

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NOKIA OF AMERICA CORPORATION,
Petitioner,

v.

OYSTER OPTICS, LLC
Patent Owner.

Case IPR2018-00146
Patent 9,363,012 B2

Before JAMESON LEE, RAMA G. ELLURU, and
PATRICK M. BOUCHER, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background and Summary

Petitioner¹ filed a Petition (Paper 3, “Pet.”) to institute *inter partes* review of claims 1–3, 5, 6, and 8–10 of U.S. Patent No. 9,363,012 B2 (Ex. 1301, “the ’012 patent”). We determined that Petitioner demonstrated a reasonable likelihood of success in proving that claims 1, 2, 5, 6, and 8–10, but not claim 3, of the ’012 patent are unpatentable, and instituted *inter partes* review on all challenged claims with respect to all grounds set forth in the Petition. Paper 11, 2. Patent Owner² filed a Patent Owner Response.³ Paper 24. Petitioner filed a Reply. Paper 27. Patent Owner filed a Sur-Reply. Paper 30. Oral hearing was held on January 11, 2019. A copy of the transcript for the oral hearing has been entered as Paper 35 (“Tr.”).

We determine that Petitioner has proved by a preponderance of the evidence that each of claims 1, 2, 5, 6, and 8 is unpatentable. We determine that Petitioner has not proved by a preponderance of the evidence that any of claims 3, 9, and 10 is unpatentable.

B. Related Matters

Petitioner and Patent Owner have identified the following district court actions relating to this proceeding: *Oyster Optics, LLC v. Nokia Corporation, et al.*, No. 2:16-CV-1297-JRG and *Oyster Optics, LLC v. Coriant America Inc., et al.*, No. 2:16-CV-1302-JRG. Pet. 1, 1–2; Paper 8,

¹ Nokia of America Corporation.

² Oyster Optics, LLC.

³ Patent Owner also filed a declaration of Keith W. Goossen, Ph.D., in support of the Patent Owner Response. Ex. 2035.

2. Patent Owner has identified the following *inter partes* review proceedings involving other patents, as that which may affect or be affected by a decision in this proceeding: IPR2017-01719; IPR2017-01720; IPR2017-01724; IPR2017-01725; IPR2017-01870; IPR2017-01871; IPR2017-01874; IPR2017-01881; IPR2017-01882; IPR2017-02146; IPR2017-02173; IPR2017-02189; IPR2017-02190; IPR2018-00070; IPR2017-00257; IPR2017-00258; IPR2017-00259. Paper 8, 2–3; Paper 9, 2–4. Petitioner has identified some of those *inter partes* review proceedings as related matters. Pet. 2.

C. The '012 Patent (Ex. 1301)

The '012 patent is directed to telecommunications involving fiber optic networks. Ex. 1301, 1:18–20. An objective of the invention is to provide a transceiver card including OTDR (“optical time-domain reflectometer”) and tapping detection capabilities. *Id.* at 2:24–29. The transceiver card includes a transmitter for transmitting data over the first optical fiber and a receiver for receiving data from the second optical fiber. *Id.* at 2:30–34. The transceiver card also includes an OTDR optically connected to the second optical fiber upstream from the receiver. *Id.* at 2:34–36. The '012 patent further states that, preferably, an energy level detector also is provided on the card, and that it is preferably optically connected to the second optical fiber between the OTDR and the receiver. *Id.* at 2:43–45.

Figure 1 of the '012 patent is reproduced below:

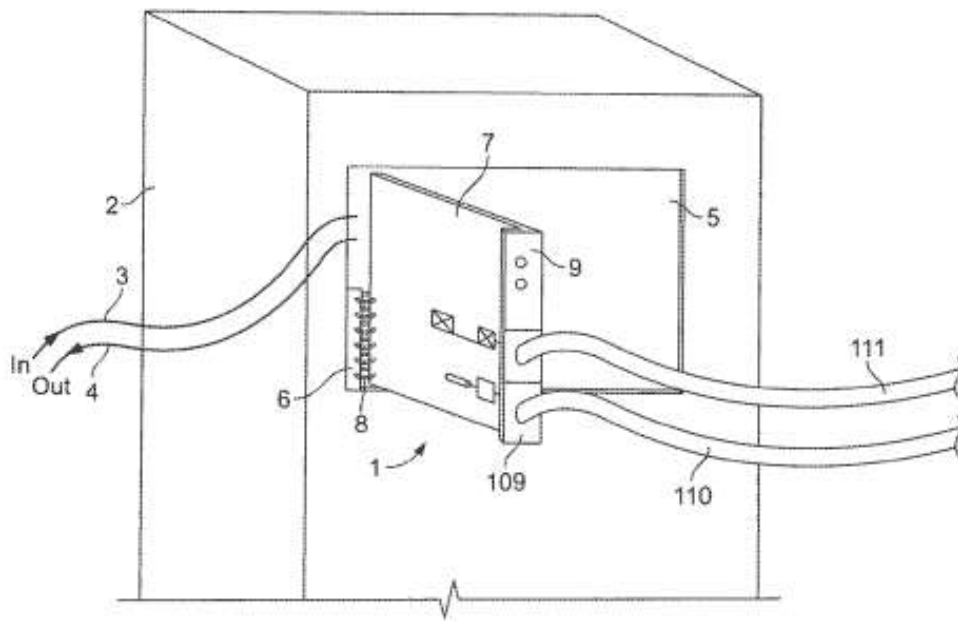


FIG. 1

Figure 1 illustrates a schematic diagram of a transceiver card located in a telecommunications box. *Id.* at 4:1–3. Telecommunications box 2, for example, a multiplexor, is refitted to include transceiver card 1. *Id.* at 4:11–13. Card 1 includes faceplate 9 and backplane 7, which preferably is a printed circuit board. *Id.* at 4:22–23. Faceplate has fiber connector 109 for connecting to output fiber 110 and input fiber 111. *Id.* at 4:26–28.

Figure 2 of the '012 patent is reproduced below:

