

1. Milbrandt (Ex. 1011)

Milbrandt describes a system and method for determining the transmit power of a communication device operating on digital subscriber lines. Ex. 1011, 1:20–24. An example of the system as illustrated in Figure 1 is reproduced below as follows:

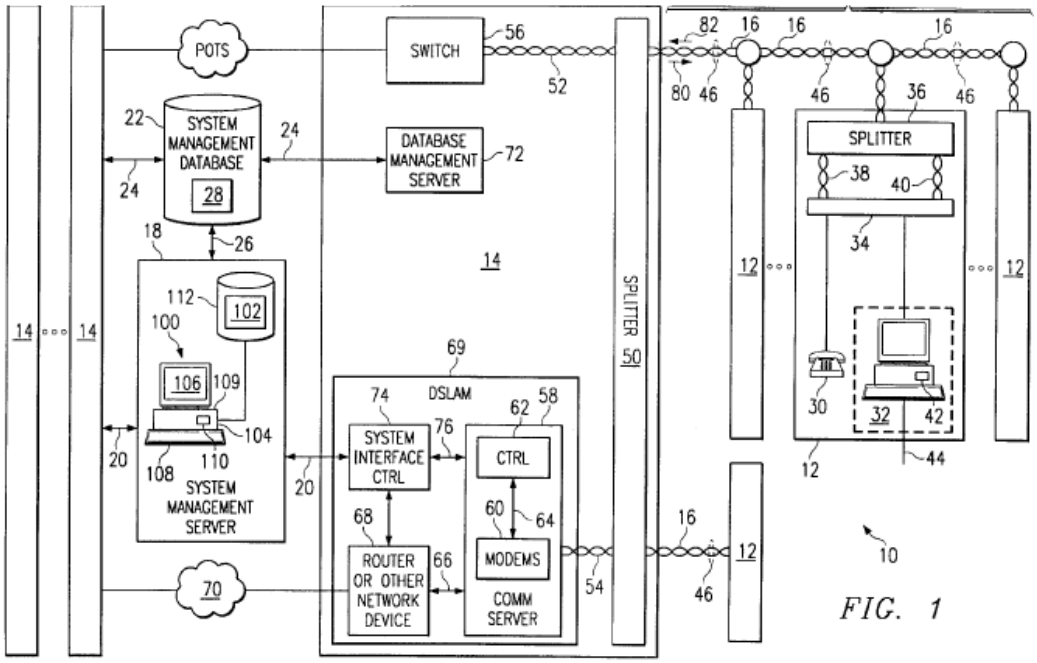

Figure 1, reproduced above, illustrates a block diagram of a communication system that provides telephone and data service to subscribers.

Communication system 10 includes system management server 18 coupled to central offices 14, which are coupled to several subscribers' premises 12 using subscriber lines 16. *Id.* at 4:6–9. Database 22 stores subscriber line information 28 and communication device information 29 defining the physical and operating characteristics of the subscriber lines 16 and communication devices 60. *Id.* at 4:9–15. System management server 18 determines the data rate capacity of selected subscriber lines 16 using subscriber line information 28 stored in database 22, and the optimal transmit power for a communication device operating on a subscriber line 16. *Id.* at 4:15–21.

Modem 42 at subscriber premises 12 receives the data signal communicated by modem 60 and determines the subscriber line information

28, such as attenuation information, noise information, received signal power spectrum density, or any other information describing the physical or operating characteristics of subscriber line 16 at the one or more sub-frequencies over which the connection between modem 60 and 42 is established. *Id.* at 11:38–45. Modem 42 extrapolates subscriber line information 28 to central office 14 over any achievable range of sub-frequencies using any suitable communication protocol. *Id.* at 4:45–53.

2. Hwang (Ex. 1013)

Hwang discloses an adaptive transmission system used in a network. Ex. 1013, 1:6–8. The system includes a computer network including network nodes capable of transmitting and receiving data over a channel using a transmitter and receiver. *Id.* at 5:1–8. The computer network utilizes discrete multi-tone (DMT) technology to transmit data over the channels. *Id.* at 5:12–14. A DMT-based system utilizes 256 tones, where each tone is capable of transmitting up to 15 bits of data on the tone waveform. *Id.* at 5:22–24. Within each carrier, data is encoded using quadrature amplitude modulation (QAM) signals. *Id*. at 3:1–3. Hwang's techniques provide effective high-speed data communications over twisted pair wiring between customer premises and corresponding network-side units, for example located at a central office of a telephone network. *Id*. at 3:15–19. If a channel characteristics are poor and the receiving node is unable to receive the transmitted data without errors, the transmitting node is able to adapt the transmission rate to ensure error-free data is received. *Id.* at 7:3–7.

3. ANSI TI.413 (Ex. 1014)

ANSI T1.413 discloses electrical characteristics of Asymmetric Digital Subscriber Line (ADSL) signals appearing at a network interface. Ex. 1014, Abstract. ADSL allows for the provision of Plain Old Telephone Service (POTS) and a variety of digital channels. *Id*. at 1. Digital channels consist of full duplex low-speed channels and simplex high-speed channels in the direction from the network to the customer premises, and low-speed channels in the opposite direction. *Id*. Among the features of ADSL is the encoding of data into discrete multitone (DMT) symbols. *Id*. at 23–34. Within each DMT subchannel, an ADSL transmitter encodes a variable number of bits of data using a constellation encoder. *Id*. at 43–45.

4. Petitioner's Contentions

Petitioner contends that that claims 1–10 are unpatentable under 35 U.S.C. § 103(a) as obvious over Milbrandt, Hwang, and ANSI T1.413. Pet. 19–50.

Petitioner sets forth evidence and argument that Milbrandt and Hwang teach the preamble of claim 1, which recites "[a] transceiver capable of transmitting diagnostic information over a communication channel using multicarrier modulation." Pet. 19–20. Petitioner argues that "Milbrandt teaches a modem 42 that 'comprises any suitable communication device that transmits and receives data,'" where "[t]he modem 42 has a 'diagnostic mode" that "'measures the received signal power spectrum density' and 'communicates this and other subscriber information 28 to modem 60' 'using data line 40.'" Pet. 19 (quoting Ex. 1011, 4:64–65, 4:64, 11:20–24, 27:26–27). Petitioner further provides supporting evidence and argument

that Milbrandt teaches multicarrier communication using a modem employing DMT technology, which Hwang explains involves N independent quadrature amplitude modulated (QAM) signals carried over distinct carrier frequency channels. Pet. 20 (citing Ex. 1011, 10:58–11:4; Ex. 1013, 2:67–3:3).

