

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NOKIA OF AMERICA CORPORATION and
AT&T SERVICES, INC.,
Petitioner,

v.

IARNACH TECHNOLOGIES LIMITED,
Patent Owner.

IPR2024-00899
Patent 9,806,892 B2

Before KARA L. SZPONDOWSKI, CHRISTOPHER L. OGDEN, and
JOHN R. KENNY, *Administrative Patent Judges*.

KENNY, *Administrative Patent Judge*.

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

I. INTRODUCTION

Nokia of America Corporation and AT&T Services, Inc. (“Nokia,” “AT&T,” and collectively, “Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–5 and 10–15 (the “challenged claims”) of U.S. Patent No. 9,806,892 B2 (Ex. 1001, the “’892 patent,” “challenged patent”) pursuant to 35 U.S.C. § 311 *et seq.* Corrected Petition, Paper 18 (“Pet.”).¹ Iarnach Technologies Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 10 (“Prelim. Resp.”).

The Petition, to justify institution of review, must demonstrate a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim. 35 U.S.C. § 314(a) (2018). After considering the Petition, the Preliminary Response, and the evidence of record, we determine that the Petition has met this standard. Further, we decline to discretionarily deny *inter partes* review. Therefore, we institute an *inter partes* review of the challenged claims of the ’892 patent.

A. Related Matters

The parties identify the following district court litigations as involving the ’892 patent:

Iarnach Technologies Ltd. v. AT&T Corp. et al., 2:23-cv-00231 (E.D. Tex.) (“AT&T litigation”); and

¹ With our authorization, Petitioner filed the Corrected Petition (Paper 18) to correct a statement on the first page of the original Petition (Paper 3), which identified claims 1–11 of U.S. Patent No. 8,934,359 B2 as the challenged claims. Paper 17. All citations in this Decision to the Petition are to the Corrected Petition (Paper 18) unless otherwise noted.

Iarnach Technologies Ltd. v. Verizon Communications, Inc. et al., 2:23-cv-00631 (E.D. Tex.) (“Verizon litigation”²).

Pet. 72; Paper 5, 2; Paper 11, 2.

The parties have informed us, however, the ’892 patent has been dismissed from the AT&T litigation. Prelim. Resp. 34; Paper 16; Ex. 1035. Thus, based on the current record, the only litigation that currently concerns the ’892 patent is the Verizon litigation. Prelim. Resp. 34; Paper 16; Ex. 1035.

B. Challenged Patent

The ’892 patent “relates to systems, devices, and techniques for data communications in a passive optical network” and “to power saving in an optical network unit (ONU) of a passive optical network (PON).” Ex. 1001, 1:19–23. Figure 1 of the ’892 patent, reproduced below, illustrates an example of a PON system. *Id.* at 2:12.

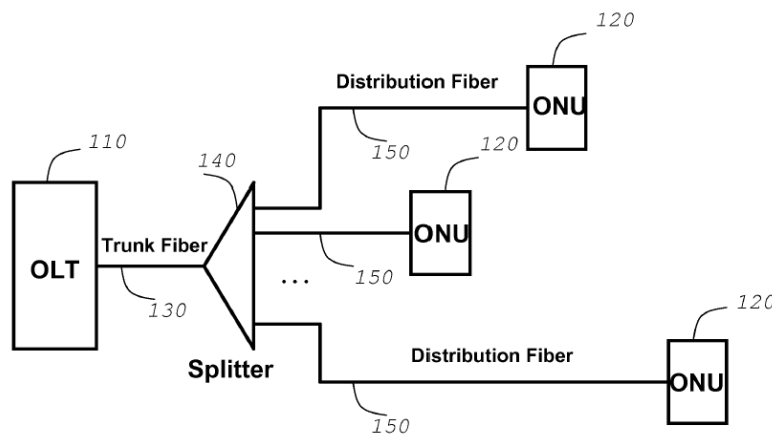


FIG. 1

² Petitioner explains that “the Verizon case . . . involves ONUs that Nokia provides to Verizon. . . . Nokia supplies Verizon certain of the accused ONUs in that case.” See Pet. 67, 72.

Ex. 1001, Fig. 1. Figure 1 above illustrates an exemplary PON system. *Id.* at 2:12. The PON system illustrated in Figure 1 includes (i) an optical line terminal (OLT) 110, (ii) a plurality of ONUs 120, and (iii) an optical distribution network (ODN) that includes optical feeder fiber or trunk fiber 130, a splitter 140, and multiple distribution fibers 150. *Id.* at 3:41–44. ONUs 120 may be deployed at or near user premises. *Id.* at 3:45–60. An ONU is an active network element that draws electric power from a power supply network present at or near the access user's premises, and may also be equipped with a battery-based power backup unit. *Id.*

The '892 patent explains that conventional standard-based PON systems (such as Ethernet PON (EPON), Broadband PON (BPON), and Gigabit PON (G-PON)) consider an ONU to be in a permanent link-layer association with the OLT, such that the ONU's optical transceiver continuously remains fully operational and fully powered. *Id.* at 3:61–4:7.

In contrast, advanced standard-based PON systems (such as 10 Gigabit/sec EPON (10G-PON) and 10 Gigabit/sec PON (XG-PON)) employ protocol-based power-saving techniques based on a signaling mechanism between the OLT and the ONU, to function properly. *Id.* at 4:8–16. The '892 patent explains that these techniques define several power levels and specify the cyclic behavior of an ONU which periodically switches between the full power level and one lower power level. *Id.* Besides the full power level, a standard-based 10 Gigabit/sec PON (XG-PON) system identifies an ONU Dozing power level (which is characterized by powering off of the ONU transmitter and the associated circuitry for substantial periods of time on the condition that the receiver remains continuously on), and an ONU Sleeping power level (characterized by the fact that both the ONU transmitter

and the ONU receiver are turned off for substantial periods of time). *Id.* at 4:17–24; *see also id.* at 3:21–24 (describing “a cyclic sleep method . . . where both receiver and transmitter are off”), 4:46–52 (providing that “[t]he dozing power level . . . which is lower than full power level 200, but substantially higher than zero (or sleep mode 220), is characterized by the ONU transmitter with the associated circuitry being powered off, and the transmitter remaining on” such that “the ONU is in a ‘listen’ mode to receive data or signals, but not in a ‘talk’ mode to transmit data or signals”). For one such PON ONU (e.g., as specified in the PON standard ITU-T G.987.3 titled “10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) layer specification”), the state machine behavior allows the ONU to transition into a Sleep Aware state or a Doze Aware state, from an initial “Active Free” state, however, “no direct transition between the Doze Aware and the Sleep Aware states . . . are provided.” *Id.* at 4:25–40. The ’892 patent explains that these “[c]onventional ONUs therefore lack the technology of directly transitioning between two low power consumption states without having to go through an active state (e.g., a full powered state).” *Id.* at 4:34–40.

The ’892 patent discloses techniques for unified optical network unit power management in a passive optical network, the techniques including operating an ONU in a first state in which a transmitter of the ONU is turned off and a receiver of the ONU is turned on, operating the ONU in a second state in which both the transmitter and the receiver are turned off, and transitioning the ONU directly between the first state and the second state, based on a power management rule. *Id.* at code (57), 1:57–64. The ’892 patent further discloses a PON system including an ONU and an OLT, with

the ONU operable in a first low power mode in which the ONU is able to receive but not transmit, and in a second low power mode in which the ONU is not able to either receive or transmit. *Id.* at 1:65–2:6. The OLT is communicably coupled to the ONU and is configured to transmit a control message to the ONU to control at least one aspect of a transition of the ONU between the first low power mode and the second low power mode. *Id.* Figure 5 of the '892 patent, reproduced below, illustrates a state machine that governs an ONU's behavior in the unified power management method and allows (*inter alia*) direct transitions between a Listen state and an Asleep state. *Id.* at 2:34–36, Fig. 5.

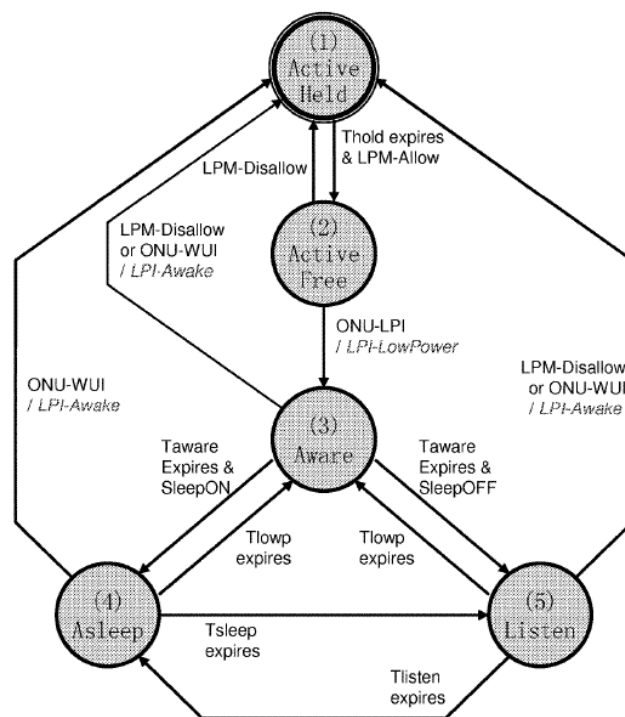


FIG. 5

Ex. 1001, Fig. 5. Figure 5 above illustrates a state machine that governs an ONU's behavior in the unified power management method. *Id.* at 2:34–36.

Figure 8 of the '892 patent, reproduced below, is a flow chart representation of a unified power management method, and Figure 9 of the '892 patent, reproduced below, is a block diagram representation of a portion of an apparatus that implements the unified power management technique. *Id.* at 2:50–55.

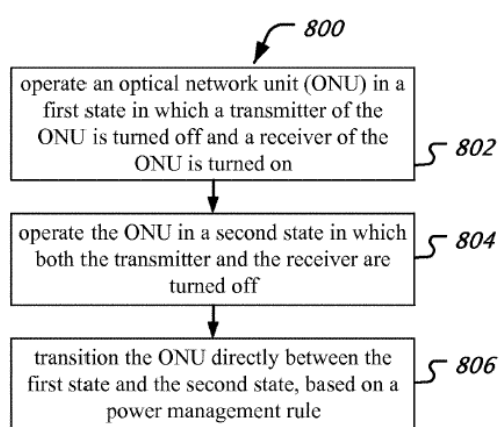


FIG. 8

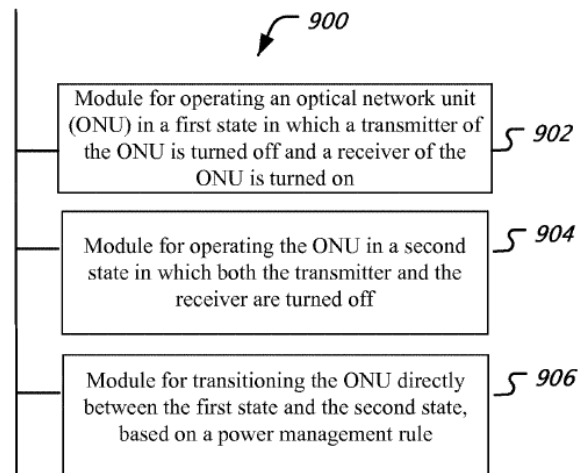


FIG. 9

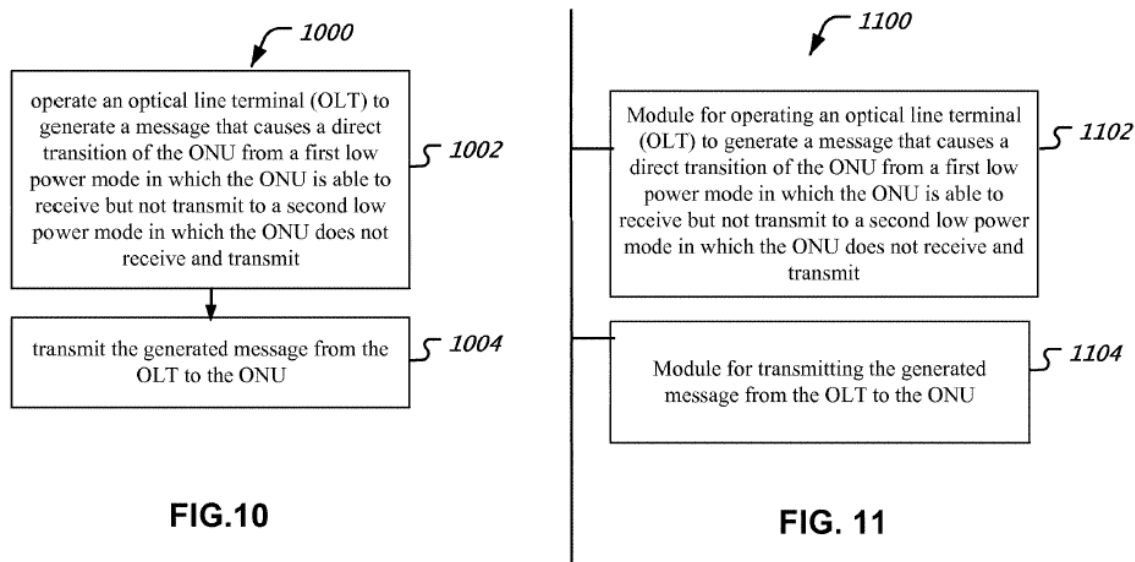
Ex. 1001, Figs. 8–9. Figure 8 is a flow chart representation of a unified power management method, and Figure 9 is a block diagram representation of a portion of an apparatus that implements the unified power management technique. *Id.* at 2:50–55. The unified power management method 800 illustrated in Figure 8 may be implemented on an ONU 120, and includes: operation 802 by which method 800 operates an ONU in a first state (e.g., a dozing state) in which a transmitter of the ONU is turned off and a receiver of the ONU is turned on; operation 804 by which method 800 operates the ONU in a second state (e.g., a sleep state) in which both the transmitter and the receiver are turned off; and operation 806 by which method 800 directly transitions the ONU between the first state and the second state, based on a power management rule. *Id.* at 12:19–45. The '892 patent explains that

“[d]irect transition refers to changing the operational state of the ONU between the first and the second states without having to go through an intermediate third state in which the power utilized by the ONU increases (e.g., as in the Active state previously discussed).” *Id.* One power management rule may be based on the timing parameters that control how long the ONU can be in the first or the second mode (e.g., in sleep or dozing mode). *Id.* Other power management rules include transitioning based on a user input (e.g., phone going off the hook), or responding to incoming control messages from the OLT that specify entering or exiting the first and the second states. *Id.*

Optical communications apparatus 900 illustrated in Figure 9 includes a module 902 for operating an optical network unit (ONU) in a first state (e.g., dozing) in which a transmitter of the ONU is turned off and a receiver of the ONU is turned on, a module 904 for operating the ONU in a second state (e.g., sleep state) in which both the transmitter and the receiver are turned off; and a module 906 for transitioning the ONU. *Id.* at 12:46–65. Module 906 is for transitioning the ONU directly between the first state and the second state, based on a power management rule. *Id.* The transition may be based on a message received from another network entity, such as the OLT. *Id.*

Figure 10 of the '892 patent, reproduced below, is a flow chart representing a process of operating an OLT, and Figure 11 of the '892 patent,

reproduced below, is a block diagram representation of a portion of an apparatus for optical communications. *Id.* at 2:55–58.