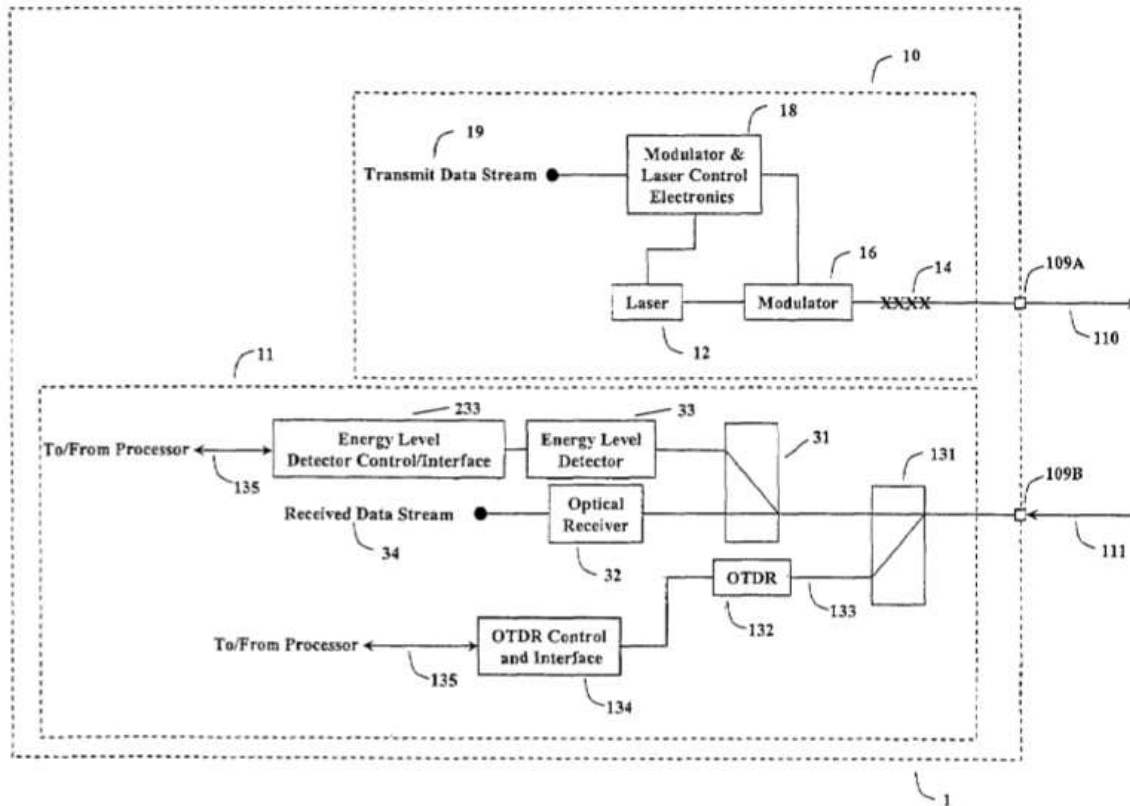


Figure 2

Figure 2 shows card 1 of Figure 1 in more detail and illustrates a block diagram of a transceiver according to the '012 patent. *Id.* at 4:4–5, 4:25–26. Transmitter 10 transmits signals over optical fiber 110 via output 109A. *Id.* at 4:30–31. Transmitter 10 includes a single laser 12, for example a semiconductor laser emitting a narrow band of light at approximately 1550 nm, or at other wavelengths. *Id.* at 4:32–34. Light emitted from laser 12 passes through modulator 16, for example an amplitude or phase modulator, which is located next to or is a part of the same package as laser 12. *Id.* at 4:34–37. The light may be depolarized by depolarizer 14. *Id.* at 4:37–38. Electronic controller 18, preferably disposed on backplane 7 (Figure 1), controls modulator 16. *Id.* at 4:38–40. Input data 19 is provided to

controller 18, which then controls modulator 16 to modulate the light from laser 12 as a function of input data 19. *Id.* at 4:41–43.

Optical signals are received from fiber 111 at connector 109. *Id.* at 4:53–54. Receiver 11 includes two coupler/splitters 31 and 131, each functioning as a splitter. *Id.* at 4:55–56. Splitter 131 splits off a portion of the received light and sends it into fiber 133 to be provided to OTDR 132. *Id.* at 4:64–66. Splitter 31 then splits off a portion of the remaining light to direct a part of the optical energy into an energy level or tap detector 33 and sends the residual light to optical receiver 32. *Id.* at 4:66–5:2. Optical receiver 32 converts the optical signal to electronic form to yield received electronic data stream 34. *Id.* at 5:2–4.

With regard to energy level detector 33, the '012 patent states:

Detector **33** monitors the light energy in the fiber **111** via the light energy coupled to the detector by splitter **31**. If the amplitude drops during monitoring which may indicate a tap, the detector **33** provides an alert and can, for example, send [an] electronic signal to the processor via bus **135** to indicate a drop or increase in the optical energy level, sound an alarm or alert network maintenance personnel, for example through an LED **133** or by sending an alarm message using transmitter **10**. Another LED **134** can provide an indication of proper signal reception. An energy level detector control circuit **233** controls the alarm threshold and energy detection and provides output indications from the energy detection circuit to a processor via bus **135** which may be shared with the OTDR control circuit **134**.

Id. at 5:11–24.

Of the challenged claims, claims 1, 5, and 9 are independent, and all are drawn to a method. All three independent claims are reproduced below:

1. A telecommunication monitoring method, comprising:
receiving an incoming optical signal at a downstream
termination point, located within an optical multiplexor box,
of an optical fiber;
splitting, within the optical multiplexor box, the incoming
optical signal into a data optical signal and a test optical
signal;
tapping the data optical signal to produce a tapped optical
signal;
processing, within the optical multiplexor box, the data optical
signal to produce a data electrical signal indicative of data
encoded in the incoming optical signal;
processing the tapped optical signal to produce an electrical
signal indicative of a power of the data optical signal; and
performing, by an optical time-domain reflectometer (OTDR)
module within the optical multiplexor box, OTDR
monitoring of an optical fiber selected from: an incoming
optical fiber associated with the incoming optical signal and
an outgoing optical fiber associated with an outgoing optical
signal.

Ex. 1001, 6:51 to 7:4.

5. A telecommunication monitoring method, comprising:
receiving, by an optical multiplexor box, an incoming optical
signal at a downstream termination of a downstream optical
fiber;
splitting the incoming optical signal into a data optical signal
and a test optical signal;
tapping the data optical signal to produce a tapped optical
signal;
processing the data optical signal to produce a data electrical
signal indicative of data encoded in the incoming optical
signal;
processing the tapped optical signal to produce an electrical
signal indicative of a power of the data optical signal; and

performing optical time-domain reflectometer (OTDR) monitoring of the test optical signal;
filtering the electrical signal indicative of the power with a low pass filter to produce an average power signal;
amplifying the average power signal to produce an amplified power signal;
comparing the amplified power signal to a threshold; and
generating an alarm in accordance with a result of said comparing.

Id. at 7:20–41.

9. A telecommunications signal processing method, comprising:
receiving, by an optical line card, a phase modulated optical signal at a downstream termination point of an optical fiber, wherein the optical signal includes a data optical signal of a first wavelength multiplexed with a test optical signal of a second wavelength;
de-multiplexing the data optical signal and the test optical signal;
detecting data encoded in the data optical signal;
performing, by the optical line card, optical time-domain reflectometer (OTDR) monitoring of the test optical signal.

Id. at 7:58 to 8:3.

D. Evidence Relied Upon by Petitioner

Petitioner relies on the following references:⁴

⁴ The '012 patent was filed on Feb. 8, 2013, and is a continuation of App. No. 12/590,185, filed Nov. 4, 2009, which is a continuation of App. No. 10/188,643, filed on July 3, 2002, which claims priority to Provisional App. No. 60/303,932, filed on July 9, 2001. Ex. 1301, (60) (63); 1:7–1. We need not determine whether Patent Owner is entitled to an effective filing date of July 9, 2001. Each prior art reference has a publication or actual filing date prior to July 9, 2001. Patent Owner has not tried to antedate any reference.

Reference		Date	Exhibit
Cohen	U.S. Pat. No. 5,329,392	July 12, 1994	Ex. 1306
Blonder	U.S. Pat. No. 4,897,711	Jan. 30, 1990	Ex. 1307
Rowan	U.S. Pat. No. 6,529,303 B1	March 4, 2003, filed Sept. 24, 1999	Ex. 1308
Deutsch	DE 199 49 401 A1 ⁵	April 19, 2001	Ex. 1309
Walsh	U.S. Pat. No. 5,825,516	Oct. 20, 1998	Ex. 1311
Roberts	U.S. Pat. No. 5,286,969	Feb. 15, 1994	Ex. 1312

Petitioner also relies on an initial Declaration of Duncan L. MacFarlane, Ph.D., P.E. (Ex. 1302), and a Reply Declaration of Dr. MacFarlane (Ex. 1327).

E. The Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability:

Claims Challenged	Basis	References
1, 8, and 9	§ 103(a)	Cohen, Blonder, and Rowan
2, 3, and 5	§ 103(a)	Cohen, Blonder, Rowan, and Roberts
1, 8, and 9	§ 103(a)	Rowan and Deutsch
2, 3, 5, 6, and 10	§ 103(a)	Rowan, Deutsch, and Walsh

⁵ Exhibit 1309 includes the German language reference as well as an English translation thereof. Citations herein to the reference are made with respect to the English translation.

II. ANALYSIS

A. Whether the Proceeding must be Dismissed without Issuance of a Final Written Decision

Patent Owner asserts that this *inter partes* review proceeding “should be dismissed without a final written decision.” PO Resp. 14. Patent Owner, citing *SAS Institute Inc. v. Iancu*, 138 S. Ct. 1348 (2018), correctly notes that the Supreme Court instructed that the Board either institute trial on all the claims and grounds alleged by Petitioner, or not at all. PO Resp. 14. According to Patent Owner, however, the Board still has governing regulations requiring that only challenged claims for which Petitioner has shown a reasonable likelihood of prevailing “may be instituted” for trial. *Id.* Thus, Patent Owner argues:

the *sole permissible outcome, consistent with both* the binary decision required under SAS (either all challenged claims or none must be instituted) and the Board’s governing regulations (only challenged claims in which there is a reasonable likelihood of prevailing on unpatentability may be instituted), is for the Board to not institute *inter partes* review.