With respect to claim 1, Petitioner asserts that Milbrandt teaches "a transmitter portion capable of transmitting a message, wherein the message comprises one or more data variables that represent the diagnostic information." Pet. 21–22. Petitioner provides declarant testimony and citation to the evidence that Milbrandt teaches a modem capable of transmitting a message using DMT, determining subscriber line information, and communicating that information to a central office. *Id*. (citing Ex. 1011, 11:19–24, 12:54, 11:31–43, 11:45–53, 13:12–15; Ex. 1009, 45–46). Petitioner further argues that Milbrandt discloses a modem that "transmits and receives data" using DMT technology and measures the received power spectrum density and other subscriber line information, which are the claimed "diagnostic information." *Id.* at 19–20 (quoting Ex. 1011, 4:64–65; citing Ex. 1011, 5:39–40, 10:58–11:4; Ex. 1009, 39). Petitioner contends that Milbrandt discloses communication using DMT modulation, where "DMT technology divides a subscriber line into individual 'sub-bands or channels,' and 'uses a form of quadrature amplitude modulation (QAM) to transmit data in each channel simultaneously.'" *Id.* at 23 (quoting Ex. 1011, 11:60–64); Ex. 1009, 48. Petitioner argues that Hwang discloses that a "DMT signal is basically the sum of N independently quadrature amplitude modulated (QAM) signals, each carried over a distinct carrier frequency

channel," and the ANSI standard provides for 256 carriers or tones, where "[e]ach tone is QAM to carry up to 15 bits of data on each cycle of the tone waveform (symbol)." Pet. 23 (quoting Ex. 1013, 2:67–3:12). Thus, Petitioner contends that Milbrandt and Hwang teach the claim 1 limitation for "wherein bits in the message are modulated onto DMT symbols using Quadrature Amplitude Modulation (QAM) with more than 1 bit per subchannel" (Pet. 22–24), and that Milbrandt and ANSI T1.413 teach "wherein at least one data variable of the one or more data variables comprises an array representing power level per subchannel information," as recited in claim 1 (*id*. at 24–28). With respect to the "an array representing power level per subchannel information" limitation, Petitioner asserts that "[a] person of ordinary skill in the art would have recognized that a frequency sub-carrier in the ANSI T1.413 standard corresponds to Milbrandt's sub-frequency, and that both of these terms correspond to the claimed 'subchannel.'" Pet. 27–28 (citing Ex. 1009, 55).

For independent claims 3, 5, 7, and 9 and dependent claims 2, 4, 6, 8 and 10, Petitioner provides argument and evidence similar to the presentation related to claim 1, demonstrating that Milbrandt, Hwang, and ANSI T1.413 teach the limitations of the challenged claims. Pet. 28–33 (ind. claim 3), 33–35 (ind. claim 5), 36–38 (ind. claim 7), 38–47 (ind. claim 9); and 48–50 (dep. claims 2, 4, 6, 8, and 10). Specifically, for dependent claims 2, 4, 6, 8, and 10, Petitioner argues that ANSI T1.412 teaches that it was known to determine power spectral density (PSD) based on a measuring a REVERB signal. Pet. 48–50. Thus, ANSI T1.412 in combination with

Milbrandt teaches the "power level per subchannel information is based on a Reverb signal" limitation of dependent claims 2, 4, 6, 8, and 10. *Id*.

Petitioner contends, with supporting evidence, that a "person of ordinary skill in the art would have found it obvious to combine the teachings of Milbrandt and Hwang because Hwang provides additional details of ADSL communication technology" and a person with ordinary skill in the art would "refer to all of their teachings in implementing an ADSL communication system for the purpose of obtaining a more complete understanding." Pet. 113–14. Petitioner argues that a person with ordinary skill in the art would have combined Hwang's teaching of using up to 15 bits for each subchannel with Milbrandt's communication system in order to transmit more data on each subchannel. *Id.* at 14 (citing Ex. 1009, 32). Petitioner also argues that a person would have been motivated to make such a combination in order to achieve a system that is "overall more efficient and has [a] higher throughput." *Id.* (citing Ex. 1009, 32). Accordingly, Petitioner argues that the combination of Hwang's known technique of using up to 15 bits per subchannel to Milbrandt's communication system renders nothing more than the predictable results of, for example, "transmitting data more efficiently, increasing throughput, improving service for customers, and making the system as [a] whole commercially desirable in the marketplace." *Id.* at 14–15 (citing Ex. 1009, 32–33). We are persuaded that a person having ordinary skill in the art would have found it obvious to combine the teachings of Milbrandt and Hwang because we agree that transmitting more data per subchannel would have been recognized by a

person having ordinary skill in the art as resulting in a more efficient system that has higher throughput.

Petitioner also argues that a person with ordinary skill in the art would have found it obvious to combine Milbrandt/Hwang with ANSI T1.413 because Milbrandt/Hwang describe communication systems, and ANSI T1.413 defines the ADSL communication standard applicable to those systems. Pet. 15–19 (citing Ex. 1009, 33–36). Thus, Petitioner argues that both Milbrandt and Hwang refer to the ADSL standard set forth by ANSI T1.413, such that a person with ordinary skill in the art would have been directed to combine the teachings of all three references for several reasons. *Id.* at 15–16 (citing Ex. 1009, 33–34). Petitioner also argues that it would have been advantageous to modify the teachings of Milbrandt and Hwang with the teachings of ANSI T1.413 in order to "improve signal quality and reliability," "adjust its automatic gain control (AGC) to an appropriate level," and "allow for interoperability with other devices that are ANSI T1.413 standard compliant, mak[ing] the overall system more robust." *Id.* at 16–17 (citing Ex. 1009, 34–35). Specifically, Petitioner argues that

> a person of ordinary skill in the art would have recognized that transmitting per-subchannel data as an array, as taught by ANSI T1.413, would advantageously [allow] the receiving modem to receive and access the information on a per sub-channel basis, without the need for additional processing or reordering of the received information.