Ex. 1001, Figs. 10, 11. Process 1000 (illustrated in Figure 10) of controlling operation of an optical network unit (ONU), operating in a passive optical network (PON), includes: operation 1002 at which process 1000 operates an OLT to generate a message that causes a direct transition of the ONU from a first low power mode (in which the ONU is able to receive but not transmit) to a second low power mode (in which the ONU does not receive and transmit); and operation 1004 at which process 1000 transmits the generated message from the OLT to the ONU. *Id.* at 12:65–13:13. The OLT may control the low power operation of ONUs by either explicitly providing control messages or by granting requests from the ONUs, e.g., transitioning from a dozing mode to a sleep mode. *Id.*

Optical communications apparatus 1100 shown in Figure 11 includes: a module 1102 for operating an optical line terminal (OLT) to generate a message that causes a direct transition of the ONU from a first low power mode (in which the ONU is able to receive but not transmit) to a second low

power mode (in which the ONU does not receive and transmit). *Id.* at 13:14–22. Module 1104 is for transmitting the generated message from the OLT to the ONU. *Id.*

C. Challenged Claims

Petitioner challenges claims 1–5 and 10–15. Pet. 1. Claims 1, 10, 12, and 14 are independent and read:

- 1.³ [1A] A method of optical communication in a passive optical network, comprising:
 - [1B] operating an optical network unit (ONU) in a first state in which a transmitter of the ONU is turned off and a receiver of the ONU is turned on;
 - [1C] operating the ONU in a second state in which both the transmitter and the receiver are turned off;
 - [1D] transitioning the ONU directly from the first state to the second state and transitioning the ONU directly from the second state to the first state, based on a power management rule;
 - [1E] ensuring the ONU is fully powered up, synchronized, and capable of responding to both upstream and downstream traffic and control before exiting the first state or the second state; and
 - [1F] receiving, by the receiver, a power management message from an optical line terminal (OLT); and
 - [1G] changing the power management rule based on the received power management message.

³ For ease of reference, we include the bracketed designations provided in the Petition for the limitations of claims 1, 10, 12, and 14 (*see* Pet. 26, 32, 75–77 (Claims Appendix)). We, however, omit the internal brackets that the Petition placed around the letters in these designations.

10. [10A] An optical communication apparatus, comprising:
 - [10B] a memory that stores processor-executable instructions; and
 - [10C] a processor that uses the stored instructions to implement a method, comprising operating an optical network unit (ONU) in a first state in which a transmitter of the ONU is turned off and a receiver of the ONU is turned on; and operating the ONU in a second state in which both the transmitter and the receiver are turned off; and
 - [10D] wherein the processor includes means for transitioning the ONU directly from the first state to the second state and means for transitioning the ONU directly from the second state to the first state, based on a power management rule;
 - [10E] wherein the processor uses stored instructions to ensure the ONU is fully powered up, synchronized, and capable of responding to both upstream and downstream traffic and control before exiting the first state or the second state; and
 - [10F] wherein the processor further uses the stored instructions to implement the method by receiving, by the receiver, a power management message from an optical line terminal (OLT) and changing the power management rule based on the received power management message.
12. [12A] An optical line terminal (OLT) for operation in a passive optical network (PON), the optical line terminal comprising:
 - [12B] a processor configured to generate messages for controlling a transition of an optical network unit from a first low power state in which a receiver of the optical network unit is turned on but a transmitter of the optical network unit is turned off to a second low power state in which both the receiver and the transmitter of the optical network unit are turned off;

- [12C] a transmitter configured to transmit the generated messages to the optical network unit;
- [12D] wherein the generated messages comprises a periodic consent message to allow the optical network unit to remain in either the first low power state or the second low power state.

14. [14A] A passive optical network (PON) communications system, comprising:

- [14B] an optical network unit (ONU) operable in a first low power mode in which the ONU is able to receive but not transmit and a second low power mode in which the ONU is not able to either receive or transmit, wherein the ONU is configured to transition from the first low power mode to the second low power mode and to transition from the second low power mode to the first low power mode based on a power management rule, and wherein the ONU changes a power management rule based on a received power management message;
- [14C] an optical line terminal (OLT) communicably coupled to the ONU, the OLT configured to transmit a control message to the ONU to control at least one aspect of transition of the ONU between the first low power mode and the second low power mode; and
- [14D] the ONU configured to ensure that the ONU is fully powered up, synchronized, and capable of responding to both upstream and downstream traffic and control before exiting the first low power mode or the second low power mode.

Ex. 1001, 15:2–21, 16:7–31, 16:38–53, 16:62–17:16.

D. Asserted Challenges to Patentability and Prior Art

Petitioner challenges claims 1–5 and 10–15 based on the grounds in the table below:

Ground	Claim(s) Challenged	35 U.S.C. § ⁴	Reference(s)
1	1–5, 14, 15	103	G.987.3, ⁵ Röger, ⁶ G.988 ⁷
2	10–13	103	G.987.3, Röger, G.988, Ghazisaidi ⁸

Pet. 1.

Petitioner submits a declaration with proffered expert testimony from Dr. Alexander V. Sergienko (Ex. 1003). Patent Owner submits a declaration with proffered expert testimony from Mr. Bruce Schofield (Ex. 2001).

II. LEVEL OF SKILL AND CLAIM CONSTRUCTION

A. Level of Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) prior-art solutions to those problems; (4) the

⁴ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013.

⁵ ITU-T (International Telecommunication Union Telecommunication Standardization Sector) Recommendation G.987.3, “*10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) layer specification*” (2011) (Ex. 1007).

⁶ M. Röger, et al. “*Optically Powered Fiber Networks*,” Optics Express, Vol. 16, No. 26 (Dec. 22, 2008) (Ex. 1006).

⁷ ITU-T (International Telecommunication Union Telecommunication Standardization Sector) Recommendation G.988, “*ONU management and control interface (OMCI) specification*” (2011) (Ex. 1008).

⁸ WO 2013/014483 A1, published January 31, 2013 (Ex. 1009).

rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). Moreover, the prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner asserts that an ordinarily skilled artisan at the time of the alleged invention “would have had at least a bachelor’s degree in electrical engineering, computer engineering, or similar discipline and had at least two years of experience with optical communications and networks.” Pet. 3 (citing Ex. 1003 ¶ 22). Petitioner further asserts that an ordinarily skilled artisan could be “[a] person with a different degree but additional relevant experience . . . if the additional experience compensates for the different educational background.” *Id.*

Patent Owner, in turn, asserts that an ordinarily skilled artisan at the time of the alleged invention

would have at least a bachelor’s degree in electrical engineering, computer science, or a similar degree plus at least two years of experience in optical networks. Ex. 2001 at ¶ 29. This description is approximate, and a higher level of education or skill might make up for less experience, and vice versa. *Id.*

Prelim. Resp. 11.

Petitioner’s and Patent Owner’s proposed definitions are very similar. For this Decision, we adopt Petitioner’s, which appears reasonable and is consistent with the level of skill reflected in the cited prior art.

B. Claim Construction

1. Means Limitations

Petitioner proposes construing the following means limitations in claims 10 and 13:

means for transitioning the ONU directly from the first state to the second state and means for transitioning the ONU directly from the second state to the first state, based on a power management rule (claim 10); and

means for specifying a first time period for operation in the first low power state and a second time period for operation in the second low power state (claim 13).

Pet. 4–5 (emphasis omitted). Petitioner argues that these means limitations should be construed to be means plus function limitations under 35 U.S.C. § 112(f). *Id.* Further, Petitioner argues that the corresponding structure for these means limitations is a processor that can execute computer program instructions. *Id.* at 5. Patent Owner does not propose constructions for these limitations. Prelim. Resp. 14.

Because construction of these means limitations is not needed to determine whether to institute trial in this case, we do not construe these limitations for this Decision. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

2. Transitions

Patent Owner proposes that [t]he term “transition” in claims 12 and 14 should be construed to require a direct transition. Prelim. Resp. 12.

Specifically, Patent Owner proposes construing “transition” in claim 12 as “direct transition,” and “transition” in claim 14 as “transition directly.” *Id.* Petitioner does not propose a construction for “transition.” Pet. 4–5.

To support its proposed construction, Patent Owner argues that the Specification repeatedly and consistently characterizes its transitions between

lower power states as direct transitions. Prelim. Resp. 13–14. Patent Owner further argues that the patentee during prosecution overcame a rejection of claim 14 by arguing that a particular prior art reference did not disclose direct transitions. *Id.* at 14 (citing Ex. 1002, 26).

We do not adopt Patent Owner’s proposed construction. Importantly, when the patentee wanted to limit its claims to direct transitions or direction transitioning, it did so expressly. Claims 1, 6, and 10 each expressly recite transitioning directly (Ex. 1001, 15:2–21, 15:40–58; 16:7–31).

In addition, it is presumed that “transitioning” in claims 1, 6, and 10 has a consistent meaning with “transition” in claims 12 and 14. “[T]he same terms appearing in different claims in the same patent . . . should have the same meaning ‘unless it is clear from the specification and prosecution history that the terms have different meanings at different portions of the claims.’” *Wilson Sporting Goods Co. v. Hillerich & Bradsby Co.*, 442 F.3d 1322, 1328 (Fed. Cir. 2006) (quoting *Fin Control Sys. Pty, Ltd. v. OAM, Inc.*, 265 F.3d 1311, 1318 (Fed. Cir. 2001)); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) (“[C]laim terms are normally used consistently throughout the patent”); *Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1342 (Fed. Cir. 2001) (“[A] claim term should be construed consistently with its appearance in other places in the same claim or in other claims of the same patent.”); *Fin Control*, 265 F.3d at 1318 (Fed. Cir. 2001); *Phonometrics, Inc. v. Northern Telecom Inc.*, 133 F.3d 1459, 1465 (Fed. Cir. 1998) (“A word or phrase used consistently throughout a claim should be interpreted consistently.”); *CVI/Beta Ventures, Inc. v. Tura LP*, 112 F.3d 1146, 1159 (Fed. Cir. 1997) (“[W]e are obliged to construe the term ‘elasticity’ consistently throughout the claims.”). Patent Owner has pointed

to nothing in the Specification or the prosecution history that teaches that the terms “transition” in claims 12 and 14 and “transitioning” in claims 1, 6, and 10 should be given inconsistent meanings. Prelim. Resp. 12–14.

In light of the presumed consistency between “transition” and “transitioning,” if those terms were limited to direct transitions, then the term “directly” in claims 1, 6, and 10 would be superfluous, and constructions that render claim terms superfluous are disfavored. *Merck & Co. v. Teva Pharms. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005) (“A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.”); *Elektia Instrument S.A. v. O.U.R. Sci. Int’l, Inc.*, 214 F.3d 1302, 1307 (Fed. Cir. 2000) (construing claim to avoid rendering the 30 degree claim limitation superfluous); *Gen. Am. Transp. Corp. v. Cryo–Trans, Inc.*, 93 F.3d 766, 770 (Fed. Cir. 1996) (rejecting the district court’s claim construction because it rendered superfluous the claim requirement for openings adjacent to the end walls).

Further, the Specification uses the term “transition” to also refer to indirect transitions. Ex. 1001, 4:32–37. Discussing the state machine behavior 700 of a conventional PON ONU, the Specification teaches that “no *direct transition* between the Doze Aware and the Sleep Aware states 704, 706 are provided.” *Id.* at 4:32–34 (emphasis added). The Specification continues: “[c]onventional ONUs therefore *lack* the technology of *directly transitioning* between two low power consumption states without having to go through an active state (e.g., a full powered state).” *Id.* at 4:34–37 (emphases added). The Specification further describes, “[i]n one detrimental aspect, *such a transition* through the active state may increase the power consumed by the ONU, thereby undesirably reducing battery life.” *Id.* at

4:37–40 (emphasis added). Thus, the Specification uses the term “such a transition” to refer to an indirect transition.

During the prosecution history, as Patent Owner noted, Applicant argued that a prior art reference, Pfeiffer, did not teach direct transitions. Prelim. Resp. 14 (citing Ex. 1002, 26). Applicant asserted that “Pfeiffer fails to teach the following amended claim features of Independent Claim 1: ‘transitioning the ONU directly from the first state to the second state and transitioning the ONU directly from the second state to the first state.’” Ex. 1002, 26. Applicant further argued that “[i]ndependent claims 7, 12, and 16 have been amended in a similar manner as Independent Claim 1, and are thus allowable for at least the same reasons as those provided above.” *Id.* at 27. (Application claim 16 issued as patent claim 14. *Id.* at 18.) For application claim 16, however, the Applicant’s statement was not correct. application claim 16 had not been amended like independent claim 1 to expressly recite a direct transition. *Id.* at 30, 33–34. Thus, we do not agree with Patent Owner that the cited argument in the prosecution history supports limiting “transitions” to direct transitions. Rather, in the cited argument, Applicant erroneously represented how application claim 16/patent claim 14 had been amended.