Id. (emphasis added).

In the Decision on Institution, we determined that Petitioner demonstrated a reasonable likelihood of prevailing on claims 1, 2, 5, 6, and 8–10, but not claim 3. Paper 11, 2. We are not persuaded by Patent Owner’s argument that, absent promulgation of new rules, we are precluded by the Board’s governing regulations from reaching a final written decision with respect to the claims and grounds for which Petitioner was determined not to have presented a reasonable likelihood of success at the time of institution of review. The current rules already cover the situation in which, at the time of institution of review, the Board determines that there are

certain claim(s) and ground(s) for which the Petitioner has not shown a reasonable likelihood of prevailing at trial and do not prohibit institution of review with respect to all claims and grounds in that circumstance.

Specifically, Patent Owner quotes 37 C.F.R. § 42.108(a) (2016), which allows the Board to “authorize the review to proceed on all or some of the challenged claims and on all or some of the grounds of unpatentability asserted for each claim.” PO Resp. 12. Patent Owner also quotes 37 C.F.R. § 42.108(b) (2016), which allows the Board to “deny some or all grounds for unpatentability for some or all of the challenged claims’ prior to institution of *inter partes* review.” *Id.* Patent Owner further refers to 37 C.F.R. § 42.108(c), which provides: “*Inter partes* review shall not be instituted for a ground of unpatentability unless the Board decides that the petition supporting the ground would demonstrate that there is a reasonable likelihood that at least one of the claims challenged in the petition is unpatentable.” *Id.* at 12–13.

None of these referenced parts of 37 C.F.R. § 42.108 requires exclusion of any claim or ground from an instituted proceeding—including those for which the Board has determined that Petitioner has not shown a reasonable likelihood that it would prevail in establishing unpatentability. Thus, the current rules cover and permit a trial to include challenged claims and corresponding grounds of unpatentability for which the Petitioner has not shown a reasonable likelihood of prevailing.

Patent Owner further notes:

In implementing these final rules, the Agency stated, “[t]he Board will identify the grounds upon which the review will proceed on a claim-by-claim basis. Any claim or issue not included in the authorization for review is not part of the review.”

See 77 Fed. Reg. 48,689. Indeed, the Agency specifically stated that the regulations *did not adopt* comments requesting that “all challenged claims to be included in the *inter partes* review when there is a reasonable likelihood of prevailing with respect to one challenged claim.” *See* 77 Fed. Reg. 48,702–03.

PO Resp. 13.

As is the case with 37 C.F.R. § 42.108, however, such statements do not indicate the Board is *prohibited* from including all challenged claims in the *inter partes* review—including when a petitioner shows a reasonable likelihood of success at trial with respect to just some (or even only one) of the challenged claims and just some (or even only one) of the asserted grounds of unpatentability. *See, e.g., FMC Techs., Inc. v. OneSubsea IP UK Ltd.*, Case IPR2016-00378, slip op. at 8 (PTAB June 30, 2016) (Paper 7) (instituting review “on all of the challenged claims and on all of the asserted grounds, as raised in the Petition,” upon finding a reasonable likelihood of success with respect to one claim). We disagree with and reject Patent Owner’s contention that, in the circumstances of this case, issuing a final written decision with respect to all challenged claims and grounds identified in the Petition is contrary to regulation.

For the foregoing reasons, we reject Patent Owner’s contention that this *inter partes* review should be dismissed without issuance of a final written decision.

B. The Burden of Proof

In an *inter partes* review, the petitioner has the burden of proving unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e). That burden never shifts to the patentee. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

C. The Law on Obviousness

The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). One seeking to establish obviousness based on more than one reference also must articulate sufficient reasoning with rational underpinning to combine teachings. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

D. Level of Ordinary Skill in the Art

Petitioner proposes a level of ordinary skill: “B.S. in Electrical Engineering or a related field with at least five years of experience in designing optical transmission systems, or an M.S. in Electrical Engineering or a related field.” Pet. 5–6. Without explaining any problem with Petitioner’s articulated level of ordinary skill, Patent Owner’s technical witness Dr. Goossen proposes something different: “at least a bachelor’s degree or equivalent in electrical engineering with optical engineering coursework, and five or more years of experience in optical transmission systems and associated components.” Ex. 2035 ¶ 23.

Neither party asserts any meaningful difference between the level of ordinary skill proposed by the parties, and we can see none. However, we decline to adopt the level articulated by either party because both proposed levels use the qualifier “at least” or “or more” to refer to experience or education level. Each of these proposed levels covers too wide a range of an experience and education level without an upper bound, e.g., including

35 years of experience or more, for a meaningful application. In the Decision on Institution, we informed the parties that Petitioner's proposed level is overly broad for that reason. Paper 11, 10. Also in the Decision on Institution, we determined that no express finding on the level of ordinary skill is necessary, and that the level of ordinary skill in the art is reflected by the prior art of record, citing *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001), *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995), and *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978). *Id.* After institution of trial, neither party argued against this treatment of the level of ordinary skill. Here, we maintain the same determinations as stated in the Decision on Institution: (1) the level of ordinary skill is reflected by the prior art of record, and (2) no additional express finding on the level of ordinary skill is necessary.

E. Claim Construction

In an *inter partes* review based on a petition filed prior to November 13, 2018, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2018);⁶ *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142–46 (2016). Consistent with that standard, claim terms are generally given their ordinary and customary

⁶ A recent amendment to this rule does not apply here because the Petition was filed on June 30, 2017, prior to the November 13, 2018, effective date of the rule change. See *Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board*, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42).

meaning, as would have been understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). There are, however, two exceptions to that rule: “1) when a patentee sets out a definition and acts as his own lexicographer,” and “2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Comp. Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

It is likewise not enough [for disavowal] that the only embodiments, or all of the embodiments, contain a particular limitation. We do not read limitations from the specification into claims; we do not redefine words. Only the patentee can do that. To constitute disclaimer, there must be a clear and unmistakable disclaimer.

Id. at 1366–67; *see also EPOS Techs. Ltd. v. Pegasus Techs. Ltd.*, 766 F.3d 1338, 1341 (Fed. Cir. 2014); *Liebel–Flarsheim v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004) (“[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited.”).

If an inventor acts as his or her own lexicographer, the definition must be set forth in the specification with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). Disavowal can be effectuated by language in the specification or the prosecution history. *Poly-America, L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016). “In either case, the standard for disavowal is exacting, requiring clear and unequivocal evidence that the claimed invention includes or does not include a particular feature.” *Id.* “[T]he claims must ‘not be read restrictively unless the patentee has

demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction.”” *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347 (Fed. Cir. 2015).

Only terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Neither Petitioner nor Patent Owner proposes a specific express construction for any term. In the Decision on Institution, we determined that there was no need to express a specific construction for any claim term. Post institution, neither party objected to that determination. Paper 11, 11. However, resolution of claims 9 and 10 turns on whether Rowan discloses a “phase modulated optical signal,” as recited in claim 9. To the extent that a construction for “phase modulated optical signal” is necessary, we find it much more meaningful to discuss it in context, in the substantive analysis of claim 9 below.