Id. at 28 (citing Ex. 1009, 55–56).

5. Patent Owner's Response and Petitioner's Reply

Petitioner has established by a preponderance of the evidence that the challenged claims are unpatentable over the cited prior art. 35 U.S.C. § 316(e). Patent Owner's response addresses specific limitations and arguments but waives arguments not raised. *See* 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). We address below those limitations and arguments Patent Owner contests in its Patent Owner's Response and Petitioner's Reply.[5]

Power Level per Subchannel Limitations

Patent Owner contends that the Milbrandt, Hwang, and ANSI T1.413 fail to disclose "an array representing power level per subchannel information" as recited in claim 1 (and in independent claims 3, 5, and 7). PO Resp. 12–13. Patent Owner argues that Petitioner's declarant testimony on this issue is conclusory and not credible and that Milbrandt's "sub-

[5] 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 21. 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 21) 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 (Fed. Cir. 2017) (discussing allegedly improper reply argument and evidence).

frequency" is demonstrably not the same as the "subchannel" in the challenged claims. *Id*. at 13–14. Patent Owner argues that Milbrandt uses the "sub-frequency" to refer to dividing the ADSL spectrum into large bands of frequencies for transmission and uses "sub-channel" to refer to DMT multicarrier units. Ex. 1011, 11:2–9; Chrissan Decl. ¶¶ 40–45. Accordingly, Patent Owner argues that "[b]ecause Milbrandt uses the term 'sub-frequency[']' to refer to the frequency spectrum of communication protocols that are not necessarily multicarrier, V.90 for example, Milbrandt's sub-frequency cannot be the same as the claimed 'subchannel' of a multicarrier communication channel." PO Resp. 16; Ex. 1011, 11:35–36; Chrissan Decl. ¶ 41. In sum, Patent Owner argues that Milbrandt does not refer to sub-frequency in the context of multicarrier communication channels that Patent Owner contends are necessary for subchannels as recited in the claims.

Petitioner replies that Patent Owner errs in reading Milbrandt, which describes "subchannels" as "channels" (Ex.1011, 10:15–65) and equates these "channels" ("subchannels") with "subfrequencies" (Ex. 1011, 11:2–6; Ex. 1100 ¶ 14). Reply 11. Milbrandt teaches that "DMT technology . . . divide[s] the bandwidth . . . into many individual . . . channels." Ex. 1011, 10:58-63. Petitioner notes that Milbrandt states that "[t]he frequency range from 25 kHz to 1.1 Mhz . . . is divided into sub-frequencies. Each sub-frequency is an independent channel and supports transmission of its own stream of data signals." Ex. 1011, 11:2–6; Reply 12–13. Milbrandt also states that "the sub-channels are divided into groups and one group of channels is allocated for the uplink transmission of data and the other for the

downlink transmission of data." Ex-1011, 11:2-10. Petitioner argues that references to the V.90 protocol is an alternative to the ADSL protocol and the use of sub-frequency in the context of the V.90 protocol does not bear on the use of that term with respect to ADSL protocol. Reply 14–15; Ex. 1110, 142:2–5 (stating that xDSL and V.90 are alternate protocols); Ex. 1011, 11:58–64 (discussing alternative communication protocol). Finally, Petitioner argues that contrary to Patent Owner's contentions (PO Resp. 16), Figure 3 of Milbrandt is not limiting, and serves only as an example of subscriber line information (Ex. 1011, 3:51–52). Reply 15.

We find Petitioner's argument and evidence persuasive that Milbrandt teaches that sub-frequencies are equated with channels and subchannels which are equivalent to the "subchannels" recited in the challenged claims. Pet. 24–28; Reply 11 –16; Ex. 1009, 46–55; Ex. 1100 ¶¶ 19–27. We are not persuaded by Patent Owner's argument and evidence that Milbrandt's reference to sub-frequencies for a voice protocol or a subset of sub-frequencies in a chart (Fig. 3) indicates that a person of ordinary skill in the art would have understood that sub-frequency *cannot* be the same as a subchannel. PO Resp. 15–16. The examples cited by Patent Owner do not indicate that the references in Milbrandt equating sub-channels and sub-frequencies with channels exclude using sub-frequency in relation to multicarrier bands. *See* Reply 12–16; Ex. 1011, 11:2–4 (describing sub-frequency as an independent channel supporting data transmission).

Milbrandt states

> ADSL modems 60 increase the amount of data that the conventional twisted-pair subscriber lines 16 can carry by using DMT technology to divide the bandwidth of a subscriber line 16,

> generally referred to as the frequency spectrum supported by a subscriber line 16, into many individual *sub-bands or channels*. *Each channel* of a subscriber line 16 uses a form of quadrature amplitude modulation (QAM) to transmit data in each channel simultaneously. For example, the 1.1 MHz frequency spectrum of a conventional twisted pair subscriber line 16 may be divided such that the lower 4 kHz is reserved for use by POTS and is generally referred to as the voice frequency spectrum. The frequency range from 25 kHz to 1.1 MHz, generally referred to as the data frequency spectrum, is divided into *sub-frequencies*. *Each sub-frequency is an independent channel* and supports transmission of its own stream of data signals. DMT technology is very useful for ADSL technology where the sub-channels are divided into groups and one group *of channels* is allocated for the uplink transmission of data and the other for the downlink transmission of data.

Ex. 1011, 10:58–11:10 (emphasis added). We find that Milbrandt supports Petitioner's argument of Milbrandt's description of downlink transmission as supported by "sub-frequencies" plural, rather than a "sub-frequency" singular, as would be appropriate if Patent Owner were correct. *See*, *e.g.*, *id.* at 12:44–57.