In sum, we construe the claim term “transition” to encompass both direct and indirect transitions.

III. ANALYSIS OF ASSERTED GROUNDS

A. Ground 1: Asserted Obviousness over G.987.3, Röger, and G.988

Petitioner argues that claims 1–5, 14, and 15 would have been obvious over the combination of G.987.3, Röger, and G.988. Pet. 1.

I. G.987.3

G.987.3 “describes the transmission convergence layer for 10-Gigabit-capable passive optical network systems” which are “a family of flexible access network systems that operate over a point-to-multipoint optical access infrastructure at the nominal data rate of 10.0 Gbit/s in at least the downstream direction, while providing a wide range of broadband and narrow-band services to end-users.” Ex. 1007, 9.⁹

G.987.3 explains, in the chapter on ONU power management (chapter 16), that “it is desirable to reduce the power consumed by an ONU.” *Id.* at 97. G.987.3 then describes “two . . . means of power management, which do require TC [(transmission convergence)] layer support. One is called doze mode; the other is referred to as cyclic sleep mode. Both are statically provisioned through OMCI [(ONU management and control interface)].” *Id.* G.987.3 also provides that the power management behavior of a given ONU is controlled by a pair of state machines residing at the OLT and the ONU. *Id.* at 99. G.987.3 then describes an ONU state machine (chapter 16.3.1) and an OLT state machine (chapter 16.3.2). *See id.* at 99, 102.

⁹ With respect to this reference, Petitioner notes that its “[c]itations throughout are made to the exhibit page number rather than the document page number.” *See* Pet. iv. We do the same.

With respect to an ONU state machine, G.987.3 provides Figure 16-1 (reproduced below) illustrating an ONU's state transition diagram (*see* Ex. 1007, 101):

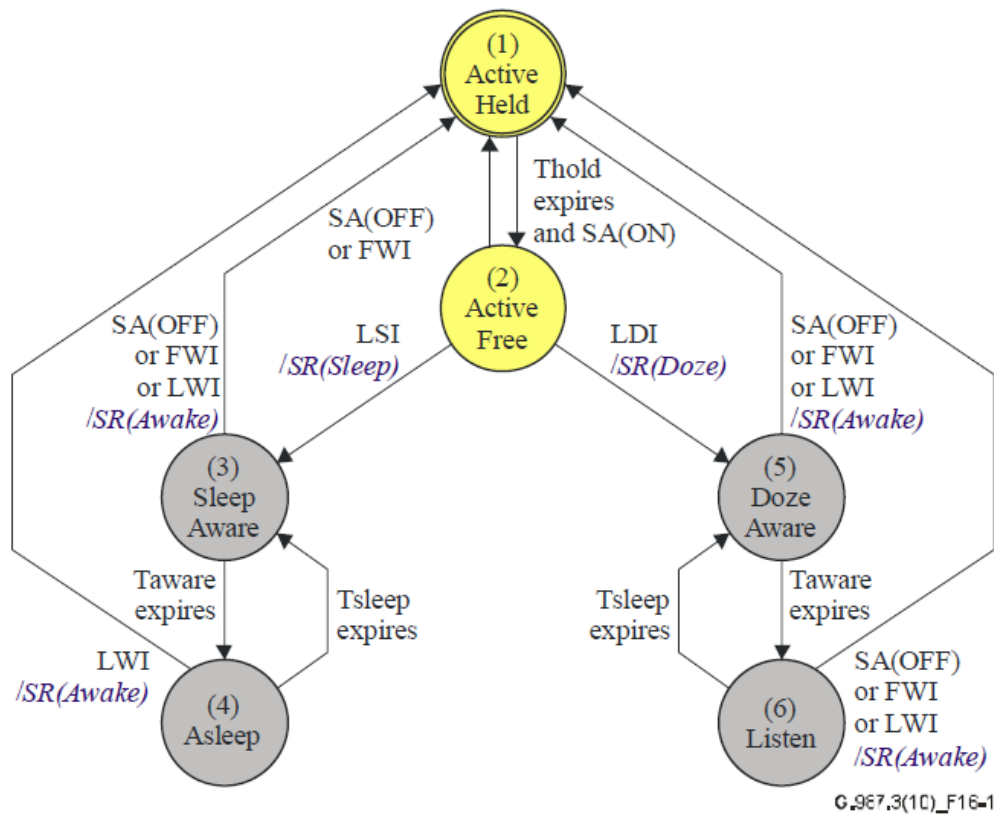


Figure 16-1 – ONU state transition diagram (initial state circled)

Id. at 101. Figure 16-1 depicts a set of six states and transitions between them. Table 16-2, reproduced below, provides more detail about these six states, including their corresponding semantic description. *Id.* at 99–100.

As shown in Figure 16-1 above and explained in Table 16-2, reproduced below, ONU power management states include (i) an initial ActiveHeld state in which the ONU is fully responsive, forwarding downstream traffic and responding to all bandwidth allocations, (ii) an ActiveFree state, in which the ONU is fully responsive, forwarding

downstream traffic and responding to all bandwidth allocations, (iii) an Asleep state, in which the ONU shuts down both its receiver and transmitter, retaining the ability to wake up on local stimulus, (iv) a Listen state, in which the ONU receiver is on and the transmitter is off, and (v) a DozeAware or SleepAware state in which both the ONU receiver and transmitter remain on. Ex. 1007, 100.

Table 16-2 – ONU power management states

State	Semantics
ActiveHeld	The ONU is fully responsive, forwarding downstream traffic and responding to all bandwidth allocations. Power management state transitions do not occur. The minimum sojourn in this state is enforced by the Thold timer. Upon entrance to this state, the ONU sends a Sleep_Request (Awake) PLOAM message. On the state diagrams, this is abbreviated as SR(Awake).
ActiveFree	The ONU is fully responsive, forwarding downstream traffic and responding to all bandwidth allocations. Power management state transition requests are a local decision.
Asleep	The ONU shuts down both its receiver and transmitter, retaining the ability to wake up on local stimulus. This state persists for a specified duration Isleep if not truncated by the arrival of a local stimulus LWI. Before exiting this state, the ONU ensures that it is fully powered up, synchronized, and capable of responding to both upstream and downstream traffic and control.
Listen	The ONU receiver is on; the transmitter is off. The ONU listens to the downstream signal and forwards downstream traffic, while retaining the ability to reactivate the transmitter on local stimulus or receipt of SA(OFF) from the OLT. This state persists for a specified duration Isleep if not truncated by the arrival of a local stimulus LWI or receipt of SA(OFF) or FWI from the OLT. Before exiting this state, the ONU ensures that it is fully powered up and capable of responding to both upstream and downstream traffic and control.
DozeAware SleepAware	Both ONU receiver and transmitter remain on. This state persists for a specified duration Iaware if not truncated by the arrival of a local stimulus LWI or receipt of SA(OFF) from the OLT. The ONU forwards downstream traffic and responds to all grant allocations. It is the responsibility of the OLT to transmit bandwidth allocations containing the PLOAMu flag with frequency sufficient to ensure that an aware ONU sees at least one.

Id.

G.987.3 further discloses, in Table 16-3 (reproduced below), a set of input events for an ONU. Ex. 1007, 100–101, Table 16-3.

Table 16-3 – ONU state machine inputs

Input categories	Input	Semantics
PLOAM events	Sleep_Allow(ON)	The OLT grants permission to the ONU to exercise any power management mode and leaves the selection of doze or cyclic sleep mode to the ONU's discretion.
	Sleep_Allow(OFF)	The OLT withholds consent to exercise a power management mode.
Bit-indication event	Forced wake-up indication (FWI)	Transmitting FWI as a flag of an allocation structure, the OLT requires immediate wake-up and transition to a full power state.
Input categories	Input	Semantics
Timer events	Thold expiration	The event applies in the ActiveHeld state, controlling the minimum sojourn in the state.
	Taware expiration	The event applies in DozeAware and SleepAware states, controlling the sojourn in the states.
	Tsleep expiration	The event applies in Asleep and Listen states, controlling the sojourn in the states.
Local events	Local sleep indication (LSI)	The ONU has no local reason to remain at full power and is willing to exercise the cyclic sleep power management mode.
	Local doze indication (LDI)	The ONU has no local reason to remain at full power and is willing to exercise the doze power management mode.
	Local wake-up indication (LWI)	A local stimulus prevents the ONU from exercising any power management mode.
NOTE – The LSI, LDI, and LWI events are conceptually derived from the ONU's ternary stimulus status level (Awake/Sleep/Doze) and correspond to the events of the level change or, in case of ActiveFree state, to the sampled value at the time of the transition. The specific criteria for the local stimulus definition remain out of scope of this Recommendation.		

Id. at 100–101.

And in Table 16-4 (reproduced below), G.987.3 discloses the normative specification of the state transitions and outputs for the ONU.
Ex. 1007, 100, 102, Table 16-4.

Table 16-4 – ONU state transition and output table

Inputs	ONU power management states					
	(1) ActiveHeld	(2) ActiveFree	(3) SleepAware	(4) Asleep	(5) DozeAware	(6) Listen
FWI	*	→ (1)	→ (1) /SR(Awake)		→ (1) /SR(Awake)	→ (1) /SR(Awake)
SA (OFF)	*	→ (1)	→ (1) /SR(Awake)		→ (1) /SR(Awake)	→ (1) /SR(Awake)
SA (ON)	→ (2) Upon Thold exp. (Note)	*	*		*	*
LWI	*	*	→ (1) /SR(Awake)	→ (1) /SR(Awake)	→ (1) /SR(Awake)	→ (1) /SR(Awake)
LSI		→ (3) /SR(Sleep)	*	*		
LDI		→ (5) /SR(Doze)			*	*
Tsleep exp.				→ (3)		→ (5)
Taware exp.			→ (4)		→ (6)	
* Indicates a self-transition. ■ A shaded cell means that the input is not applicable in the given state. NOTE – An ONU remains in the ActiveHeld state for at least Ihold upon entry into that state regardless of the SA message parameter value indicated by the OLT. The minimum sojourn in the ActiveHeld state is controlled by timer Thold that is initiated to Ihold upon ONU's entry into the ActiveHeld state. When Thold expires, the ONU executes a transition into to the ActiveFree state if the latched value of SA message parameter is ON or as soon as SA (ON) message is received.						

Id. at 102.

With respect to an OLT state machine, G.987.3 provides Figure 16-2 (reproduced below) illustrating an OLT's state transition diagram (Ex. 1007, 102, 104):

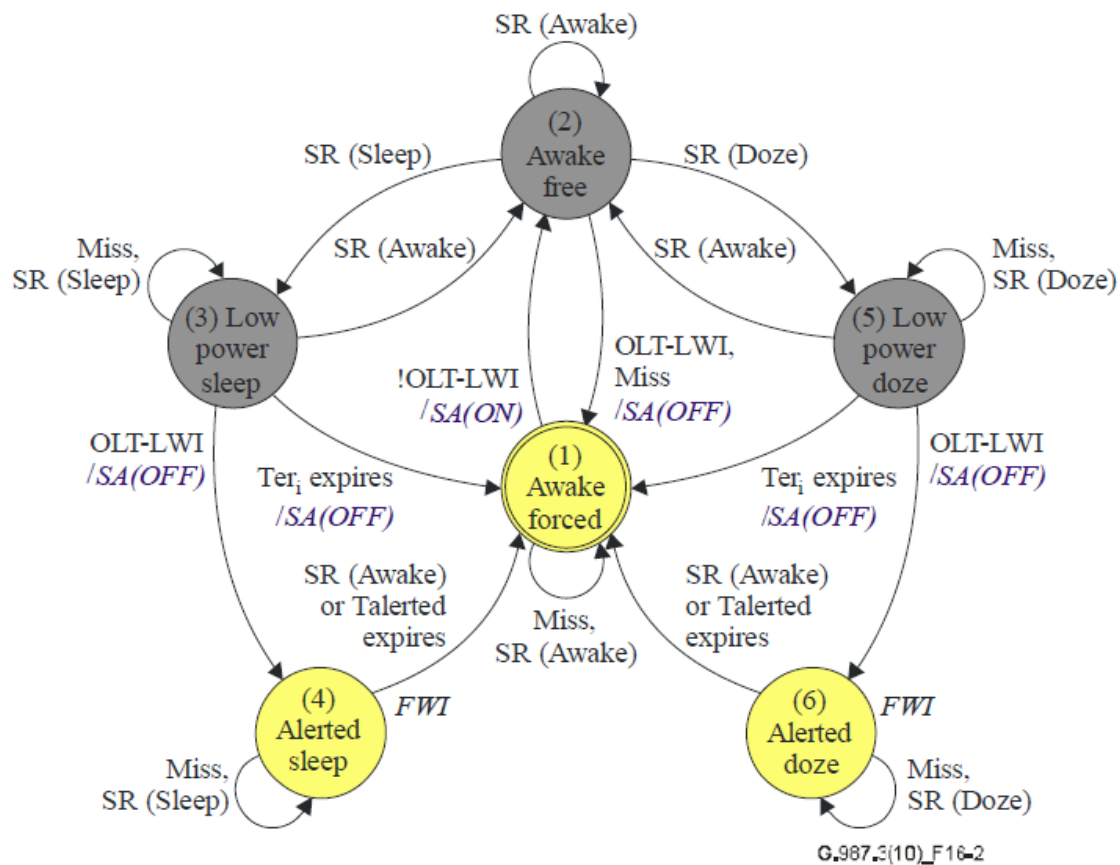


Figure 16-2 – OLT state transition diagram (initial state circled)

Id. at 104.

G.987.3 also discloses (in Table 16-7, reproduced below), the normative specification of the state transitions and outputs for an OLT.
Ex. 1007, 102, 105.