F. Alleged Obviousness of Claims 1, 8,
and 9 over Cohen, Blonder, and Rowan

1. Cohen

Cohen is directed to an optical communication network. Ex. 1306, 2:11–12. Cohen includes a fiber optic terminal system (FOTS) and a “diagnostic platform” that is integrated component 110 formed on substrate 120. *Id.* at 2:12–14; 3:17–20. Figure 3 of Cohen is reproduced below:

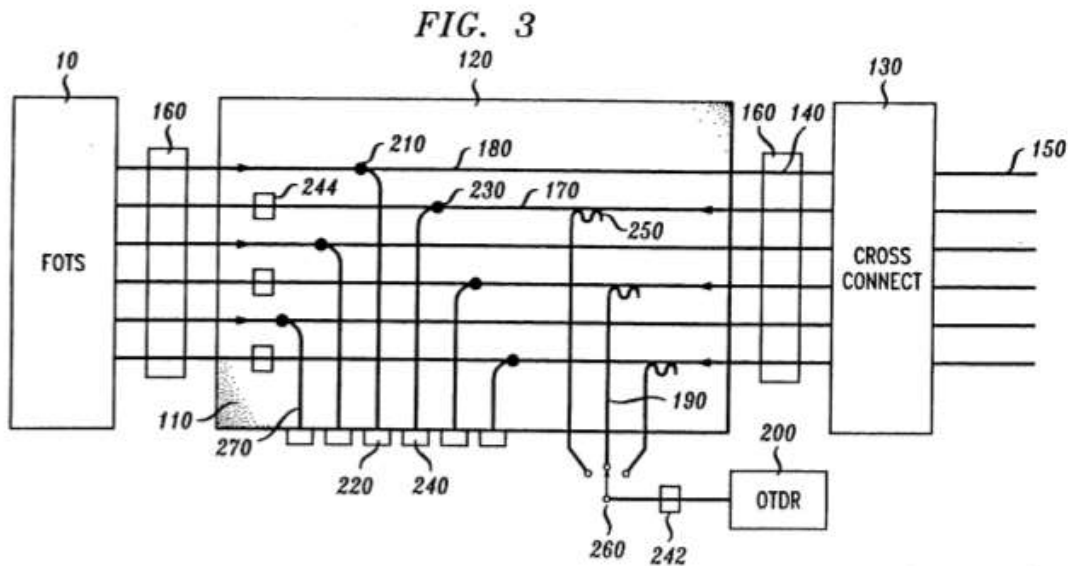


Figure 3 shows a schematic diagram according to one embodiment of Cohen, including a diagnostic platform connected to FOTS 10 and cross-connect frame 130. *Id.* at 2:55–59.

Integrated component 110 is formed on substrate 120, has a planar upper surface, and multiple, planar, optical waveguides formed on the upper surface thereof. *Id.* at 3:17–22. Cohen describes that in a preferred embodiment, substrate 120 is a portion of a silicon wafer and the waveguides and other passive components are lithographically processed. *Id.* at 3:22–25. Cohen states: “The technology for manufacturing components of this kind, often referred to as ‘silicon optical bench (SiOB)’ technology, is well known.” *Id.* at 3:25–28.

The FOTS can be located at a central office (CO), and it includes receivers for receiving optical fiber transmission coming into the CO and transmitters for initiating optical fiber transmission exiting the CO. *Id.* at 1:16–21. Alternatively, the FOTS can be located at a remote terminal (RT) which further connects, by optical fibers, to a plurality of distant terminals (DT). *Id.* at 1:44–47. The cross-connect frame connects internal optical

fibers at either the CO or the DT to external optical fibers. *Id.* at 1:21–26; 1:47–50; 3:31–37. Hundreds of waveguides are formed on the surface of substrate 120 and are optically coupled to ribbon-cable connectors 160 on either side of the substrate. *Id.* at 3:38–46.

Cohen's disclosed embodiment also includes OTDR transceiver 200 coupled to certain waveguides on the substrate to perform OTDR monitoring of the network. *Id.* at 3:53–61. Cohen describes that in one embodiment, the diagnostic platform includes fifty waveguides 170 that carry inbound signals, fifty waveguides 180 that carry outbound signals, and one hundred waveguides 190 that carry diagnostic transmissions for OTDR monitoring of the network. *Id.* at 3:53–58.

Regarding detectors, Cohen describes:

Optically coupled to each outbound waveguide is a 20-db directional coupler 210 to divert into a monitor 220 about 1% of the optical power transmitted through that waveguide from the FOTS. The 20-db coupler is formed as a passive, integrated component on the substrate. Similarly, a 10-db directional coupler 230 is optically coupled to each inbound waveguide to divert into a monitor 240 about 10% of the optical power received from the outside plant through that waveguide. As depicted in FIG. 3, the inbound and outbound waveguides are arranged alternately on the substrate.

Id. at 3:61 to 4:4. With regard to OTDR monitoring, Cohen describes:

The OTDR waveguides will carry transmissions at one or more wavelengths λ_m which are distinct from the signal wavelength or wavelengths. OTDR transmissions will be coupled into and out of the OTDR waveguides by means of wavelength-division multiplexers (WDMs) 250 which are also formed as passive, integrated components on the substrate.

Id. at 4:8–14.

2. Rowan

Rowan is directed to optical communication networks, specifically the use of frequency-division multiplexing in optical communication systems.

Ex. 1308, 1:31–34. Rowan discusses add/drop multiplexing (ADM) functionality. *Id.* at 2:31–32. Specifically, Rowan describes:

Typically, a number of low-speed data streams (i.e., “low speed channels”), for example transmitted by different users, are combined into a single high-speed channel for transport across the fiber. Conversely, when the high-speed channel reaches the destination for one of the low-speed channels contained in it, the low-speed channel must be extracted from the rest of the high-speed channel. A typical optical network consists of nodes which transmit high-speed channels to each other over optical fibers. In addition to transporting low-speed channels through the node (the “pass-through” function) as part of high-speed channels passing through the node, nodes may also combine incoming low-speed channels to the high-speed channel (the “add” function) and/or extract outgoing low-speed channels from the high-speed channels (the “drop” function). These functions are commonly referred to as add-drop multiplexing (ADM).

Id. at 2:16–32.

Rowan’s Figure 1A is reproduced below:

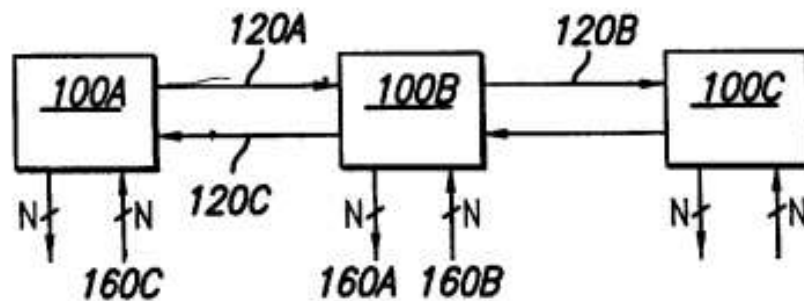


FIG. 1A

Figure 1A is a block diagram of an exemplary optical communication network according to Rowan. *Id.* at 7:11–12. The network includes nodes 100A, 100B, and 100C, which transmit high speed data signals to each other through optical fibers. *Id.* at 7:12–8. Rowan refers to such data signals as high-speed channels 120, and high-speed channels 120A, 120B, and 120C are shown in Figure 1A. *Id.* at 7:18–21. Each node 100 also transmits and receives lower speed data signals to other devices, and Rowan refers to these lower-speed data signals as tributaries 160, which are shown in Figure 1A as 160A, 160B, and 160C, together with an associated slashed arrow entering and exiting the bottom of each node. *Id.* at 7:34–38. The letter “N” next to each slash represents the presence of multiple signals. *Id.* at 7:39.