We also are not persuaded by Patent Owner's contention that the six columns 344 of Figure 3 would be understood to correspond to "sub-frequencies associated with the various communication protocols supported by modem 42, rather than subchannels of a multicarrier communication channel (of which there may be hundreds)." PO Resp. 16 (quoting Chrissan Decl. ¶ 44). Neither Patent Owner nor Dr. Chrissan explain why, if that were the case, Figure 3 would depict six columns when ADSL, by Patent Owner's own explanation, should require only two columns—*one* for upstream and *one* for downstream. We are persuaded instead that Figure 3

is merely illustrating an example and that a person of ordinary skill in the art would have understood that, as even Dr. Chrissan acknowledges (Chrissan Decl. ¶ 44 ("a person of skill in the art would not interpret this to mean exactly six columns") (emphasis omitted)).

We are persuaded that Milbrandt uses "sub-frequency" to refer to one carrier and not, as Patent Owner contends, a group of carriers. We are, thus, persuaded that Milbrandt's "sub-frequency" teaches the recited "subchannel."

Patent Owner contends that the "power spectrum density" per sub-frequency and "attenuation" per sub-frequency disclosed in Milbrandt do not teach the "power level per subchannel" in the challenged claims. PO Resp. 17 (citing Chrissan Decl. ¶¶ 47–50). Patent Owner contends that Milbrandt's power is for an entire bandwidth divided by the number of frequencies in the bandwidth, producing a single value of power per frequency (or average power level for the band of frequencies). PO Resp. 17 (citing Chrissan Decl. ¶¶ 47–48; Ex. 1011, 12:14–31). Similarly, Patent Owner contends Milbrandt teaches a single attenuation number for an entire band of frequencies and not on a per sub-channel basis. *Id*. Patent Owner asserts the single value average level Milbrandt discloses does not teach the "power level per subchannel information" recited in the challenged claims, which require separate power levels for each subcarrier of a multicarrier system. PO Resp. 17–18; *see* Ex. 1001, 4:38–40 ("For example, the Average Reverb Signal contains the power levels per tone, up to, for example, 256 entries, detected during the ADSL Reverb signal."). Patent Owner further argues that a person of ordinary skill in the art would not have

regarded Milbrandt's attenuation or power spectral density (PSD) value—one value for a band of frequencies rather than per subchannel— as being representative of the power of levels of subchannels. PO Resp. 18 (citing Chrissan Decl. ¶ 49).

Petitioner contends that Patent Owner's arguments are premised on sub-frequency in Milbrandt being only related to "large bands of frequencies." Reply 16–17. As discussed above, Milbrandt's reference to subfrequency represents individual channels that equate to the subchannels in the challenged claims. With this interpretation of subfrequency as disclosed in Milbrandt, Petitioner provides sufficient argument and evidence that Milbrandt's PSD per sub-frequency is measurement of power carried by a signal in a subchannel. Pet. 24; Reply 16–17; Ex. 1009, 50; Ex. 1021, 126–27 (discussing PSD); Ex. 1022, 34 (discussing spectral density); Ex. 111, 104:2–15 (Patent Owner's declarant agreeing that the PSD is measure of power in a specified frequency range.). Specifically, Petitioner contends that the range of frequencies for which PSD is determined is the 4.3125 kHz range of a single sub-frequency/subchannel, *not* "an entire spectrum or band of frequencies," as Patent Owner contends (PO Resp. 17). Reply 17–18 ("When Milbrandt's PSD sub-frequency is integrated across its respective range of 4.3125 kHz, the power level for that sub-frequency is obtained.").

We agree with Petitioner. Milbrandt describes transmitting "power spectrum density, Q_f, for one or more sub-frequencies." Ex. 11:33–35. As an initial matter, we are persuaded that Milbrandt uses "sub-frequency" to mean the recited "subchannel" for the reasons discussed above. Although both parties rely upon the formula for PSD at pages 126 to 127 of Exhibit

1021 (Pet. 24; PO Resp. 17; Reply 17), the parties disagree about whether "unit bandwidth" refers to a single subchannel or multiple subchannels. Exhibit 1021 states, however, that "the PSD $S_g(\omega)$ represents the power per unit bandwidth (in hertz) of the spectral components at the frequency ω," (singular), not frequencies (plural), which supports Petitioner's contention that PSD represents power for a single subchannel. Ex. 1021, 126–127.

Because we are persuaded that Milbrandt's PSD "represent[s] power level per subchannel," we need not determine whether Milbrandt's attenuation information, also relied upon by Petitioner, "represent[s] power level per subchannel information."

For the foregoing reasons, we are persuaded that the combination of Milbrandt, Hwang, and ANSI T1.413 teaches "power level per subchannel information."

Patent Owner further asserts that with respect to dependent claims 2, 4, 6, and 8, Petitioner has not demonstrated that the combination of Milbrandt, Hwang, and ANSI T1.413 discloses "level per subchannel information . . . based on a Reverb signal." PO Resp. 20–23. Patent Owner argues that ANSI T1.413 does not disclose PSD on a per sub-channel basis but instead discloses a single, aggregate PSD value for a system. PO Resp. 21; Chrissan Decl. ¶ 53; Ex. 1014, 94.

Patent Owner's argument is not persuasive because Petitioner is relying upon the combination of the references. Nonobviousness cannot be established by attacking references individually where, as here, the ground of unpatentability is based upon the teachings of *a combination* of references. *In re Keller*, 642 F.2d 413, 426 (CCPA 1981). Rather, the test

for obviousness is whether the combination of references, taken as a whole, would have suggested the patentee's invention to a person of ordinary skill in the art. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Here, we are persuaded that Milbrandt teaches PSD "per subchannel" for the reasons described in the previous section. Moreover, we are persuaded that ANSI T1.413 teaches calculating PSD "based on a Reverb signal" because it states "the ATU-C shall measure the aggregate received upstream power on sub-carriers 7 – 18 of R-REVERB1, and thereby calculate a downstream PSD." Ex. 1014, 94. Thus, the "downstream PSD" is "based on" the aggregate received upstream power on sub-carriers 7–18 of R-REVERB1.