Table 16-7 – OLT state transition and output table

Inputs	OLT power management states					
	(1) AwakeForced	(2) AwakeFree	(3) LowPower Sleep	(4) Alerted Sleep / FWI	(5) LowPower Doze	(6) Alerted Doze / FWI
SR (Awake)	*	*	→ (2)	→ (1)	→ (2)	→ (1)
SR (Sleep)	* /SA(OFF) (Note 1)	→ (3)	*	*	→ (1) /SA(OFF) (Note 2)	→ (1) /SA(OFF) (Note 2)
SR (Doze)	* /SA(OFF) (Note 1)	→ (5)	→ (1) /SA(OFF) (Note 2)	→ (1) /SA(OFF) (Note 2)	*	*
Allocation miss	*	→ (1) /SA(OFF)	*	*	*	*
OLT-LWI ON	*	→ (1) /SA(OFF)	→ (4) /SA(OFF)	*	→ (6) /SA(OFF)	*
OLT-LWI OFF	→ (2) /SA(ON)	*	*	* (Note 3)	*	* (Note 3)
Talerted exp.				→ (1)		→ (1)
Ter _i exp.			→ (1) /SA(OFF)		→ (1) /SA(OFF)	

NOTE 1 – An exception from the subgraph rule; an output may help to stabilize the state machine in case the condition is caused by a lost SA(OFF) message. The output is not shown on the FSM diagram.
NOTE 2 – Direct transitions between Doze mode and Cyclic Sleep mode are disallowed. When the OLT receives a request to execute such a transition, it attempts to regain state machine synchronization by waking up the ONU. The transitions are not shown on the diagram for the sake of compactness.
NOTE 3 – This is a situation when the OLT initiates a wake-up, but the OLT-LWI is cleared before the ONU is awoken. In this case, the OLT, instead of cancelling the wake-up process and attempting to immediately revert to a low power state, insists on waking the ONU up with the intent to re-enter a low power state via states AwakeForced and AwakeFree.

Id. at 105.

2. Röger

Röger describes “[o]ptically powered fiber networks” employing “a sensor network with [heterogeneous] subscribers [having widely varying needs with respect to power and bandwidth] consuming less than 1 μ W average power, and an optically powered high-speed video link transmitting data at a bitrate of 100 Mbit/s.” Ex. 1006, 1.¹⁰ Röger’s disclosed “optically powered fiber network . . . connects and provides power to a multitude of subscribers, which are attached to a central office (CO) in a combined star and tree-like topology.” *Id.* at 3. Röger explains that the focus of its study is “on energy optimized subscriber hardware in combination with a new and flexible *low-energy medium-access control* (LE-MAC) protocol, which enables efficient use of the optically provided energy that is transmitted to each subscriber.” *Id.* In order to operate all subscribers with the least possible power consumption, Röger “extend[s] specifications of common medium access control (MAC) protocols” with additional features that (i) implement communication of subscribers only with CO, (ii) support of an “energy saving *snooze mode*: Subscribers maintain synchronism with CO,” (iii) support of a “minimum-energy *sleep mode*: Subscribers lose synchronism with CO,” the sleep mode requiring “[a]ll communication circuitry [to be] switched off” and “[a]utonomous wake-up needed, no external control possible.” *Id.* at 6 (emphasis omitted).

¹⁰ With respect to this reference, Petitioner notes that its “[c]itations throughout are made to the exhibit page number rather than the document page number.” *See* Pet. iv. We do the same.

Figure 2 of Röger, reproduced below, illustrates the LE-MAC protocol's timing chart schematic. Ex. 1006, 6–7.

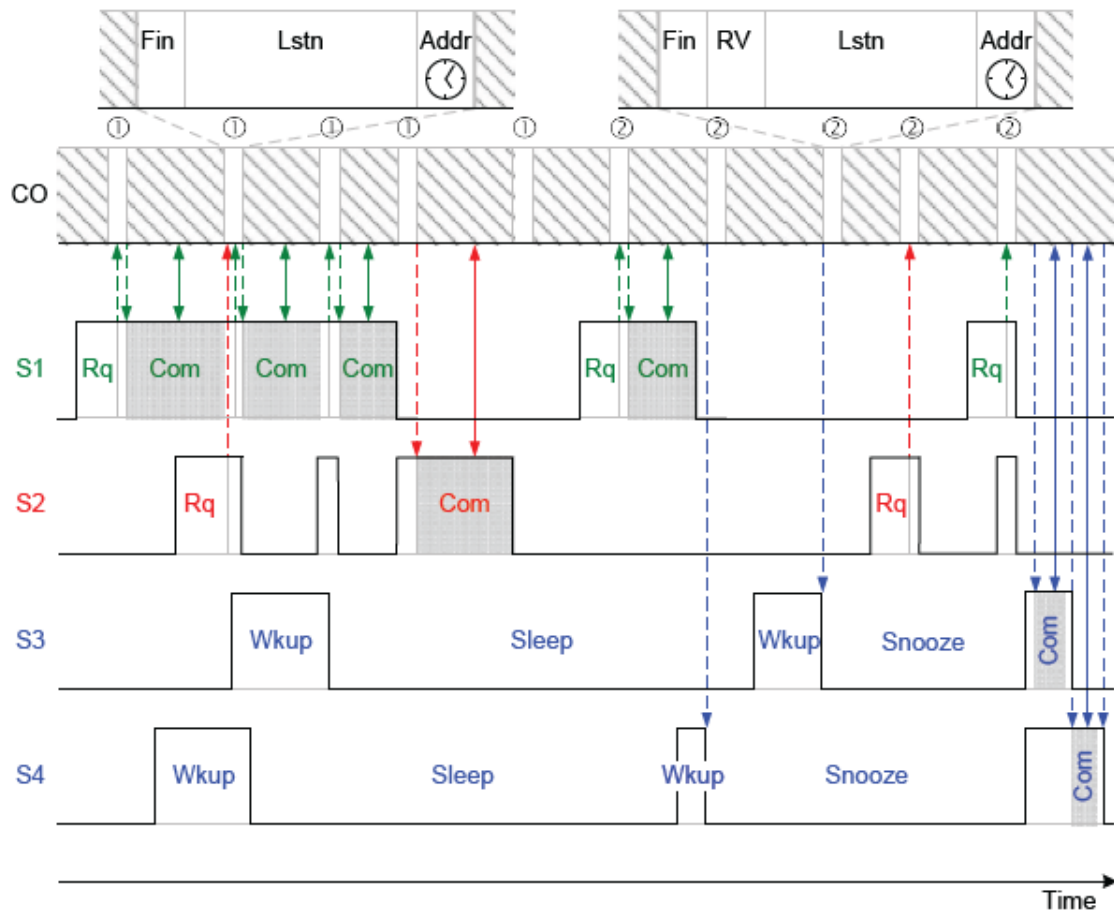


Fig. 2. Timing chart schematic for low-energy medium access control (LE-MAC) protocol; for details, see main text. Due to the treelike network architecture, the central office (CO) broadcasts its messages to each subscriber, which can communicate only with CO, but not peer-to-peer. — *Subscribers with high bandwidth demand* (S1, S2) along with low duty cycle subscribers (S3, S4) are handled by CO via broadcast polling (control) signals ① or ②, top row. Broken arrows stand for unidirectional, solid double-arrows for bidirectional communication (Com) of subscriber and CO. Access requests (Rq) of subscribers are queued by CO during the polling signal's listen interval Lstn in ①. Then CO decides which subscriber will be scheduled next and for what time interval. This is sent during the addressing interval Addr, after which communication can start (Com). — *Low duty cycle subscribers* spend most of the time in a minimum-energy Sleep mode that is interrupted by nearly periodically appearing wake-up intervals Wkup, which are initiated autonomously by the subscribers. Communication with CO is managed by broadcasting special polling (control) signals ②, top row right. During Wkup a rendezvous time stamp RV is sensed, a precise clock is set, and the subscribers return to a power-saving Snooze mode. At rendezvous time the subscribers awake, listen to be addressed, communicate with CO, and go again to Sleep mode.

Id. at 7. As shown in Figure 2, the CO organizes the communication with subscribers by broadcasting the polling signals ① or ② (top row of Figure

2). *Id.* at 6. The CO's communication protocol consists of alternating polling and Com sequences. *Id.* In Figure 2, subscribers S1 and S2 require CO's attention and send a request to CO, which then listens for a fixed time interval (Lstn), acknowledges reception, and schedules the subscribers that have requested bandwidth. *Id.* The scheduled subscribers may communicate with the CO during the assigned communication time slot (Com, solid double arrow), while deferred subscribers learn by the broadcast when a next interval is to be expected, and can spend this idle time in an energy saving snooze mode, before repeating their communication request. *Id.* Subscribers maintain time synchronism with the CO, even in snooze mode. *Id.* Subscribers with small duty cycles (S3 and S4 in Figure 2) may reside in a minimum-energy sleep mode. *Id.*

Röger further describes "a more efficient protocol" that may "save both energy and communication bandwidth" and involves "an additional rendezvous sequence (RV), the purpose of which is to efficiently inform sleep mode subscribers if and when a communication 'rendezvous' will be arranged in not too far a future." Ex. 1006, 7. The RV sequence may be a multicast call to a whole group of subscribers. *Id.* Röger explains that the protocol would work as follows:

When waking up (WkUp in Fig. 2), subscribers S3 and S4 activate their basic receiver circuitry and listen for the CO's polling. If the rendezvous signal RV is *not* received during WkUp (polling signal ① in Fig. 2 as opposed to polling signal ②), the subscribers go back to sleep, as is the case for S3 and S4 during their first WkUp period in Fig. 2. However, if after the Fin sequence a device receives the rendezvous signal RV (polling signal ② in Fig. 2), it extracts the time stamp for the next rendezvous with CO, sets a high precision clock to the rendezvous time, and then goes to an energy-saving snooze mode.

Snoozing subscribers (S3 and S4) maintain a precise quartz clock, awake exactly at rendezvous time and wait for being addressed by the CO. On reception of their individual address (broken arrows downwards), the first chosen subscriber S3 communicates with CO and exchanges data (solid double arrow). Having finished, S3 listens again to CO. On reception of a valid address other than its own (or being triggered by an internal time-out signal), S3 goes back to sleep mode. At this time (broken arrow downwards), S4 senses its own address, starts communicating with CO (solid double arrow), and ends the same way as formerly S3. This can be repeated for as many subscribers as needed. If a subscriber is not addressed or if the addressing signal is corrupted, an internal time-out mechanism sends the device back to sleep mode.

Id. at 7–8.

Figure 6 of Röger, reproduced below, shows a measured timing diagram for an experimental network consisting of a CO and four ultralow duty cycle subscribers S3-S6. Ex. 1006, 12.

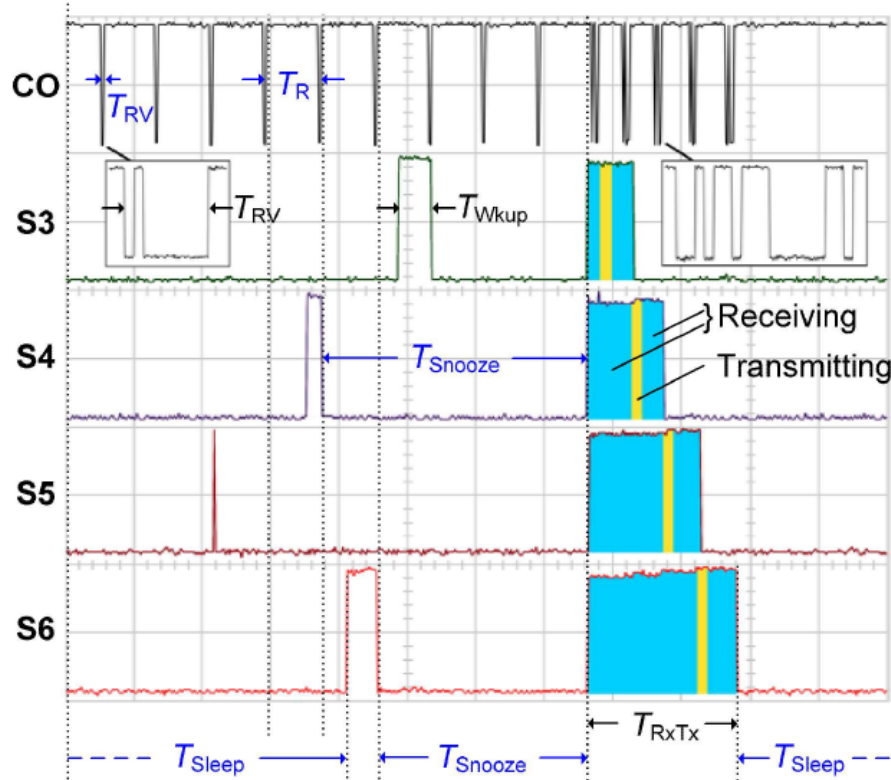


Fig. 6. Measured timing chart for low-energy medium access control (LE-MAC) protocol. Four randomly self-activating subscribers (S3...6) synchronize and communicate with the central office CO. Trace CO displays the data transmitter voltage of the CO. High S3...6 levels indicate energy-costly receive or transceive (RxTx) modes, low levels mark low-power Sleep or Snooze modes. Within a time interval T_{Sleep} the CO polls the subscribers with rendezvous signals RV (width T_{RV}) that repeat with a period $T_{\text{R}} = T_{\text{Sleep}} / R$ where R is a fixed number. These RV signals transmit information about the next rendezvous time with CO. If a sleeping subscriber becomes awake during a rendezvous signal is broadcast by CO, the subscriber senses the rendezvous time, starts a precise clock and goes snoozing. At rendezvous time all subscribers awake, wait for being addressed and exchange data with CO. An ending signal issued by CO sends the subscribers back sleeping.