Figure 4 of Rowan is reproduced below:

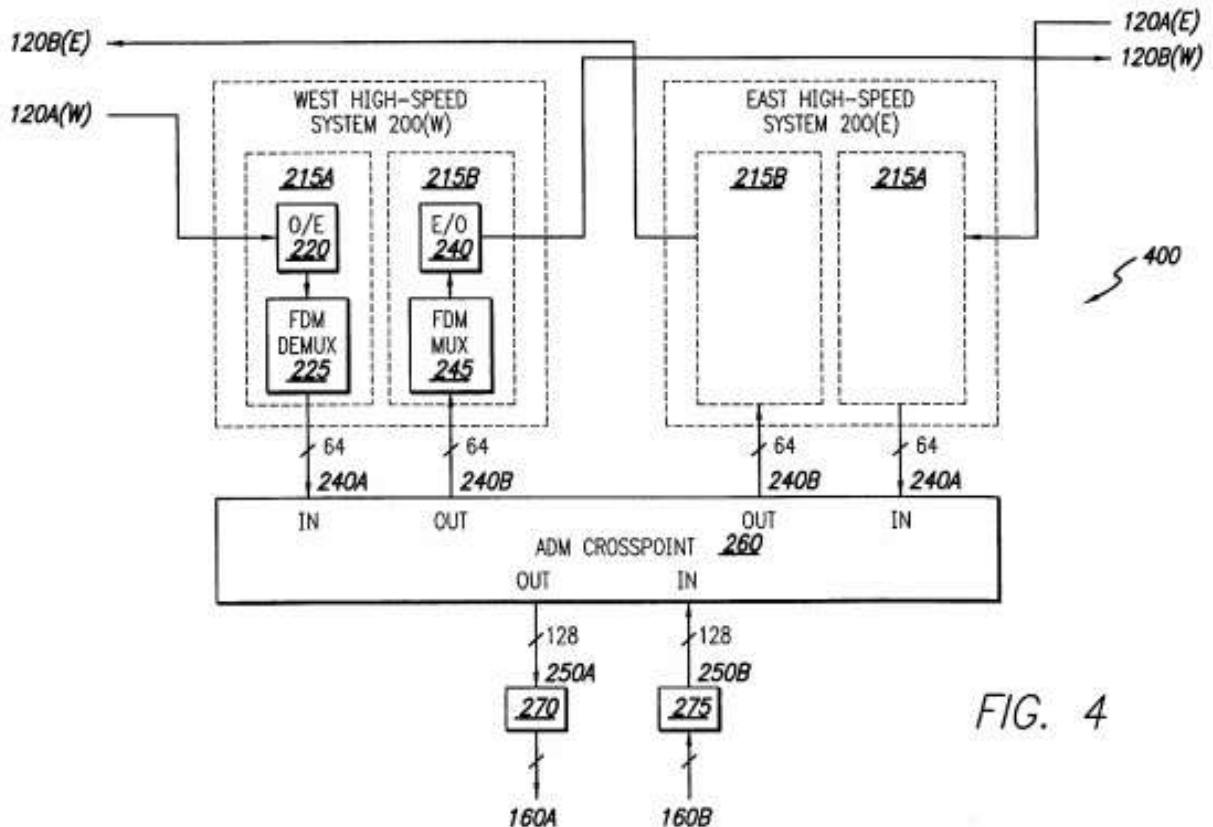


Figure 4 is a block diagram of an embodiment of node 100. *Id.* at 6:44–45.

Rowan describes:

FDM node **400** includes two high-speed systems **200(E)** and **200(W)**, a low-speed system **201**, and a control system **290** (not shown in FIG. 4). The high-speed systems **200** are the same as each other, but two systems are used in order to facilitate flow to two other nodes (not shown) which are arbitrarily referred to as an east and a west node. This is a common configuration, as shown in FIGS. 1A–1C. The suffixes E and W denote high-speed channels arriving from the east and west nodes, respectively. In the eastbound direction, high-speed system **200(E)** has incoming and outgoing high-speed channels **120A(E)** and **120B(E)** and is coupled to low-speed system **201** in the same manner as in FDM node **100** [Figure 2]. West high-speed system **200(W)** is analogously coupled.

Id. at 11:63 to 12:10. Numeral 215A denotes a high-speed receiver and numeral 215B denotes a high-speed transmitter. *Id.* at 10:18–22. Optical to electrical (O/E) converter 220 converts an incoming signal from optical to electrical form. *Id.* at 9:36–38. Frequency division demultiplexer 225 demultiplexes an incoming signal into a plurality of signals 240A, which are referred to as slow-speed channels. *Id.* at 9:39–42. Frequency division multiplexer 245 multiplexes a plurality of signals 240B into a single signal. *Id.* at 9:63–65. Electrical to optical (E/O) converter 240 converts signals from electrical to optical form. *Id.* at 9:65–66.

Each low-speed channel 240 and 250 carries electrical signals. *Id.* at 12:24–25. ADM Crosspoint 260 implements an add/drop functionality. *Id.* at 11:14–15. For instance, to implement an add functionality, a tributary 160B is received and ADM Crosspoint 260 couples the relevant incoming low-speed channel 250B to the relevant outgoing low-speed channel 240B and outputs low-speed channel 240B as a part of high-speed channel 120B.

Id. at 11:15–21. To implement a drop functionality, ADM Crosspoint 260 couples the relevant incoming low-speed channel 240A to the relevant outgoing low-speed channel 250A. *Id.* at 11:21–25. Numerals 270 and 275 denote converters that convert between the format of ADM Crosspoint 260 and tributaries 160A and 160B. *Id.* at 9:53–56; 9:59–61.

Figure 12A of Rowan is reproduced below:

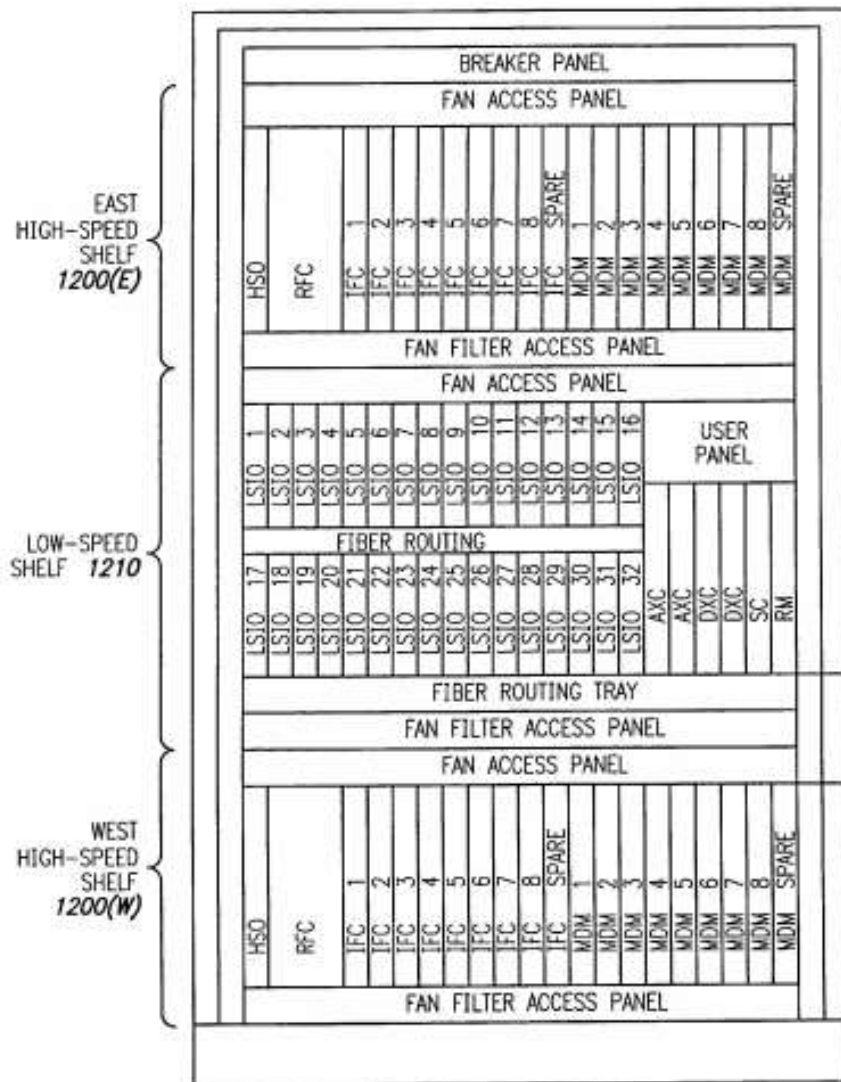


FIG. 12A

Figure 12A illustrates a preferred physical layout for the FDM node 400 shown in Figure 4. *Id.* at 19:51–52. Rowan describes:

As shown in FIG. 12A, FDM node **400** is a full-height electronics rack with three shelves: east high-speed shelf **1200(E)**, west high-speed shelf **1200(W)**, and low-speed shelf **1210**. Each shelf includes a number of cards, with electrical communication between the cards preferably occurring via a backplane for the shelf. Generally speaking, east high-speed shelf **1200(E)** implements the functionality of east high-speed system **200(E)** of FIG. 4, west high-speed shelf **1200(W)** implements the functionality of west high-speed system **200(W)**, and low-speed shelf **1210** implements the functionality of the low-speed system **201** and control system **290**.