With respect to the teaching in ANSI T1.413 relied upon by Petitioner, we note that it describes measuring an "aggregate" upstream power, but does not describe *calculating* an "aggregate" downstream PSD. The Reverb signal, therefore, is not "per subchannel," but that is not necessarily inconsistent with the claims, which include no such requirement. Moreover, we are persuaded by Petitioner's evidence that "aggregate" as used in ANSI T1.413 includes individual values for each of the subchannels/sub-carriers in the same way that the '956 patent's Average Reverb Signal contains up to 256 entries. Reply 28–29 (citing Ex. 1100 ¶ 34; Ex. 1001, 4:38–40).

Based on the foregoing, Petitioner has shown that Milbrandt, ANSI T1.413 teaches "wherein the power level per subchannel information is based on a Reverb signal."

Signal to Noise Limitations

Patent Owner contends that Petitioner has not shown that Milbrandt and ANSI T1.413 teach "an array representing Signal to Noise Ratio per subchannel during Showtime information" as recited in independent claim 9.

Patent Owner argues that the noise ratio is not measured "per subchannel" because Mildbandt does not disclose sub-channels" and ANSI T1.413 similarly produces a single value for the entire communication channel and not per subchannel as required in the recited claims. PO Resp. 24–25 (citing Ex. 1014, 81; Chrissan Decl. ¶ 60).

We disagree with Patent Owner's contentions regarding Signal to Noise Ratio per subchannel. As discussed above, we find that Milbrandt teaches measurement on a subchannel basis. The Petition further provides persuasive evidence that Milbrandt measures signal to measure noise characteristics on a subscriber line as a function of frequency. Pet. 42–43 (citing Ex. 1011, 16:40–50, 23:51–57, Fig. 3). Petitioner also cited the signal-to-noise margin test parameters and SNR measured in ANSI T1.413 that would make signal-to-noise ratios as measured at the modem in Milbrandt externally accessible to the central office modem. Pet. 44–45 (citing Ex. 1009, 87–88; Ex. 1014, 3, 82). We also agree with Petitioner that Dr. Chrissan concedes that ANSI T1.413 measures signal to noise ratio for each tone and that a tone is the same as a subchannel. Reply 19 (citing Ex. 1110, 88:5–7, 125:23–126:12, 127:13–15) (quotations omitted).

Patent Owner further argues that Milbrandt and ANSI T1.413 do not teach SNR measurement "during Showtime" as recited in the claims because

the noise measurement in Milbrandt occurs "during modem training" that is not during normal operations. PO Resp. 25–26.

With respect to "during Showtime," we agree with Petitioner's argument and evidence that Milbrandt discusses measuring noise information during operation. Ex. 1011, 12:58–63; Pet. 42; Reply 19. Although Milbrandt refers to "noise information" and not a signal-to-noise ratio, Petitioner provides sufficient and persuasive evidence that ANSI T1.413 discloses signal-to-noise (SNR) ratio margin test parameters" and "SNR, as measured" that are made available at any time after initialization and training of the ADSL system. Pet. 44; Ex. 1014, 82. Petitioner argues that making such measurements available at any other time after initialization and training indicates that measurements are taken during normal operation and made externally accessible. Ex. 1100 ¶ 49; Pet. 44–45. Petitioner relies on ANSI T1.413 that teaches "SNR, as measured by the receivers at . . . the ATU-R ***shall*** be externally accessible from the ATU-C," which explains that SNR per tone is measured on demand during normal operation. Reply 21 (citing Ex. 1100 ¶ 51; Ex. 1014, 82).

Finally, Petitioner also provides evidence that the noise gathering in Milbrandt is not limited to the initialization step but also occurs during Showtime, further supporting the measurement of noise parameters during normal modem operation. Ex. 2011, 50:23–51:8. Patent Owner argues that Milbrandt states that the modem collects information "while providing data services to subscribers," referring to this as "modem training" that generally occurs "during the normal course of operation" Ex. 1011, 10:41–46. Although Milbrandt calls the process "training," which suggests it is not

"during Showtime," Milbrandt simultaneously describes the process as occurring "during the normal course of operation" and "while providing data services to subscribers," which suggests it is "during Showtime." Because Milbrandt is, at best, ambiguous on this point, we are not persuaded that it is inconsistent with the portion of Milbrandt relied on by Petitioner that states the modem "may operate as a spectrum analyzer during operation" and "measure[e] noise characteristics of a subscriber line" Ex. 1011, 12:58–63; Pet. 42; Reply 19.

Patent Owner contends that the SNR "margin" measured in ANSI T1.413 is not the same as the signal-to-noise ratio in the challenged claims. PO Resp. 27; Ex. 1014, 81, Chrissan Decl. ¶ 64. According to Patent Owner, because SNR margin, which is the difference between measured SNR and the minimal SNR the system is designed to tolerate, is not the same thing as SNR, which is a measured mathematical ratio of signal level over noise level, the SNR measured in ANSI T1.413 would not teach a person of ordinary skill in the art to measure SNR. *Id*.

Petitioner replies ANSI T1.413 discloses measured SNR which differs from the SNR margin and does not use the terms interchangeably. Reply 21–22. Indeed, Petitioner relies on both signal-to-noise (SNR) margin test parameters and measured SNR as disclosed in ANSI T1.413 to teach the limitation for "signal to noise . . . information" as recited in the challenged claims. *Id*. (citing Ex. 1014, 82; Ex. 1100 ¶¶ 54–56). Because Patent Owner argues only about SNR margin, Petitioner contends, it is undisputed that ANSI T1.413's measured SNR teaches the recited "Signal to Noise ratio information." Reply 21–22. Based on the foregoing, we find that Petitioner

has shown that Milbrandt and ANSI T1.413 in combination teach the SNR measurement during showtime limitation of the challenged claims.