Id. at 12. In Figure 6, when a receive mode is activated, the subscriber stays listening whether CO broadcasts a rendezvous signal RV (trace S3). *Id.* On reception of RV, the subscriber switches to an energy-saving snooze mode, watches its high-Q clock, and activates itself precisely at the scheduled

rendezvous time. *Id.* If no valid RV signal could be decoded, the subscriber goes back sleeping. At rendezvous time all subscribers switch to receive mode and stay listening for their address to be broadcast by CO (right inset of Fig. 6). *Id.* When, for instance, subscriber S4 recognizes its address, it activates its transmitter, sends to CO whatever information was required, and deactivates its transmitter again. *Id.* at 12–13. If CO fails to receive the subscriber's data, CO repeats addressing S4 a fixed number of times until either reception succeeds, or until the subscriber's time-out mechanism sends S4 back sleeping. *Id.* When CO receives the subscriber's data (or gave up interrogating S4), CO broadcasts the next subscriber's address (e.g., S5), and the previously addressed subscriber S4 returns to sleep mode as soon as it recognizes a valid address not being its own. *Id.* Having interrogated all desired subscribers, CO broadcasts an End command, thus sending the remaining listening subscribers to sleep mode. *Id.*

3. G.988

G.988 “specifies the optical network unit (ONU) management and control interface (OMCI) for optical access networks” and “the managed entities of a protocol-independent management information base (MIB) that models the exchange of information between an optical line termination (OLT) and an optical network unit (ONU),” and “covers the ONU management and control channel, protocol and detailed messages.”

Ex. 1008, 3.¹¹ G.988 describes an access system having a single ONU on each fiber subtended from the OLT, with the OMCI fitting into the overall model for an access network system as illustrated in Figure 6.1-1, reproduced

¹¹ With respect to this reference, Petitioner notes that its “[c]itations throughout are made to the exhibit page number rather than the document page number.” *See* Pet. iv. We do the same.

below (in which the dotted line shows a path for OMCI signals between an OLT and ONU). *Id.* at 18.

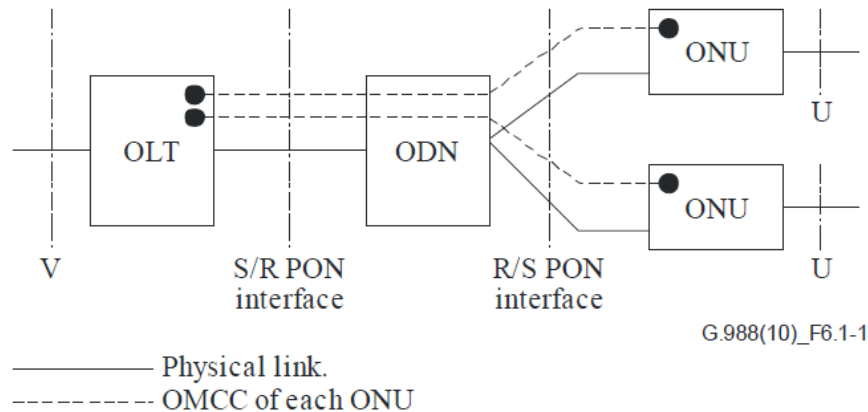


Figure 6.1-1 – Reference model, OMCI

Id.

With respect to the ONU dynamic power management control, G.988 describes a managed entity (ME) that models the ONU's ability to enter power conservation modes in cooperation with the OLT in an ITU-T G.987 system, which specifies two modes, doze and cyclic sleep. *Id.* at 81. G.988 explains that an ONU that supports power conservation modes automatically creates an instance of this managed entity. *Id.* Attributes associated with an ONU's dynamic power management control include (i) a power reduction management mode which enables one or more of the ONU's managed power conservation modes, (ii) a maximum sleep interval, which specifies the maximum time the ONU spends in its asleep or listen states, as a count of 125-microsecond frames, (iii) a minimum aware interval, which specifies the time the ONU spends in its aware state, as a count of 125-microsecond frames, before it re-enters asleep or listen states, and (iv) a minimum active held interval, which specifies the minimum time during which the ONU

remains in the active held state, as a count of 125-microsecond frames. *Id.* at 81–82.

4. Independent Claim 1

As mentioned, Petitioner argues that claim 1 would have been obvious over the combination of G.987.3, Röger, and G.988. Pet. 1. Petitioner provides a limitation-by-limitation analysis of claim 1, supported by expert testimony. *Id.* at 8–35 (citing various paragraphs in Ex. 1003). Patent Owner disagrees, focusing on limitation 1D and Petitioner’s proffered motivation to combine the references’ teachings. Prelim. Resp. 16–28. Patent Owner also provides expert testimony to support its arguments. *Id.* (citing various paragraphs in Ex. 2001).

a. Preamble 1A and Limitations 1B and 1C

Petitioner argues that G.987.3 teaches “‘10-Gigabit-capable [PON] systems,’ including ONUs and OLTs in communication with each other.” Pet. 15 (alteration in original). Petitioner maps the recited first and second states to the “Listen” and “Asleep” states in G.987’s ONUs. *Id.* at 15–17. Patent Owner does not challenge Petitioner’s analysis of preamble 1A and limitations 1B and 1C. Prelim. Resp. 16–28. Upon review of the record, we determine that Petitioner has made a sufficient showing for preamble 1A and limitations 1B and 1C.

b. Limitation 1D

Limitation 1D recites: “transitioning the ONU directly from the first state to the second state and transitioning the ONU directly from the second state to the first state, based on a power management rule.” Ex. 1001, 15:9–13. Petitioner argues that G.987.3 alone suggests this limitation. Pet. 19. Petitioner further argues that the combination of G.987.3 and Röger teaches

or suggests this limitation. *Id.* at 20–23. Patent Owner provides counterarguments for both arguments. Prelim. Resp. 16–27.

i. Petitioner’s Arguments

(a). Petitioner’s Arguments Regarding G.987.3 Alone

Petitioner acknowledges that G987.3 teaches indirect, rather than direct, transitions between its “Listen” and “Asleep” states. Pet. 19. Petitioner argues, however, that an ordinarily skilled artisan would have been motivated to apply direct transitions between these states to save energy by not powering on the transmitter when transitioning between these states. *Id.* Petitioner argues that modifying G.987.3 to have direct transitions between its “Listen” and “Asleep” states “would have been driven by a well-known problem in the field, reducing power consumption.” *Id.* at 11 (citing Ex. 1003 ¶ 70). Petitioner quotes G.987.3’s statement that “it is desirable to reduce the power consumed by an ONU as much as possible.” *Id.* (quoting Ex. 1007, 97; citing Ex. 1003 ¶ 70). Petitioner further asserts that “[a]s was well known, it was desirable to reduce power to realize “more efficient realizations of given functions.”” *Id.* (quoting Ex. 1007, 97; citing Ex. 1003 ¶ 70). Petitioner argues that “[g]reater power consumption increases cost, and in a PON with multiple ONUs, saving power at each ONU can lead to a significant reduction in total cost.” *Id.*

Petitioner further contends that “there are a finite number of solutions to reduce power consumption in optical networks.” Pet. 11. According to Petitioner, possible transitions between different low-power states are even more limited given the limited numbers of power states and scenarios for an ONU to transition between them. *Id.* at 11–12. Petitioner asserts that, therefore, it would have been obvious to an ordinarily skilled artisan to try

the finite number of transitions and find that direct transition between Listen mode and Asleep sleep mode reduces power consumption compared to transitioning to a full-power state in between Listen mode and Asleep sleep mode. *Id.* at 12.

(b). Petitioner’s Arguments Regarding Röger

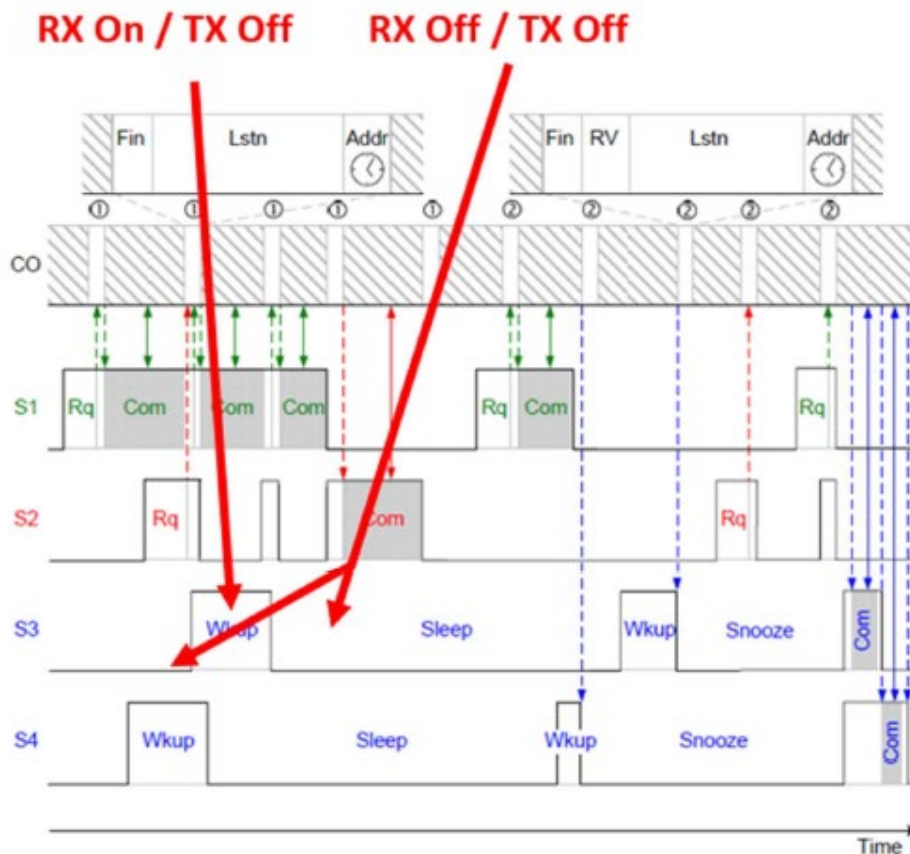
Petitioner argues that Röger teaches an efficient protocol that saves both energy and communication bandwidth by using a rendezvous sequence to inform sleep mode subscribers of future communications. Pet. 20.

Petitioner asserts that, at times, subscriber stations (ONUs) are in a sleep mode where “all communication circuitry is switched off.” *Id.* According to Petitioner, the subscriber stations then “activate their basic receiver circuitry” for a wake-up period and “listen for the [OLT’s] polling.” *Id.* (alteration in original). Petitioner argues that, thus, the subscriber stations (ONUs) directly transition from the sleep mode (“first state”) to a receive state (“second state”) where the receiver is turned on and the transmitter remains off. *Id.*

Petitioner further argues that “[i]f a rendezvous signal is not received by the subscriber station during the wake-up period, ‘the subscribers go back to sleep.’” Pet. 20 (emphasis omitted). Petitioner asserts that, thus, the subscriber stations (ONUs) directly transition from a receive mode (“first state”) where the receiver is turned on and the transmitter is turned off to a sleep mode (“second state”) where both the receiver and transmitter are turned off. *Id.*

Petitioner argues that Figure 2 of Röger demonstrates direct transitions between a receive mode and a sleep mode. Pet. 20–21. Petitioner provides the following annotated version of Figure 2:

Ex. 1006, Fig. 2 (annotated)



Id. at 21. Figure 2 above is a “[t]iming chart schematic for low-energy medium access control (LE-MAC) protocol.” Ex. 1006, 7. The annotated version of Figure 2 above provides arrows and text annotations in red identifying where Petitioner contends that (i) the ONU’s receiver would be on but the transmitter would be off (RX On /TX Off) and (ii) the ONU’s receiver and transmitter would both be off (RX Off /TX Off). Pet. 21.

Petitioner argues that the annotated version of Figure 2 above illustrates that “the subscriber station S3 (among other examples) first

operates in a sleep mode (“second state”) illustrated by the first low portion of the line representing subscriber station S3.” Pet. 20. Further, Petitioner argues that the subscriber station S3 “then transitions directly into a receive mode (‘first state’) illustrated by the first high portion of the line representing subscriber station S3.” *Id.* at 20–21. Petitioner then asserts that subscriber station S3 “then finally transitions directly back into the sleep mode (‘second state’) illustrated by the second low portion of the line representing subscriber station S3.” *Id.* at 21. Petitioner argues that thus Figure 2 demonstrates direct transitions between the subscriber’s snooze (sleep) mode and receive mode. *Id.*

*(c). Petitioner’s Arguments Regarding Combining
G.987.3 and Röger*

Petitioner argues that an ordinarily skilled artisan would have been motivated to combine G.987.3 with Röger’s teachings regarding direct transitions. Pet. 10. Petitioner asserts that both references teach transitions in ONUs between a first state where a receiver is on and a transmitter is off and a second state where both the transmitter and receiver are off. *Id.* Petitioner asserts that G.987.3 does not expressly allow direct transitions between its Doze mode (a first state) and its Cyclic Sleep mode (a second state). *Id.* Petitioner acknowledges that note 2 of the OLT state transition table of G.987.3 states that direct transitions between the Doze mode and Cyclic Sleep mode are disallowed. *Id.* Petitioner, however, argues that this note is applicable only to OLTs. *Id.* Petitioner asserts that the same note is present in G.9807.1, which permits direct transitions. *Id.* at 10–11.