Id. at 19:52–63. The HSO card on a high-speed shelf implements an optical transceiver with the optical fibers carrying the optical high-speed channels 120 plugging into the front of the card. *Id.* at 20:9–13.

3. Blonder

Blonder is directed to a subassembly used in packaging optoelectronic devices such as photodiodes and light emitting diodes. Ex. 1307, 1:5–9;

1:64 to 2:3. Blonder states:

For example, it would be desirable, on the one hand, to have a subassembly which fits inside of a dual-in-line package (DIP) header and is adapted to a 125 μm diameter fiber and, on the other hand, to have a different subassembly which is adapted to a larger diameter fiber and is surface mounted on a printed circuit (PC) board.

Ex. 1307, 1:52–58. Figure 2 of Blonder is reproduced below:

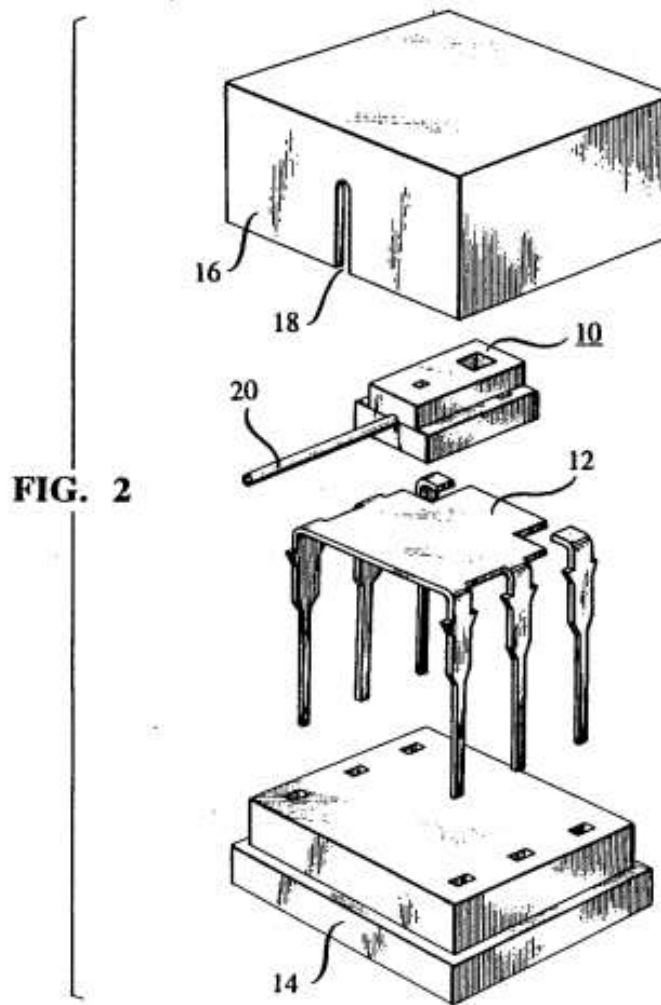


Figure 2 of Blonder is an exploded view of a package according to Blonder for an optoelectronic device. *Id.* at 2:62–68. Optoelectronic device subassembly 10 is mounted on lead frame 12 which is inserted in DIP header 14, and is provided with cover 16 having slot 18 to permit optical fiber 20 to extend from subassembly 10 to the exterior of the package. *Id.* at 3:18–22. “Fiber 20 permits lightwave signals to be transmitted to and/or from an optoelectronic device (e.g., photodiode 11) within the subassembly.” *Id.* at 3:22–25.

4. Proposed Combination of Cohen, Blonder, and Rowan

Petitioner explains:

While *Cohen* is silent as to the complete physical implementation [of an optical multiplexor], a POSITA would have recognized that integrating the *Cohen* components onto circuit cards (e.g., PCBs) designed for installation into optical multiplexor boxes would have been a common sense and *necessary* step, since the combination of the *Cohen* components would have necessarily required some physical structure that implemented the various connections between the components, and the admitted known cards and boxes were the physical form factors found in optical networks at the time. *See supra* § VII; Ex-1301, 1:22–46; Ex-1302, ¶¶ 34–36, 89, 93.

Pet. 24. Petitioner specifically notes Blonder’s teachings in connection with Cohen as follows:

Moreover, *Blonder* discloses . . . the integration of optical devices onto SiOB subassemblies, and integrating the SiOB subassemblies on to larger substrates, such as one or more printed circuit boards, was within the capability of a POSITA, and was desirable for the purpose of using commercially available equipment designed for PCB production without requiring extensive retooling or new assembly techniques. Ex-1307, 1:40–61; Ex-1302, ¶¶ 96–97. Directly relevant to the network disclosed in *Cohen*, *Blonder* acknowledges the specific benefit to “cost sensitive, high volume applications, such as *lightwave systems between central switching offices or remote-terminals and subscribers’ homes* (known as the subscriber loop).” Ex-1307, 1:40–45 (emphasis added); Ex-1302, ¶ 97. The packaged components on an SiOB substrate in *Blonder* include light sources and photodiodes, which are the same elements of *Cohen*’s transmitter, receiver, and OTDR parts, and *Cohen* also discloses the elements of its diagnostic platform on the same type of SiOB substrate. Ex-1302. ¶¶ 52–54, 63–67, 98.

Id. at 25. Petitioner asserts that the integration of Cohen components into one or more printed circuit boards would have been obvious “as nothing

more than the common sense application of integration techniques, known to POSITA and taught by *Blonder*, to the known *Cohen* system to obtain a predictable result.” *Id.* at 26.

In Petitioner’s analysis as presented above, Petitioner asserts that “common sense” would have prompted a person of ordinary skill to integrate the subassembly components of Cohen onto circuit boards. Generally, reliance on “common sense” in an obviousness analysis to fill a gap, without evidentiary support for what was known and reasoning as to why one with ordinary skill in the art would have applied that which was known, is inappropriate. *Arendi S.A.L. v. Apple Inc.*, 832 F.3d 1355, 1366 (Fed. Cir. 2016) (“A conclusory statement is insufficient to justify a conclusion about ‘common sense.’”); *In re Zurko*, 258 F.3d 1379, 1383 (Fed. Cir. 2001) (holding that a conclusion of obviousness cannot be based on unsupported assertions of “basic knowledge” and “common sense”).

Here, however, Petitioner has provided evidentiary support for what was known from *Blonder* as well as reasoning on why one with ordinary skill in the art would have applied in Cohen that which was known from *Blonder*. Specifically, as noted above, *Blonder* teaches that integrating optical devices onto SiOB subassemblies and SiOB subassemblies on to larger substrates was desirable because it allowed using commercially available equipment designed for PCB production without requiring extensive retooling or new assembly techniques. Thus, Petitioner’s analysis is not conclusory. Rather, notwithstanding Patent Owner’s argument, which we discuss and reject below, Petitioner’s reasoning as to why a person of with ordinary skill would have combined the teachings of Cohen and *Blonder* is persuasive. Petitioner’s articulated rationale, supported by the

evidence Petitioner cites, establishes that it would have been obvious to one with ordinary skill in the art to integrate Cohen's optical device onto SiOB subassemblies and to integrate the SiOB subassemblies onto printed circuit boards.

Patent Owner argues that Blonder discloses the packaging and integration of an optoelectronic device that connects only to a single fiber, and notes that Cohen's diagnostic platform includes 200 or even more waveguides and a ribbon cable to connect fibers to the waveguides. PO Resp. 25. Specifically, Patent Owner asserts:

There is no teaching in Cohen or Blonder of how the single fiber package of Blonder can be applied to the hundreds of fibers in Cohen. Simply put, Blonder does not support the broad proposition that Petitioners seek for it to teach, particularly given the difference in scope between Cohen and Blonder (e.g., hundreds of optical fibers disclosed in Cohen versus one optical fiber discloses in Blonder). Accordingly, Blonder does not add anything meaningful to Petitioners' analysis of Cohen or Rowan.