Motivation to Combine

Patent Owner challenges Petitioner's motivation to combine the references. Specifically, Patent Owner argues that Petitioner's proffered motivation to combine ANSI T1.413 with Milbrandt—"to adjust its automatic gain control (AGC) to an appropriate level" or to "adjust the signal equalization" (Pet. 49)—mischaracterizes the technology relying on conclusory arguments that are meritless. PO Resp. 22–23. Patent Owner also contends that Petitioner has not provided any "valid rationale for why it would have been obvious to transmit or receive specific information in a multicarrier transceiver." *Id*. at 28. Patent Owner argues that Petitioner's allegations are vague and conclusory and make no technological sense. *Id*. at 28–29. Specifically, Patent Owner avers that Milbrandt already discloses localized SNR measurements that are not transmitted to or received from another modem because the system of Milbrandt calculates these values directly at the central office modem. *Id*. at 29 (citing Ex. 1011, 16:33–38, Fig. 7; Chrissan Decl. ¶ 69). Because the features Petitioner cites as a reason to combine the references already exists in Milbrandt, there is no benefit to the combination or rationale to combine Milbrandt with ANSI T1.413. PO Resp. 30 (citing *In re NTP, Inc*., 654 F.3d 1279 (Fed. Cir. 2011); *Apple, Inc. v. Cellular Comm. Equip., LLC*, Case No. IPR2015-00576, Paper 7 (P.T.A.B. June 12, 2015).

With respect to the combination of references, Petitioner asserts that Patent Owner's arguments do not address Petitioner's motivation to combine

Milbrandt and ANSI T1.413 to (1) "allow the subscriber modem to send back upstream to the central office modem the power levels to be used on each DMT sub-carrier" (Reply 31–32; Pet., 17; Ex. 1009, 57; Ex. 1014, 87), or (2) to "make Milbrandt's system compliant with the ANSI T1.413 standard" (Reply 32; Pet., 17; Ex. 1011, 9:31–34). Indeed, Petitioner asserts that combining Milbrandt and ANSI T1.413 "would be desirable because it would allow for interoperability with other devices that are ANSI T1.413 standard compliant, make the overall system more robust since it has been developed through an accredited consensus process . . . , and also make the system as whole commercially desirable." Pet. 17 (citing Ex. 1009, 35).

We agree that Patent Owner does not directly address Petitioner's argument regarding combining Milbrandt's system with the ANSI T1.413 standard to make the Milbrandt modems compatible with the standard. Reply 32; Pet. 17; Ex. 1011, 9:31–34. Patent Owner's argument that the Board did not cite or adopt this rationale in the Decision on Institution is not persuasive or relevant to our inquiry. PO Resp. 28 n.2. It is the Petition, not our Decision on Institution, which sets forth the grounds and basis for Petitioner's challenge. We also find unavailing Patent Owner's argument that adding SNR measurement features to achieve compliance with ANSI T1.413 would not add such features because Milbrandt already complies with ANSI Standard T1.413 communications. *Id*. (citing Ex. 1011, 9:31–34). We do not agree, as we do not read Milbrandt as describing full compliance with ANSI T1.413, but instead states that an embodiment supports communication using ADSL techniques that comply with ANSI Standard T1.413. Ex. 1011, 9:31–34. We also credit Petitioner's unrebutted

argument and evidence that compliance with ANSI T1.413 would have motivated the combination. Ex. 1100 ¶ 38; Ex. 1009 ¶¶ 86–87; Ex. 1011, 9:31–34.

With respect to combining the references to adjust parameters, we are also not persuaded by Patent Owner's evidence or argument that generating a PSD based on Reverb to adjust the signal equalization is meritless. PO Resp. 22–23. Patent Owner's declarant testified that "one could use some notion of power" to train an equalizer, but formed no opinion on whether the notion of power could be derived from a reverb signal. Ex. 1110, 99:4–100:15. We credit the testimony of Dr. Kiaei that a person of skill in the art would understand the use of Reverb to train or adjust an equalizer. Ex. 1110 ¶ 36; Ex. 1009, 59. We are also not persuaded by Patent Owner's argument that PSD has nothing to with adjusting automatic gain control (AGC). PO Resp. 23. Petitioner provides sufficient argument and evidence to establish that ANSI T1.413 discloses the use of Reverb to adjust AGC, where gain is based on power, represented by PSD. Ex. 1100 ¶ 37; Ex. 1009, 58–59; Chrissan Decl. ¶ 55; Pet 17. Accordingly, we do not agree with Patent Owner that signal equalization or AGC adjustment from the use of Reverb for generating a PSD mischaracterizes the technology.

Patent Owner's arguments are belied by their argument that at best ANSI T1.413 provides a reason to send the Reverb signal in Milbrandt, but does not support a power level per subchannel based on those Reverb signals. PO Resp. 23 (citing Chrissan Decl. ¶ 55). Patent Owner's argument indirectly supports Petitioner's contention that ANSI T1.413 introduces a Reverb signal that could be used in the system of Milbrandt for the reasons

discussed in ANSI T1.413, which includes adjusting gain and equalization. Reply 31 (citing Chrissan Decl. ¶¶ 55–56). Petitioner has presented sufficient evidence that the Reverb signal introduced from ANSI T1.413 could also be used to generate PSD information.

No Weight Should Be Given to Petitioner's Declarant

Patent Owner argues that no weight should be given to Petitioner's declarant, Dr. Kiaei, because he "lacked knowledge about basic concepts at issue in this proceeding." PO Resp. 23 (citing Ex. 2005, 76:14–21; 47:22–48:4, 69:2–70:3, 76:7–13; 72:7–73:11). In support of the argument, Patent Owner directs attention to portions of Dr. Kiaei's cross examination testimony where he allegedly (1) paused too long when answering a few questions, (2) was unfamiliar with certain terms or concepts, and (3) was incorrect from a technological standpoint. *Id*. at 23–24. Petitioner replies that Patent Owner's attack has not merit, as Dr. Kiaei has experience with the architecture, design and implementation of DSL systems that Dr. Chrissan, Patent Owner's declarant, lacks. Reply 32–33.

We have reviewed the arguments provided by Patent Owner and determine such arguments are insufficient to have Dr. Kiaei's declaration excluded in its entirety. Rather, it is within our discretion to assign the appropriate weight to be accorded evidence. *See* 37 C.F.R. § 42.65(a); *see also, e.g.*, *Yorkey v. Diab*, 601 F.3d 1279, 1284 (Fed. Cir. 2010) (holding the Board has discretion to give more weight to one item of evidence over another "unless no reasonable trier of fact could have done so"); *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) ("[T]he Board is entitled to weigh the declarations and conclude that the lack of factual

corroboration warrants discounting the opinions expressed in the declarations."); and *Velander v. Garner*, 348 F.3d 1359, 1371 (Fed. Cir. 2003) ("In giving more weight to prior publications than to subsequent conclusory statements by experts, the Board acted well within [its] discretion."). Based on the record before us, we are not persuaded that we should give the entirety of Dr. Kiaei's declaration no weight.