Petitioner argues that an ordinarily skilled artisan would have been motivated to apply the direct transitions taught by Röger to the ONUs of G.987.3 because of known advancements in technology. Pet. 12. Petitioner

asserts that advancements in chip speed that occurred before the priority date of the '892 patent made it more practical to periodically turn on and off a receiver while a transmitter remained off in an ONU. *Id.* at 13. In particular, Petitioner asserts that an ordinarily skilled artisan would have been motivated to apply the direct transitions of Röger in light of advancements in how fast a receiver could be switched on. *Id.*

According to Petitioner, periodically turning on a receiver was previously less efficient due to a slower continuous mode (CM) clock and data recovery (CDR) time of 2–5 milliseconds for each RxOn event for earlier electronic circuits. *Id.* Petitioner further argues that before the priority date of the '892 patent, it was known that a modern Burst mode (BM) CDR technology that utilized a local oscillator unit at each ONU reduced the CDR time down to 1–10 nanoseconds. *Id.* Petitioner asserts that this reduced the time for an RxOn event and made it much more practical to periodically switch the receiver on and off while keeping the transmitter off, since delays in CDR and additional power consumption were reduced. *Id.* Further, Petitioner asserts that this improvement to electronic chip and circuits technology also reduced the attractiveness of leaving an ONU in a receive-only state since additional power could be saved by periodically switching the receiver off without causing significant delay during transition. *Id.*

Petitioner argues that, given this well-known improvement to electronic chip and circuits technology, an ordinarily skilled artisan would have been motivated to apply the direct transitions between sleep and receive states from Röger to G.987.3 because Röger specifically states that its protocol allows ONUs to operate with “the least possible power

consumption” to “save both energy and communication bandwidth.” Pet. 14 (quoting Ex. 1006, 6–7). According to Petitioner, saving energy and communication bandwidth allows the PONs to perform their functionality with more efficiency. *Id.*

Petitioner further argues that an ordinarily skilled artisan would have had a reasonable expectation of success in applying the direct transitions taught by Röger to the ONUs of G.987.3. Pet. 14.

ii. Patent Owner’s Arguments

(a). Patent Owner’s Arguments Regarding G.987.3 Alone

Patent Owner argues that an ordinarily skilled artisan would not have modified G.987.3’s ONUs to have direct transitions between Listen and Asleep states because the modified ONU would no longer be compliant with the G987.3 standard. Prelim. Resp. 16–17. Patent Owner asserts that “G.987.3 explicitly disallows ‘[d]irect transitions between Doze mode and Cyclic Sleep mode,’ which is exactly what Petitioners are proposing.” *Id.* at 17 (alteration in original). Patent Owner asserts that an ordinarily skilled artisan would have been motivated to retain compliance with the standard. *Id.* at 18.

Patent Owner argues that the statement in G.987.3 prohibiting direct transitions applies to ONUs. Prelim. Resp. 18. Patent Owner argues that the

Doze mode and Cyclic Sleep mode are ONU power saving modes. *Id.*
Patent Owner provides the following annotated excerpt from G.987.3:

11.3.4.5 Sleep_Request message		
An ONU sends Sleep_Request to signal its intention to change power saving modes. Clause 16 defines the use and function of this message in detail.		
Octet	Content	Description
1-2	ONU-ID	
3	0x10	Message type ID "Sleep_Request".
4	SeqNo	Always 0.
5	Activity_level	0- Sleep_Request (awake). 1- Sleep_Request (doze). Doze request, ONU receiver active – During low-power periods of doze mode, the ONU can receive downstream traffic. 2- Sleep_Request (sleep). Cyclic sleep request, ONU receiver inactive – During low-power periods of cyclic sleep mode, the ONU cannot receive downstream traffic. Other values reserved.
6-40	Padding	Set to 0x00 by the transmitter; treated as "don't care" by the receiver.
41-48	MIC	Message integrity check

Prelim. Resp. 18 (reprinting from Ex. 1007, 59). The above excerpt provides details regarding G.987.3's Sleep_Request message. The excerpt states that "[a]n ONU sends Sleep_Request to signal its intention to change power saving modes," and indicates that the Sleep_Request can be a "[d]oze request" or a "[c]yclic sleep request."

Patent Owner asserts that the statement in Table 16–7 of G.987.3 prohibiting direct transitions was made when discussing OLT state transitions because the OLT is involved in controlling ONU power states, not because the statement applies only to OLTs. Prelim. Resp. 19. Patent Owner quotes G.987.3: "[t]he power management behaviour of a given ONU is controlled by a pair of state machines residing at the OLT and the ONU." *Id.* (quoting Ex. 1007, 99).

Patent Owner acknowledges that G.9807.01 has the same statement prohibiting direct transitions as G.987.3. Prelim. Resp. 19. Patent Owner further acknowledges that G.9807.1 allows direct transitions in its Watchful Sleep mode. *Id.* Patent Owner argues that the existence of direct transitions in G.9807.1's Watchful Sleep mode is not contradictory to prohibiting direct transitions between the Doze and Cyclic Sleep modes in an ONU because the Watchful Sleep mode is distinct from the Doze and Cyclic Sleep modes. *Id.* at 19–20. Patent Owner argues that the Watchful Sleep mode was not standardized until after the '892 Patent was filed and that an ordinarily skilled artisan can use direct transitions in the Watchful Sleep mode and comply with G.9807.1, but cannot use direct transitions with G.987.3. *Id.* at 20.

Patent Owner also argues that an ordinarily skilled artisan would not have been driven solely by reducing power consumption. Prelim. Resp. 20. Patent Owner asserts that an ordinarily skilled artisan would have been focused on standard compliance. *Id.* Patent Owner also argues that Petitioner's proposed modification would add complexity to the ONU state machine. *Id.*

Patent Owner argues that there are numerous potential solutions to reduce power consumption in optical networks, including power shedding, which itself takes into account numerous shedding classes. Prelim. Resp. 20. Patent Owner concludes that it would not have been obvious to use the '892 Patent's approach to transition mechanics between two specific lower power states in the ONU (as opposed to looking for power savings in, for example, another network component). *Id.* at 20–21.

(b). Patent Owner's Arguments Regarding Röger

Patent Owner argues that Röger does not disclose direct transitions between low power states. Prelim. Resp. 21. Patent Owner asserts that

Röger is not concerned with transitions at a state machine level, does not discuss them, and does not contain a single state diagram. *Id.*

Patent Owner contends that the statement in Röger that subscribers activate their basic receiver circuitry says nothing as to whether the transition from the sleep mode to the receive mode is direct. Prelim. Resp. 21. Patent Owner asserts that G.987.3 compliant ONUs activate their basic receiver circuitry when transitioning from the Asleep state to the Listen state, but do so with an indirect transition. *Id.* Further, Patent Owner argues that the statement in Röger that subscribers go back to sleep also says nothing about whether the transition between to the sleep state was direct. *Id.*

Patent Owner argues that Figure 2 of Röger does not describe transitions between a sleep mode and a receive mode at a state machine level. Prelim. Resp. 23. Patent Owner asserts that an intermediate state exists, which is not illustrated in the diagram. *Id.* Patent Owner further argues that Figure 6 of Röger could be interpreted to as showing that the receive mode and transceive mode have the same power consumption because both modes correspond to high portions of a line. *Id.* at 23–24. Patent Owner argues, however, that the supply current for the transceive mode is almost double the supply current for the receive mode. *Id.* at 24. Patent Owner argues that, just as Figure 6 fails to show power consumption details, Figure 2 fails to show state transition details. *Id.* at 25.

Patent Owner argues that the high levels in Figure 6 of Röger indicate both receive or transceive modes, so a single high portion of line in Röger's diagrams can indicate multiple different states. Prelim. Resp. 25. Patent Owner argues that “Com” in Figure 2 of Röger corresponds to multiple states. *Id.* Patent Owner further argues that Petitioner admits that Röger's

ONU enters an intermediate fully powered up state between the snooze and receive modes. *Id.* at 25–26.

*(c). Patent Owner’s Arguments Regarding
Combining G.987.3 and Röger*

Patent Owner argues that G.987.3 explicitly prohibits its proposed combination with Röger. Prelim. Resp. 26. Patent Owner asserts that Petitioner’s proposed combination would directly alternate between sleep and doze modes but G.987.3 disallows direct transitions between those modes. *Id.* Patent Owner further asserts that an ordinarily skilled artisan would have focused on complying with this standard. *Id.*

Patent Owner disputes Petitioner’s argument that advancements in technology at the time and the desire for reduced energy consumption would have motivated an ordinarily skilled artisan to apply direct transitions to the ONUs of G.987.3. Prelim. Resp. 26–27. Patent Owner argues that Petitioner contends that advancements in how fast a receive could be switched on due to the decreased clock and data recovery (CDR) disclosed in Wong would have motivated the application of direct transitions to the ONUs of G.987.3. *Id.* at 27. Patent Owner argues:

The classic device for recovering a clock signal from the data transitions is utilizing a Phase Lock Loop (“PLL”). The technology always evolves but not substantially enough during the relevant period to drive the selection of power saving modes of the ONU. There is an application-dependent design tradeoff that always needs to be made for any PLL. The closed loop bandwidth of the PLL dictates two major competing design goals: the incoming signal always has jitter (noise) on it, but the recovered clock should be as stable (jitter free) as possible. Thus, to reduce the jitter on the clock, it is best to have a very low closed loop bandwidth. However, the lower the closed loop bandwidth, the slower the acquisition time. As result, it is not ideal to have a superfast locking time, at the cost of having excessive noise on

the recovered clock. Therefore, the PLL properties are a design consideration, not a technology limitation for ONUs. And the CDR advancements that Petitioners point to would not have motivated a POSA to apply Röger to G.987.3.

Id. (citing Ex. 2001 ¶ 51, internal citations omitted).

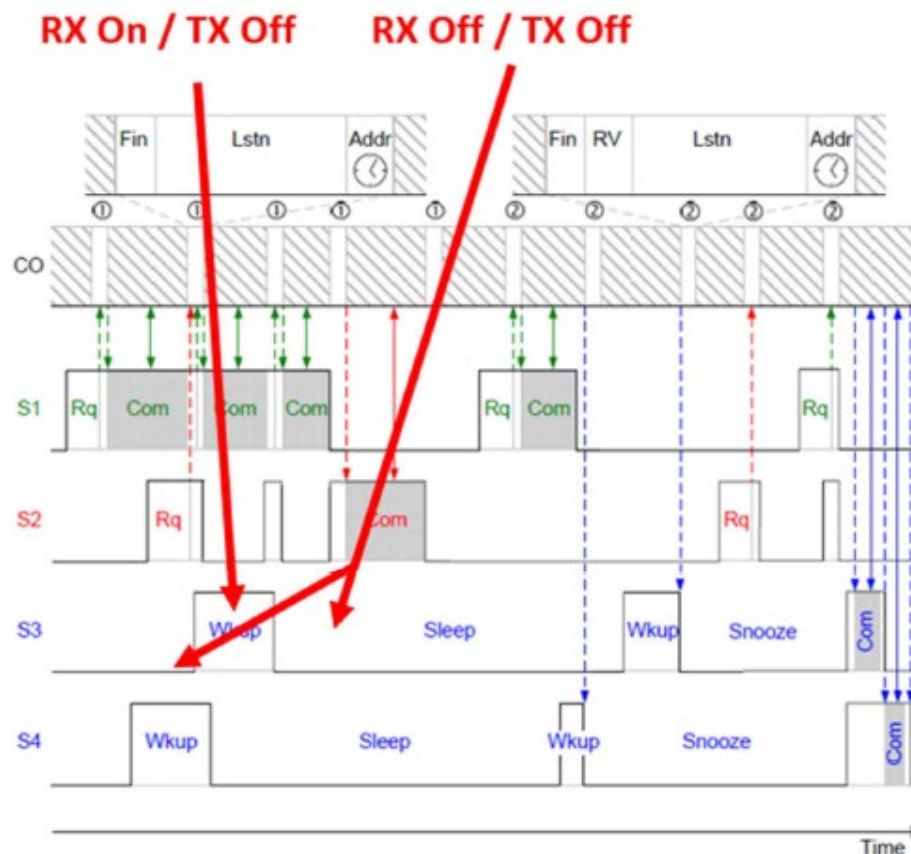
iii. Analysis of Limitation 1D

We determine that, for purposes of institution, Petitioner made a sufficient showing for limitation 1D. We focus on Figure 2 of Röger and Petitioner's proffered motivation to combine the teachings of G.987.3 and Röger.

(a) Figure 2 of Röger

Below is Petitioner's annotated copy of Figure 2, which was reproduced and described above:

Ex. 1006, Fig. 2 (annotated)



Pet. 21. We focus on S3 in the annotated figure above. As noted, Petitioner added the red arrows and red text to the annotated figure, which indicate that in the first interval labeled *Wkup*, S3's receiver is on and its transmitter is off, and, in the first interval labeled *Sleep*, S3's receive and transmitter are both off. *Id.* These annotations are supported by the testimony of Dr. Sergienko and citations to the Röger. *Id.* Further, Patent Owner does not dispute that in the first interval labeled *Wkup*, S3's receiver is on and its transmitter is off and, in the first interval labeled *Sleep* and the portion of the

interval preceding the first Wkup interval, S3's receiver and transmitter are both off. Prelim. Resp. 22–26. In addition, the labels Wkup and Sleep are part of the original figure. Ex. 1006, 7. With these labels and Petitioner's undisputed assertions, Figure 2 illustrates a direct transition from a Sleep state to the Wkup state and then a direct transition from the Wkup state to the Sleep state. No intermediate interval is shown.

Patent Owner's expert, Mr. Schofield, testifies that an intermediate state exists but is not illustrated in Figure 2 of Röger. Ex. 2001 ¶ 49. Mr. Schofield quotes Dr. Sergienko's testimony that an ordinarily skilled artisan "would have known that the ONUs would have had to be fully powered up and capable of responding to upstream and downstream traffic (i.e., capable of receiving and transmitting messages between the ONU and OLT) before exiting the snooze mode ('second state') . . . in order to communicate with the OLT." *Id.* (quoting Ex. 1003 ¶ 90) (alteration in original). The quoted testimony by Dr. Sergienko appears to be directed to the transitions that occur at a rendezvous time shown in Figure 6 of Röger. Ex. 1003 ¶ 90. The relevance of that testimony to the states shown (or not shown) in Figure 2 of Röger is an issue that could be explored further during trial. At the moment, it is unclear whether Mr. Schofield agrees with the quoted testimony from Dr. Sergienko, and if Mr. Schofield's assertion instead rests solely on Dr. Sergienko's testimony, we would also have to consider Dr. Sergienko's testimony that Figure 2 of Röger discloses direct transitions between the Wkup and Sleep states. *Id.* ¶ 83. On the current record, the testimony in paragraph 49 of Mr. Schofield's declaration and in paragraph 90 of Dr. Sergienko's declaration does not render Petitioner's showing regarding direct transitions in Röger insufficient.