Id. Thus, Patent Owner's contention is that Blonder does not support the proposition of packaging an optoelectronic device having a connection to hundreds of fibers. *Id.* The contention is unpersuasive. It does not undermine Petitioner's position in any meaningful manner. An optoelectronic device that would connect to multiple fibers would have the same, if not greater, needs for packaging and structural support as would an optoelectronic device that connects to a single fiber. Also, the record evidence does not indicate that packaging optoelectronic devices that connect to multiple fibers would present a problem for one with ordinary skill in the art. Furthermore, in Petitioner's proposed combination, the diagnostic platform need not actually connect to 200 optical fibers.

Additionally, Petitioner's assertions are supported by the cited testimony of Dr. MacFarlane. See Ex. 1302 ¶¶ 96–97. For example, Dr. MacFarlane testifies: “With particular relevance to the type of optical networks including central offices, remote terminals and subscribers disclosed in Cohen (see Fig. 1), Blonder recognizes the need and the benefits of integration of optical devices onto SiOB subassemblies, and integrating the SiOB subassemblies on to larger substrates, such as printed circuit boards.” *Id.* at 97 (citing Ex. 1307, 1:40–61). In contrast, Patent Owner's contentions are not supported by the testimony of any technical witness.

Petitioner proposes to use Cohen's monitoring method and diagnostic platform, implemented on a printed circuit, in Rowan's system to monitor Rowan's high speed network optical fibers 120A/B and/or low speed network optical signals 160A/B. Pet. 28–29. Petitioner explains that that combination is nothing more than the predictable use of known techniques to improve similar devices in the same way, e.g., to improve the Rowan network by adding Cohen's monitoring capabilities. *Id.* Petitioner's contentions are supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶¶ 106–110. Patent Owner does not present contrary arguments on this aspect of Petitioner's proposed combination. We are persuaded by Petitioner's reasoning and find that it is based on rational underpinnings.

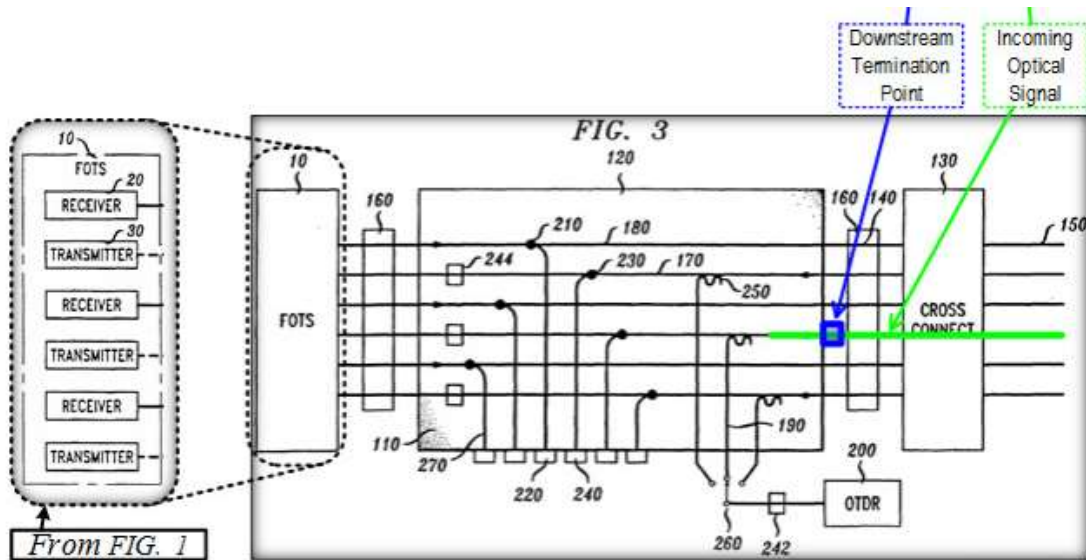
In the alternative, in an argument spanning pages 27 through 28 of the Petition, Petitioner proposes a different combination of Cohen, Blonder, and Rowan. We do not find this analysis to be expressed with sufficient clarity. Petitioner proposes “integrating the *Cohen/Blonder* transceiver card features with the HSO transceiver card in the *Rowan* 1200E and/or 1200W boxes,” or “integrat[ing] the diagnostic platform and OTDR of the *Cohen/Blonder*

circuit into the transceiver cards 1224 of *Rowan*'s low-speed system for implementing interfaces 270 and 275 to provide the same monitoring of optical fiber links on the tributary side of the network [of *Rowan*]." Pet. 27. We do not understand this rationale because, according to the above-noted assertions, one would expect the resulting combination to be a modified *Rowan* network. Yet, Petitioner refers to the resulting combination as "[t]he resultant card/box in *Cohen*'s network" and "improv[ing] the *Cohen* network." Pet. 27–28. This alternative rationale is confusing and, thus, unpersuasive.

5. Claim 1

Claim 1 recites "A telecommunications monitoring method, comprising" Ex. 1302, 6:51. Petitioner explains that *Cohen* discloses a telecommunications monitoring method, citing to various portions of *Cohen* and the testimony of Dr. MacFarlane. Pet. 31–32. Patent Owner has not presented a contrary argument. We are persuaded that *Cohen* discloses a telecommunications monitoring method.

Claim 1 recites "receiving an incoming optical signal at a downstream termination point, located within an optical multiplexor box, of an optical fiber." Ex. 1302, 6:52–54. The bottom half of an illustration with colored annotation appearing on page 36 of the Petition is reproduced below:



The partial illustration is based on Figure 3 of Cohen, has dark blue and green annotations provided by Petitioner, and depicts how Petitioner regards the limitation here as satisfied by its proposed combination of Cohen, Blonder, and Rowan. Pet. 36–39. Petitioner asserts:

Fig. 3 of *Cohen* (bottom half of [entire figure on page 36 of Petition]) illustrates receiving an incoming optical signal over optical fibers 150 that terminate at cross connect 130, and over optical fiber 140 that terminate at diagnostic platform substrate 120 with a ribbon fiber connector or as waveguide-to-fiber couplers. Ex-1306, 3:31–42, 3:53–55, 6:19–7L6, 8:52–54; Ex-1302, ¶ 123.

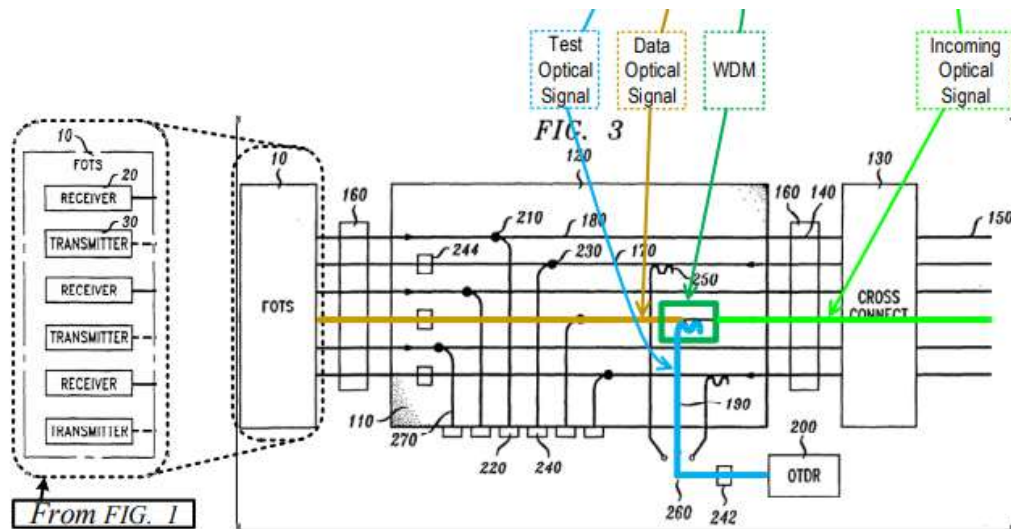
Id. at 36–37. According to Petitioner, the square box in the above illustration, as annotated in dark blue, denotes the downstream termination point required by claim 1. *Id.* at 37. Petitioner has made a sufficient showing in that regard. The assertion is persuasive. We see that the marked location represents a downstream termination point of an optical fiber, because it is where optical signals would exit incoming optical fiber 140 and enter the internal circuitry of Cohen’s diagnostic platform 120. Patent

Owner has not presented contrary arguments on this issue in the Patent Owner Response.