Conclusion

Based on the foregoing, we are persuaded by Petitioner's argument and evidence, which we adopt, that Milbrandt, Hwang, and ANSI T1.413 teach the limitations of claims 1–10 pf the '956 patent by a preponderance of the evidence.

III. PATENT OWNER'S MOTION TO EXCLUDE

Patent Owner filed timely objections (Paper 18) and moves to exclude Exhibit 1103 and 1109. PO Mot. Exc. 2–4. Exhibit 1103 is titled the "Declaration of Robert Short, Ph.D." and states that it was submitted on behalf of Patent Owner in IPR2016-01020. PO Mot. Exc. 2; Exhibit 1103 ¶¶ 1–2. Exhibit 1109 is described as a "FCC Filing by Alcatel." Paper 18, 3; PO Mot. Excl. 3. Patent Owner contends that we should exclude Exhibits 1103 and 1109 as hearsay under FRE 801–802. Although Exhibits 1103 and 1109 are referenced briefly in Petitioner's Reply (pages 8, 28, and 32), we do not rely on Exhibits 1103 and 1109 in rendering our decision. Exhibits 1103 and 1109 were not considered or relied on in reaching our decision that Petitioner demonstrated, by a preponderance of the evidence that the challenged claims are unpatentable.

Accordingly, we *dismiss* Patent Owner's Motion to Exclude Exhibits 1103 and 1109.

IV. CONCLUSION

Based on the evidence and arguments, Petitioner has demonstrated by a preponderance of the evidence that claims 1–10 are unpatentable as obvious over Milbrandt, Hwang, and ANSI T1.413.

V. ORDER

Accordingly, it is

ORDERED that claims 1–10 of the '956 patent have been shown 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.

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Paper No. 40
Filed: March 28, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC. and ARRIS GROUP, INC.,
Petitioner,

v.

TQ DELTA, LLC,
Patent Owner.

Case IPR2016-01007[1]
Patent 8,432,956 B2

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

JEFFERSON, *Administrative Patent Judge*.

DECISON
Denying Patent Owner's Request for Rehearing
37 C.F.R. § 42.71

[1] ARRIS Group, Inc., who filed a Petition in IPR2017-00422, has been joined in this proceeding.

I. INTRODUCTION

Pursuant to 37 C.F.R. § 42.71(d), TQ Delta, LLC ("Patent Owner") requests rehearing of our Final Written Decision (Paper 38, "Dec."). Paper 39 ("Req. Reh'g"). Specifically, Patent Owner submits that we overlooked arriving at a contradictory claim construction, overlooked a non-obviousness argument, misapprehended Patent Owner's argument with respect to "power level per subchannel information . . . based on a reverb signal," and misapprehended the law regarding proper reply evidence and argument. Req. Reh'g passim.

For the reasons set forth below, Patent Owner's Request for Rehearing is *denied*.

II. STANDARD OF REVIEW

A party requesting rehearing bears the burden of showing that the decision should be modified. 37 C.F.R. § 42.71(d). The party must identify specifically all matters we misapprehended or overlooked, and the place where each matter was addressed previously in a motion, an opposition, or a reply. *Id*. With this in mind, we address the arguments presented by Patent Owner.

III. ANALYSIS

A. "During Showtime"

Patent Owner argues that our claim construction of "during showtime" in this proceeding to mean "during normal communications of a DSL receiver" (Dec. 9) contradicts our discussion of the claim construction,

which made the bases for our finding that the prior art rendered obvious the claim limitation of "SNR during Showtime" unclear. Req. Reh'g 1–2.

Patent Owner's issue is based on a sentence in the claim construction analysis of "during Showtime" in the Final Written Decision that states, "[w]e are not persuaded by Patent Owner's negative construction, which excludes initialization from normal communication." The "not" in that sentence is a mistake. In an Errata mailed concurrently herewith, we correct that sentence in the Final Written Decision to read "[w]e are persuaded by Patent Owner's negative construction, which excludes initialization from normal communication." The construction in the Final Written Decision is consistent with our discussion that notes that "[t]he parties agree that 'during Showtime' is a term of art that encompasses normal communication, which follows the completion of initialization and handshaking, for known DSL standards and protocols." Dec. 8 (citing PO Resp. 6–7; Reply 10; Kiaei Decl. ¶ 43). Our Final Written Decision also noted that "[t]here is also no dispute that 'during Showtime' is intended to distinguish initialization and training." Dec. 9 (citing PO Resp. 7–8; Reply 9; Tr. 21:19–23:11).

Patent Owner also argues that we misapprehended its arguments and evidence that the prior art does not teach measuring signal-to-noise ratio ("SNR") "during Showtime" (i.e., not during initialization). Req. Reh'g. 2. Specifically, Patent Owner argues that we overlooked its explanation that Milbrandt's use of "during operation" in the context of measuring noise (*see, e.g.*, Ex. 1011, 12:58–63 ("[t]he noise information for a particular subscriber line 16 may be determined by measuring noise characteristics of a subscriber line 16 during operation")) means during modem training, which is not

during "Showtime." *Id*. at 2–5 (citing Ex. 2001 ¶ 62). To the contrary, this argument was addressed at pages 30 to 31 of our Final Written Decision, which explained that it is not persuasive because Milbrandt appears to be using "modem training" idiosyncratically to refer to a process that occurs "while providing data services to subscribers 12" and "during the normal course of operation of system 10," both which occur "during Showtime" as we have construed that term. Dec. 30–31. Our Final Written Decision's reference to any ambiguity in Milbrandt's discussion of modem training notes that it stands in direct contrast to Milbrandt's clear description of the modem "operating as a spectrum analyzer during operation" to measure noise characteristics of a subscriber line. Dec. 31 (citing Ex. 1011, 12:58–63; Pet. 42; Reply 19).