Patent Owner raises the issue of what the vertical axis in Figure 2 of Röger represents. Prelim. Resp. 23–25. Patent Owner argues that high vertical values in Figure 6 of Röger do not represent actual power levels because the vertical values for receive and transceiver modes are the same. *Id.* at 23–24. Patent Owner further argues that just as Figure 6 fails to show power consumption details, Figure 2 fails to show state transition details. *Id.* at 24. Patent Owner also asserts that the high levels in Figure 6 indicate receive or transceiver modes, so a high portion of a line in Röger’s diagrams can indicate multiple different states. *Id.* at 25. At trial, if the parties can provide more insight into what the vertical axis in Figure 2 of Röger represents, that could be beneficial.

The states in S3 in Figure 2 of Röger, however, are not indicated solely by the high or low portions of the line representing S3, rather they are also indicated by the express labels of “Wkup” and “Sleep” provided on the figure. Ex. 1006, 7. Thus, Petitioner has made a sufficient showing that Röger teaches the requisite direct transitions.

(b) Motivation to Combine

As discussed above, Petitioner sets forth a proffered motivation to combine the teachings of G987.3’s Doze and Cyclic Sleep Modes with Röger’s teachings of direct transitions. Pet. 9–15. As further discussed, Patent Owner argues that an ordinarily skilled artisan would not have had made that combination because G.987.3 disallows direct transitions between Doze mode and Cyclic Sleep mode and that an ordinarily skilled artisan would have tried to comply with the G.987.3 standard. Prelim. Resp. 16–26. Patent Owner also disputes that the technology developments before the filing of the ’892 patent would have motivated an ordinarily skilled artisan to make the combination. *Id.* at 26–27.

(i) G.987.3 and Direct Transitions

Table 16.7 of G.987.3, which is an OLT state transition and output table, is reproduced below:

Table 16-7 – OLT state transition and output table

Inputs	OLT power management states					
	(1) AwakeForced	(2) AwakeFree	(3) LowPower Sleep	(4) Alerted Sleep / FWI	(5) LowPower Doze	(6) Alerted Doze / FWI
SR (Awake)	*	*	→ (2)	→ (1)	→ (2)	→ (1)
SR (Sleep)	* /SA(OFF) (Note 1)	→ (3)	*	*	→ (1) /SA(OFF) (Note 2)	→ (1) /SA(OFF) (Note 2)
SR (Doze)	* /SA(OFF) (Note 1)	→ (5)	→ (1) /SA(OFF) (Note 2)	→ (1) /SA(OFF) (Note 2)	*	*
Allocation miss	*	→ (1) /SA(OFF)	*	*	*	*
OLT-LWI ON	*	→ (1) /SA(OFF)	→ (4) /SA(OFF)	*	→ (6) /SA(OFF)	*
OLT-LWI OFF	→ (2) /SA(ON)	*	*	* (Note 3)	*	* (Note 3)
Talerted exp.				→ (1)		→ (1)
Ter _i exp.			→ (1) /SA(OFF)		→ (1) /SA(OFF)	

NOTE 1 – An exception from the subgraph rule; an output may help to stabilize the state machine in case the condition is caused by a lost SA(OFF) message. The output is not shown on the FSM diagram.

NOTE 2 – Direct transitions between Doze mode and Cyclic Sleep mode are disallowed. When the OLT receives a request to execute such a transition, it attempts to regain state machine synchronization by waking up the ONU. The transitions are not shown on the diagram for the sake of compactness.

NOTE 3 – This is a situation when the OLT initiates a wake-up, but the OLT-LWI is cleared before the ONU is awoken. In this case, the OLT, instead of cancelling the wake-up process and attempting to immediately revert to a low power state, insists on waking the ONU up with the intent to re-enter a low power state via states AwakeForced and AwakeFree.

Ex. 1007, 105. Note 2 of this table states: “Direct transitions between Doze mode and Cyclic Sleep mode are disallowed.” *Id.* Petitioner argues that this

note only applies to the Doze mode and Cyclic Sleep mode of OLTs, not the corresponding modes in ONUs. Pet. 10–11. Patent Owner disagrees, arguing the language prohibiting direct transitions between Doze mode and Cyclic Sleep mode applies to ONUs because those modes are ONU power saving modes. Prelim. Resp. 18. Patent Owner relies on the following annotated description of the Sleep Request Message from G.987.3 to support this argument:

11.3.4.5 Sleep_Request message		
An ONU sends Sleep_Request to signal its intention to change power saving modes. Clause 16 defines the use and function of this message in detail.		
Octet	Content	Description
1-2	ONU-ID	
3	0x10	Message type ID "Sleep_Request".
4	SeqNo	Always 0.
5	Activity_level	0- Sleep_Request (awake). 1- Sleep_Request (doze). Doze request, ONU receiver active – During low-power periods of doze mode, the ONU can receive downstream traffic. 2- Sleep_Request (sleep). Cyclic sleep request, ONU receiver inactive – During low-power periods of cyclic sleep mode, the ONU cannot receive downstream traffic. Other values reserved.
6-40	Padding	Set to 0x00 by the transmitter; treated as "don't care" by the receiver.
41-48	MIC	Message integrity check

Id. (reproducing excerpt from Ex. 1007, 59). In the above annotated table for the Sleep Request Message, Patent Owner highlights the statement that “[a]n ONU sends Sleep_Request to signal its intention to change power saving modes.” *Id.* Patent Owner also highlights the “Sleep_Request (doze). Doze request” and the “Sleep_Request (sleep). Cyclic sleep request.” *Id.*

On this preliminary record, we are persuaded by Petitioner’s argument that G.987.3’s prohibition on direct transitions between the Doze and Cyclic Sleep Modes is directed to an OLT, not an ONU. Pet. 10–11. The

prohibition is set forth in Table 16.7, which is G.987.3's *OLT* state transition and output table. Ex. 1007, 105. Further, the power management states identified in the table are *OLT* power management states. *Id.* G.987.3 sets forth an ONU state transition and output table: Table 16.4, which sets forth ONU power management states. *Id.* at 102. Table 16.4 has no such prohibition. *Id.* It could be beneficial at trial, however, for the parties to address in more detail Tables 16.4 and 16.7 and their related disclosures (e.g., Tables 16-2, 16-3, 16-5, and 16-6, Figures 16-1 and 16-2).

(ii) Technology Advancements

As discussed above, Petitioner set forth various technology advancements that it contends were made before the filing of the '982 patent that made it easier for an ordinarily skilled artisan to take advantage of known energy savings by incorporating the direct transitions of Röger into G.987.3. Pet. 12–14. These arguments are supported by expert testimony, which in turn has non-testimonial evidentiary support. *Id.*; Ex. 1003 ¶¶ 70–74; Ex. 1011, 3–4; Ex. 1006, 5–7. Patent Owner's contrary argument is supported by expert testimony, but that expert testimony does not cite non-testimonial evidentiary support and is conclusory regarding why the advancements would not motivate an ordinarily skilled artisan to modify G.987.3. Prelim. Resp. 26–27; Ex. 2001 ¶ 51. Thus, on the current record, Petitioner's argument regarding the motivation resulting from technology advances is more persuasive. At trial, however, additional exposition could be beneficial on the issues of technology advances, their effects on an ordinarily skilled artisan's motivation, and energy reduction.

(c) Summary Regarding Limitation 1D

Upon review of the record, we determine that Petitioner has made a sufficient showing for limitation 1D.

c. Limitations 1E–1G

Petitioner sets forth how it contends that the combination of G.987.3, Röger, and G.988 teaches or suggests limitations 1E–1G. Pet. 23–35. Patent Owner does not challenge Petitioner’s analysis of limitations 1E–1G. Prelim. Resp. 16–28. Upon review of the record, we determine that Petitioner has made a sufficient showing regarding limitations 1E–1G.

d. Combination with G.988

Petitioner sets forth reasons it contends an ordinarily skilled artisan would have been motivated to combine G.988 with G.987.3 and Röger. Pet. 9–15. Patent Owner presents no counterarguments regarding combining G.988 with G.987.3. Prelim. Resp. 21–28. Patent Owner argues, however, that an ordinarily skilled artisan would not have combined G.988 with Röger for the same reasons an ordinarily skilled artisan would not have combined G.987.3 with Röger. *Id.* at 26–28. As set forth above, on this preliminary record, we are persuaded by Petitioner’s arguments regarding an ordinarily skilled artisan’s motivation to combine G.987.3 with Röger. Upon review of the record, we determine that Petitioner has made a sufficient showing regarding the motivation of an ordinarily skilled artisan to combine the teachings of G.987.3, Röger, and G.988.

d. Conclusion Regarding Claim 1

Petitioner has sufficiently shown at this stage of the proceeding that the combination of G.987.3, Röger, and G.988 teaches or suggests every limitation of claim 1 and that an ordinarily skilled artisan would have been motivated to combine the teachings of these references with a reasonable expectation of success. Thus, Petitioner has demonstrated a reasonable likelihood of proving that claim 1 would have been obvious over the combination of G.987.3, Röger, and G.988.

5. Dependent Claims 2–5

Claims 2–5 each depend from claim 1. Ex. 1001, 15:22–39. Petitioner sets forth how it contends that the combination of G.987.3, Röger, and G.988 teaches or suggests every limitation that claims 2–5 add to claim 1. Pet. 36–46. Patent Owner does not provide any arguments specifically for claims 2–5, but relies on its arguments for claim 1. Prelim. Resp. 27–28. Upon review of the record, we determine that Petitioner has demonstrated a reasonable likelihood of proving that claims 2–5 would have been obvious over the combination of G.987.3, Röger, and G.988.

6. Independent Claim 14 and Dependent Claim 15

Petitioner sets forth how it contends that the combination of G.987.3, Röger, and G.988 teaches or suggests every limitation of claim 14. Pet. 46–53. Petitioner also sets forth why it contends an ordinarily skilled artisan would have been motivated to combine the teachings of those references. *Id.* at 9–15. Patent Owner raises the same issues regarding claim 14 that it raised for claim 1. Prelim. Resp. 16–28. Claim 14, however, does not recite direct transitions from a first to a second state, and as set forth in Section II.B.2 above, we have not construed the term “transition” as limited to “transition directly.” Upon review of the record, we determine that Petitioner has demonstrated a reasonable likelihood of proving that claim 14 would have been obvious over the combination of G.987.3, Röger, and G.988.

Claim 15 depends from claim 14. Ex. 1001, 17:17–25. Petitioner sets forth how it contends that the combination of G.987.3 and Röger teaches or suggests the limitation that claim 15 adds to claim 14. Pet. 53–54. Patent Owner does not provide any arguments specifically for claim 15, but relies on its arguments for claim 14 (and claim 1). Prelim. Resp. 27–28. Upon review of the record, we determine that Petitioner has demonstrated a

reasonable likelihood of proving that claim 15 would have been obvious over the combination of G.987.3, Röger, and G.988.

B. Ground 2: Asserted Obviousness over G.987.3, Röger, G.988, and Ghazisaidi

Petitioner argues that claims 10–13 would have been obvious over the combination of G.987.3, Röger, G.988, and Ghazisaidi. Pet. 1.

1. Ghazisaidi

Ghazisaidi “relates to systems, software and methods and, more particularly, to mechanisms and techniques for energy efficient dynamic bandwidth allocation in optical networks.” Ex. 1009 ¶ 1. Ghazisaidi’s device and method for scheduling traffic exchange are applied to a passive optical network, PON, to reduce energy consumption. *Id.* at code (57). In Figure 1 (reproduced below), Ghazisaidi illustrates a schematic diagram of a PON. *Id.* ¶ 18.

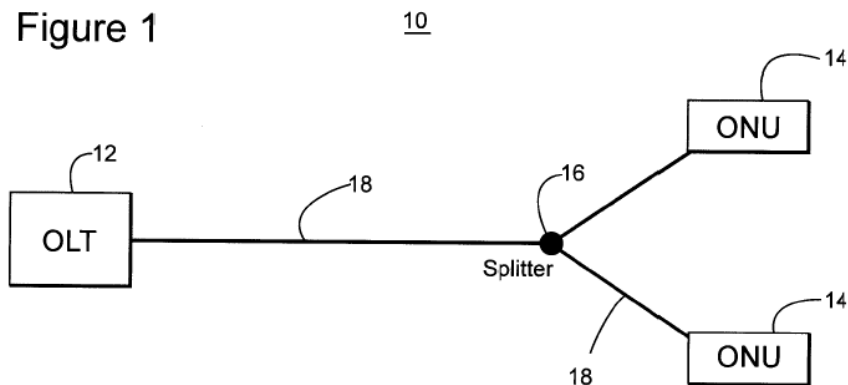


Figure 1 is a schematic diagram of a PON. *Id.* ¶ 18.

Ex. 1009, 30. As shown in Figure 1, a PON is a point-to-multipoint, fiber to the premises network architecture in which unpowered optical splitters are used to enable a single optical fiber to serve multiple premises. *Id.* ¶ 3.

PON 10 illustrated in Figure 1 includes an optical line terminal (OLT) 12 (for example, at the service provider’s central office) and a number of optical

network units (ONUs) 14 (also known as optical network terminal (ONT), for example, near end users). *Id.* A splitter 16 is provided along the optical fiber 18 to split the signal from the OLT for the ONUs. *Id.*

Figure 8 of Ghazisaidi, reproduced below, is a schematic diagram of a control system implemented in the OLT and/or ONU. Ex. 1009 ¶ 25.