Patent Owner also argues that we misapprehended the parties' argument by finding that ANSI T1.413 teaches measuring "SNR during Showtime" whereas not even Petitioner alleged that ANSI T1.413 measured SNR during Showtime. Req. Reh'g 5. Patent Owner's argument appears to be based on our description of Petitioner's evidence that "ANSI T1.413 [] teaches 'SNR, as measured by the receivers at . . . the ATU-R ***shall*** be externally accessible from the ATU-C,' which explains that SNR per tone is measured on demand during normal operation." Dec. 30 (quoting Reply 21 (citing Ex. 1100 ¶ 51; Ex. 1014, 82)). Contrary to Patent Owner's argument (Req. Reh'g 5), our Final Written Decision does not state that ANSI T1.413 teaches "SNR during Showtime." Dec. 29–31. Instead, our Decision cites Petitioner's argument that ANSI T1.413 teaches "SNR, *as measured*" in conjunction with the "noise information" measurement in Milbrandt. Dec.

29, 30 (emphasis added). We credited Petitioner's argument that Milbrandt discusses measuring noise information that is measured during normal operation and that ANSI T1.143 discloses "SNR, as measured by the receivers." Dec. 29–31.

Patent Owner also argues that we overlooked its argument, in its Preliminary Response, that it would not have been obvious to combine Milbrandt with ANSI T1.413. Req. Reh'g 6–7. We addressed this argument in our Final Written Decision and found it unpersuasive.[2] Dec. 32–34. Contrary to Patent Owner's arguments (Req. Reh'g 6–7), we addressed Patent Owner's arguments and did not rely on impermissible evidence. Our Final Written Decision noted that Patent Owner's argument did not comport with the express text of ANSI T1.413 and credited the Petitioner's argument and evidence in support of the combination. Dec. 33–34 (citing Ex. 1011, 9:31–34; Ex. 1100 ¶ 38; Ex. 1009 ¶¶ 86–87; Ex. 1011, 9:31–34).

B. "Power Level Per Subchannel Information . . . Based on a Reverb Signal"

Patent Owner argues that we "misapprehended the nature of the limitation, Petitioners' arguments, and Patent Owner's rebuttal evidence" in determining that Petitioner showed that Milbrandt and ANSI T1.143 teach the "power level per subchannel information is based on a Reverb signal" limitation. Req. Reh'g 8–9. We disagree, as we addressed Petitioner's and

[2] To the extent Patent Owner's rehearing request relies on arguments presented in the Patent Owner Preliminary Response (Req. Reh'g 6–7 (citing Paper 7)), our Scheduling Order "cautioned that any arguments for patentability not raised in the [Patent Owner] response will be deemed waived." Paper 9, 5–6.

Patent Owner's evidence and argument. Dec. 27–28, 34–35. Specifically, we addressed Patent Owner's argument that "power level per subchannel information, even if it is based on a Reverb signal, is not used to adjust AGC" and found it unpersuasive. Dec. 34–35.

C. Reply Evidence and Argument

Patent Owner generally argues that the Final Written Decision relied on evidence and argument that Patent Owner objected to as being improper new reply arguments. Req, Reh'g 9–10. Patent Owner does not identify any specific evidence cited in the Final Written Decision that rely on improper new reply arguments from Petitioner.

Patent Owner argues that we abused our discretion by authorizing it to file only a listing of allegedly improper Reply arguments with the Petitioner submitting a response identifying where allegedly improper arguments reply to the Patent Owner's Response. Req. Reh'g 10. Patent Owner argues that the process was unreasonable because it failed to allow Patent Owner to explain why Petitioner's Reply arguments were improper and could have been brought earlier, denied Patent Owner due process via an opportunity to be heard without a reasoned justification, and addressed Patent Owner's listing in a footnote in the Final Written Decision. Req. Reh'g. 10–11 (citing *Redline Detection, LLC v. Star Envirotech, Inc.*, 811 F.3d 435 (Fed. Cir. 2015); *Ultratec, Inc. v. CaptionCall, LLC*, 872 F.3d 1267 (Fed. Cir. 2017)).

The cases relied upon by Patent Owner do not stand for the proposition that we must authorize a motion to strike and/or a surreply with explanation. *Redline* involved a denial of Petitioner's Motion to Submit

Supplemental Information and, on appeal, the Federal Circuit held that the denial did not constitute an abuse of discretion. *Redline*, 811 F.3d at 443–449. *Ultratec* involved a denial of a Patent Owner authorization to file a Motion to Submit Supplemental Information in the form of sworn inconsistent testimony. *Ultratec*, 872 F.3d 1269–1271. The Federal Circuit held that "[t]he Board abused its discretion when it refused to admit and consider Mr. Occhiogrosso's trial testimony and when it refused to explain its decision. *Ultratec*, 872 F.3d at 1275.

Here, in contrast, Patent Owner was not denied an opportunity to submit evidence. Instead, Patent Owner was granted the opportunity to identify allegedly new arguments and evidence in Petitioner's Reply, and we considered the identified portions when reaching our decision. Although the "listing" format required Patent Owner to be efficient in its identification and required Petitioner to be efficient in its responsive paper, these papers provided "the information necessary to make a reasoned decision" (*Ultratec*, 872 F.3d at 1273) about whether the arguments and evidence raised in reply were outside the scope of a proper reply. Accordingly, we are not persuaded that we abused our discretion by denying Patent Owner authorization to file a Motion to Strike and/or Sur-Reply, or by determining, in the Final Written Decision, that "Petitioner's arguments and evidence that Patent Owner objects to 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" (Dec. 21 n.5).

IV. ORDER

Accordingly, it is it is ORDERED that Patent Owner's Request for Rehearing is *denied*.

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JEFFERSON, *Administrative Patent Judge*.

ERRATA

[1] ARRIS Group, Inc., who filed a Petition in IPR2017-00422, has been joined in this proceeding.

The panel modifies our Final Written Decision issued on October 27, 2017 (Paper 38) as follows: On pages 9 of the Final Written Decision, the sentence "We are not persuaded by Patent Owner's negative construction, which excludes initialization from normal communication," is changed to "We are persuaded by Patent Owner's negative construction, which excludes initialization from normal communication." Specifically, the word "not" is deleted from the sentence. In all other respects, the Final Written Decision is unchanged.

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