Figure 8

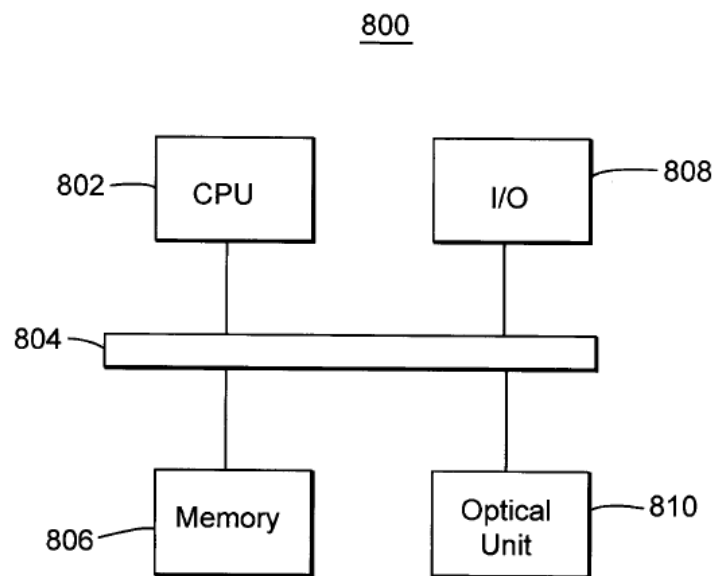


Figure 8 is a schematic diagram of a control system implemented in the OLT and/or ONU. *Id.* ¶ 25.

Id. at 37. Figure 8 shows a controller 800 that may be implemented in an OLT and/or an ONU. *Id.* ¶ 52. The controller includes a processor 802 connected to a bus 804, a memory 806 used to store various instructions for processor 802, an input/output unit 808 connected to bus 804, and an optical unit 810 connected to bus 804 and allowing data communication with processor 802 via the PON. *Id.*

2. Independent Claim 10 and Dependent Claim 11

Petitioner sets forth how it contends that the combination of G.987.3, Röger, G.988, and Ghazisaidi teach or suggest every limitation of claim 10

and the reasons it contends an ordinarily skilled artisan would combine the teachings of those references. Pet. 54–58. Patent Owner argues that this combination of references does not teach or suggest the direct transitions recited in limitation 10D. Prelim. Resp. 28. Patent Owner relies on its arguments for limitation 1D. *Id.* As set forth above, we determined that Petitioner sufficiently showed, for purposes of institution, that Röger discloses the recited direct transitions. We further determined that Petitioner sufficiently showed that an ordinarily skilled artisan would have been motivated to combine G.987.3 and Röger’s teachings. Thus, upon review of the record, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that claim 10 would have been obvious over G.987.3, Röger, G.988, and Ghazisaidi.

Claim 11 depends from claim 10. Ex. 1001, 16:32–37. Petitioner sets forth how it contends that the combination of G.987.3, Röger, and G.988 teaches or suggests the limitation that claim 11 adds to claim 10. Pet. 37–42, 59. Patent Owner does not provide any arguments specifically for claim 11, but relies only on its arguments for claim 10 (and claim 1). Prelim. Resp. 28. Upon review of the record, we determine that Petitioner has demonstrated a reasonable likelihood of proving that claim 11 would have been obvious over the combination of G.987.3, Röger, G.988, and Ghazisaidi.

3. Independent Claim 12 and Dependent Claim 13

There are two disputed issues for claims 12 and 13. Prelim. Resp. 28–32. Claim 13 depends from claim 12 (Ex. 1001, 16:54–61), and the disputed issues for claim 13 are the same as for claim 12. Prelim. Resp. 28–32.

The first disputed issue concerns limitation 12B. As discussed in Section II.B.2 above, Patent Owner argues that the term “transition” in limitation 12B should be construed as “direct transition.” Prelim. Resp. 12.

Patent Owner argues that, with that construction, the combination of G.987.3, Röger, G.988, and Ghazisaidi does not teach or suggest limitation 12B. *Id.* at 28. As set forth above in Section IIB.2, we did not adopt this proposed construction by Patent Owner. Therefore, for this Decision, we resolve this disputed issue in favor of Petitioner.

Patent Owner also argues that the combination of G.987.3, Röger, G.988, and Ghazisaidi does not teach or suggest limitation 12D, which recites: “wherein the generated messages comprises a periodic consent message to allow the optical network unit to remain in either the first low power state or the second low power state.” Prelim. Resp. 29. Petitioner argues that the combination of G.987.3 and Ghazisaidi teach or suggest this limitation. Pet. 62. Petitioner argues that in G.987.3 “PLOAM [physical layer operations, administration, and maintenance] messages are used to consent to the ONU operating in a doze mode including a Listen state (‘first low power state’) or a cyclic sleep mode including an Asleep state (‘second low power state’).” *Id.* Petitioner further argues that in G.987.3, “[u]sing the PLOAM event Sleep_Allow(ON), ‘[t]he OLT grants permission to the ONU to exercise any power management mode and leaves the selection of doze or cyclic sleep mode to the ONU’s discretion.’” *Id.* (quoting Ex. 1007, 100) (second alteration in original). Further, Petitioner asserts that “Sleep_Allow(ON) shifts the responsibility to the ONU to determine whether to remain in a low power state (i.e., gives consent).” *Id.* Petitioner also sets forth arguments regarding the periodic nature of the identified consent message. *Id.* at 62–63.

Patent Owner argues that the Sleep_Allow(ON) message gives permission to enter a low power mode, not remain in a lower power state as

required by limitation 12D. Prelim. Resp. 29. Patent Owner argues that this fact is confirmed by G.987.3's ONU state diagram and table, which shows that Sleep_Allow(ON) message applies only when the ONU is in the ActiveHeld state. *Id.* at 29–31.

The arguments by Patent Owner regarding the Sleep_Allow(ON) message may be meritorious. This issue, however, could benefit from additional briefing and expert testimony at trial in accordance with the rules regarding timeliness. In any event, Petitioner has demonstrated a reasonable likelihood of proving that more than one challenged claim is unpatentable.

IV. DISCRETIONARY DENIAL IN VIEW OF PARALLEL LITIGATION

Under § 314(a), the Director possesses “broad discretion” in deciding whether to institute an *inter partes* review. *See* 35 U.S.C. § 314(a); *Saint Regis Mohawk Tribe v. Mylan Pharms. Inc.*, 896 F.3d 1322, 1327 (Fed. Cir. 2018). The Director is “permitted, but never compelled,” to institute an *inter partes* review. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016). The Board decides whether to institute an *inter partes* review on the Director's behalf. 37 C.F.R. § 42.4(a) (2023).

Based on *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”), Patent Owner argues that we should exercise our discretion under § 314(a) to deny institution in view of the Verizon litigation. Prelim. Resp. 32–39. Petitioner asserts the opposite. Pet. 66–70.

A. Nonexclusive Factors to Consider

When deciding whether to exercise discretion under § 314(a) to deny institution, the Board has considered the status of litigation involving the parties in light of the AIA's objective “to provide an effective and efficient alternative to district court litigation.” *NHK Spring Co. v. Intri-Plex Techs.*,

Inc., IPR2018-00752, Paper 8 at 12, 19–20 (PTAB Sept. 12, 2018) (precedential) (“*NHK*”). The Board has set forth the following nonexclusive factors to consider when determining whether to exercise discretion under § 314(a) to deny institution due to the advanced state of parallel litigation:

- (1) whether the court granted a stay or evidence exists that one may be granted if the Board institutes a trial;
- (2) the proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision;
- (3) the investment in the parallel litigation by the court and the parties;
- (4) the overlap in the issues raised by the petition and the issues in the parallel litigation;
- (5) whether the petitioner and the defendant in the parallel litigation are the same party; and
- (6) other circumstances that impact the Board’s exercise of discretion, including the merits.

Fintiv, IPR2020-00019, Paper 11 at 5–6.

These factors “relate to whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding.” *Fintiv*, IPR2020-00019, Paper 11 at 6. Further, *Fintiv* instructs that the Board should take “a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review.” *Id.*; see PTAB Consolidated Trial Practice Guide at 55–56, 58 (Nov. 2019) (“CTPG”).¹²

We also follow the Director’s Memorandum setting forth an Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with

¹² Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

Parallel District Court Litigation (June 21, 2022) (“Director’s Memo”).¹³ As specified in the Director's Memo, “compelling, meritorious challenges will be allowed to proceed at the PTAB even where district court litigation is proceeding in parallel.” Director's Memo 4. The Director's Memo, however, does not require that a petitioner establish compelling merits to avoid discretionary denial. Additionally, the Director clarified that “[t]he Board should first assess Fintiv factors 1–5; if that analysis supports discretionary denial, the Board should engage the compelling merits question.” *CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 6 (PTAB Feb. 27, 2023) (precedential).

B. Analysis

As discussed in Section I.A above, the AT&T litigation no longer involves the '892 patent, so, except as otherwise noted, we focus on the Verizon litigation in our *Fintiv* analysis.

1. Factor 1: Stay

As both parties agree, Fintiv factor 1 is neutral because no party has moved to stay the Verizon litigation. Pet. 66; Prelim. Resp. 35.

2. Factor 2: Proximity to Trial Date

Petitioner argues that the trial date for the Verizon litigation is set for September 22, 2025. Pet. 67. Petitioner further argues that the median time to trial in the Eastern District of Texas is 21.4 months, which, according to Petitioner, gives the Verizon litigation an estimated trial date of no earlier

¹³ Available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

than December 2025. *Id.* at 67–68. Petitioner asserts that a December 2025 trial date does not support denial. *Id.* at 68.

Patent Owner argues that Petitioner miscalculated the estimated trial date for the Verizon litigation based on median time to trial data. Prelim. Resp. 35. Patent Owner asserts that the Verizon complaint was filed in December 28, 2023 and that the median time to trial in the Eastern District of Texas is 21.6 months. *Id.* at 35–36. According to Patent Owner, this yields a projected trial date of October 2025. *Id.* at 36. Patent Owner further argues that an October 2025 trial date for the Verizon litigation would occur two to three months before a Final Written Decision would be due in this matter. *Id.*

On this record, Patent Owner is correct. Based on a 21.4 or a 21.6 month median time to trial, the expected trial date for the Verizon litigation is in October 2025. The due date for a Final Written Decision in this proceeding is in December 2025. Therefore, the expected trial date for the Verizon litigation is two to three months prior to the due date for the Final Written Decision in this proceeding. Accordingly, Factor 2 favors exercising our delegated discretion to deny institution.

3. Factor 3: Investment in Parallel Proceeding

Petitioner argues that the Verizon litigation is in its early stages, noting that its claim construction hearing is scheduled for March 2025. *Id.* at 69. Patent Owner argues, however, that the Verizon litigation will be in the middle of the *Markman* process by the institution deadline. Prelim. Resp. 37. Based on the parties' submissions, some activity has taken place in the Verizon litigation, but that litigation is still in early stages. Thus, Factor 3 slightly favors exercising our delegated discretion to deny institution.

4. Factor 4: Overlap with Parallel Proceeding

Petitioner stipulates that it will not pursue invalidity against the asserted claims in the district court using the specific combination of prior art references set forth in the grounds presented in this Petition for purposes of establishing obviousness. Pet. 69. Petitioner's stipulation is not a *Sortera*¹⁴ type stipulation. Rather, it is a *Sand Revolution* type stipulation, which, in general, "mitigates to some degree the concerns of duplicative efforts between the district court and the Board as well as concerns of potentially conflicting decisions." *Sand Revolution II, LLC v. Continental Intermodal Group—Trucking LLC*, IPR2019-01393, Paper 24, at 11–12 (PTAB June 26, 2020) (informative). In this case, nevertheless, there will be no overlap between this proceeding and the litigation to which Petitioner is a party (the AT&T litigation) because the '892 patent was dismissed from the AT&T litigation. This dismissal provides a greater assurance of a lack of overlap in the AT&T litigation than a *Sortera* stipulation because the latter permits invalidity defenses that could not have reasonably been raised in this proceeding, whereas the dismissal ensures that no invalidity defense regarding the '892 patent will be raised in the AT&T litigation. *Sotera Wireless*, Paper 12 at 18. The Director has already determined that when the petitioner provides a *Sortera* stipulation, the PTAB will not discretionarily deny institution in favor of a parallel district court litigation. *Id.* In sum, Petitioner's stipulation and the dismissal of the '982 patent from the AT&T litigation heavily favor not exercising our delegated discretion to deny institution.

¹⁴ *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential).

5. Factor 5: Whether Petitioner and Defendant are the Same Party

Petitioner is not a party to the Verizon litigation. Prelim. Resp. 38.

Thus, Factor 5 weighs against exercising our discretion to deny institution.

6. Evaluating Fintiv Factors 1–5

We determine that as a whole Fintiv Factors 1–5 weigh against discretionary denial. As mentioned, Fintiv Factor 1 is neutral. Fintiv Factors 2 and 3 weigh in favor of discretionary denial. Fintiv Factors 4 and 5, however, weigh more heavily against discretionary denial. In light of our determination regarding Fintiv Factors 1–5, we do not need to evaluate Fintiv Factor 6. *CommScope*, Paper 23 at 4. In sum, we decline to exercise our delegated discretion to deny institution.

V. CONCLUSION

We determine that Petitioner has demonstrated a reasonable likelihood of proving the unpatentability of at least one challenged claim of the '892 patent. Further, we decline to exercise our delegated discretion to deny institution under 35 U.S.C. § 314. We clarify, however, that our analysis is based only on the record as it stands now and that we have not made a final determination regarding the patentability of any challenged claim. Further, no party should rely on any preliminary finding or determination in this Decision nor assume that the evidence cited in this Decision for any preliminary finding or determination will result in a similar finding or determination in the Final Written Decision after a complete record is developed.

VI. ORDER

It is

ORDERED that, pursuant to 35 U.S.C. § 314(a) an *inter partes* review of the challenged claims in the '892 patent is hereby instituted on the asserted grounds set forth in the Petition; and

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

For PETITIONER:

Christopher Douglas
Scott Stevens
Bennett Hardyman
Karlee Wroblewski
ALSTON & BIRD LLP
christopher.douglas@alston.com
scott.stevens@alston.com
bennett.hardyman@alston.com
karlee.wroblewski@alston.com

For PATENT OWNER:

Blaine A. Larson
Michael F. Heim
R. Allan Bullwinkel
Christopher L. Limbacher
HEIM PAYNE & CHORUSH, LLP
blarson@hpcllp.com
mheim@hpcllp.com
abullwinkel@hpcllp.com
climbacher@hpcllp.com