Petitioner further explains that the termination point of the optical fiber in the proposed combination of Cohen, Blonder, and Rowan would be located within an optical multiplexor box, as recited in claim 1, because in Petitioner's proposed combination, Cohen's diagnostic platform 120 would be within one of Rowan's high speed or low speed shelves. *Id.* In that regard, Petitioner asserts: "A 'shelf' is an industry term for a box having card slots, and is analogous to prior art multiplexor box discussed in the '012 patent. Ex-1302, ¶ 72." Pet. 21, 37. The assertion is supported by the cited testimony of Dr. MacFarlane (Ex. 1302 ¶ 72). We do not discern that Petitioner's assertion about the location of the termination point is disputed by Patent Owner by way of any argument presented in the Patent Owner Response.

For the foregoing reasons, Petitioner persuasively has established that Cohen discloses "receiving an incoming optical signal at a downstream termination point, located within an optical multiplexor box, of an optical fiber."

Claim 1 further recites "splitting, within the optical multiplexor box, the incoming optical signal into a data optical signal and a test optical signal." Ex. 1302, 6:55–57. The bottom half of an illustration appearing on page 41 of the Petition is reproduced below:



Pet. 41. The partial illustration is based on Figure 3 of Cohen, has blue, dark yellow, dark green, and light green annotations provided by Petitioner, and depicts how Petitioner regards the limitation here as satisfied by its proposed combination of Cohen, Blonder, and Rowan. *Id.* at 41–42. Petitioner explains, referring to the above illustration, which is an annotated version of Cohen’s Figure 3, that wavelength division multiplexer (WDM) 250 splits the incoming optical signal on waveguide 170 into a data optical signal, which continues along waveguide 170, and a test optical signal, which continues along waveguide 190. *Id.* The explanation is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶¶ 128–131, 160, 161. The explanation also is supported by the cited portions of Cohen. Ex. 1306, 4:8–14. For instance, Cohen describes:

The OTDR waveguides [190] will carry transmissions at one or more wavelengths λ_m which are distinct from the signal wavelength or wavelengths. OTDR transmissions will be coupled into and out of the OTDR waveguides [190] by means of wavelength-division multiplexers (WDMs) 250 which are also formed as passive, integrated components of the substrate.

Id. In this context, the OTDR transmissions constitute the test optical signal separated out by WDM 250 from a waveguide 170 carrying inbound signal.

Notwithstanding the contrary argument of Patent Owner, which we discuss below, Petitioner persuasively has established that Cohen discloses the claimed step of “splitting, within the optical multiplexor box, the incoming optical signal into a data optical signal and a test optical signal.”

Patent Owner argues that the splitting referenced by Petitioner does not actually exist in Cohen. Prelim. Resp. 23. Patent Owner argues:

In particular, Petitioners do not address that the incoming signal in Cohen is not divided into a test optical signal and a data optical signal as alleged. Following operation of WDM 250, significant portions of the full optical signal exist. In particular, the “blue” signal identified in Cohen’s Fig. 3 contain both data signal and OTDR transmissions (Cohen, 4:30–32, “the OTDR receiver may intercept, as noise, signal transmissions”), and the “dark yellow” signal identified in Cohen’s Fig. 3 contains both data signal and OTDR transmissions (Cohen, 4:41–43, “it is desirable to include reflective filters 244 to reduce the OTDR power incident on the system receivers”). Cohen expressly requires additional elements, 242 and 244, to address these significant portions of the signal existing after operation of WDM 250. Cohen, 4:33–38, 4:41–44. Thus, because the resultant signal after WDM 250 is mixed, Cohen is not demultiplexing signals of different wavelengths to separate the data optical signal from the test optical signal.

Id. at 23–24.

Patent Owner’s argument is unpersuasive. The claimed splitting step does not require perfection. The portions of Cohen cited by Patent Owner reflect only that the split is imperfect and refer to signal transmission present in the OTDR waveguide, if any, as “noise.” Ex. 1306, 4:30–32. What is described as possible “noise” does not amount to a significant portion of

OTDR transmissions diverted into OTDR waveguide 190 as alleged by Patent Owner. Patent Owner also does not cite to the testimony of any technical witness to support its characterization that the presence of signal transmissions in OTDR waveguides 190 is significant. We are unpersuaded by Patent Owner's argument. The evidence does not undermine Petitioner's showing that WDM 250 splits the incoming signal into a data optical signal and a test optical signal.

Claim 1 further recites "tapping the data optical signal to produce a tapped optical signal." Ex. 1301, 6:58–59. Petitioner explains that in Cohen's diagnostic platform 120, coupler 230 diverts about 10% of the data optical signal onto a vertical waveguide and passes the remainder of the data optical signal towards the receiver along waveguide 170. Pet. 43 (citing Ex. 1306, 3:66 to 4:2, 4:50–58, 5:6–11, Fig. 3–5). The explanation is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶ 134 (cited at Pet. 43–44). Patent Owner has not presented contrary arguments with respect to the limitation of "tapping the data optical signal to produce a tapped optical signal." We are persuaded by Petitioner that Cohen discloses the step of "tapping the data optical signal to produce a tapped optical signal."

Claim 1 further recites "processing, within the optical multiplexor box, the data optical signal to produce a data electrical signal indicative of data encoded in the incoming optical signal." Ex. 1301, 6:60–62. In Petitioner's proposed combination of Cohen, Blonder, and Rowan, which adds Cohen's monitoring method and diagnostic platform to Rowan's system so that input optical signals of Rowan may be monitored, data optical signal would be coupled to Rowan's receiver. Pet. 71. Petitioner explains

that optical-to-electrical converter 220 within Rowan's high speed shelf is an optical receiver that receives an incoming data optical signal and converts the received optical signal to a corresponding electrical signal. *Id.* The explanation is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶¶ 213–216, 233, 234. Patent Owner has not presented contrary arguments with respect to the claimed step of “processing, within the optical multiplexor box, the data optical signal to produce a data electrical signal indicative of data encoded in the incoming optical signal.” Based on the explanation provided by Petitioner and the testimony of Dr. MacFarlane, Petitioner persuasively has established that the combined teachings of Cohen, Blonder, and Rowan disclose the step of “processing, within the optical multiplexor box, the data optical signal to produce a data electrical signal indicative of data encoded in the incoming optical signal.”

Claim 1 further recites “processing the tapped optical signal to produce an electrical signal indicative of a power of the data optical signal.” Ex. 1301, 6:63–64. Petitioner explains that in Cohen's diagnostic platform 120, monitor detector 240 receives and measures average pulse power of the tapped optical signal, which is indicative of the power of the data optical signal. Pet. 47 (citing Ex. 1306, 5:48–53). The explanation is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶¶ 44, 145. Patent Owner has not presented contrary arguments with respect to the claimed step of “processing the tapped optical signal to produce an electrical signal indicative of a power of the data optical signal.” Based on the explanation provided by Petitioner and the testimony of Dr. MacFarlane, Petitioner persuasively has established that the combined teachings of Cohen, Blonder,

and Rowan disclose the step of “processing the tapped optical signal to produce an electrical signal indicative of a power of the data optical signal.”

Claim 1 further recites “performing, by an optical time-domain reflectometer (OTDR) module within the optical multiplexor box, OTDR monitoring of an optical fiber selected from: an incoming optical fiber associated with the incoming optical signal and an outgoing optical fiber associated with an outgoing optical signal.” Ex. 1301, 6:66 to 7:4.

Petitioner explains that in its proposed combination of Cohen, Blonder, and Rowan, OTDR module 200 receives test optical signal 190 from WDM 250 to monitor the input optical fiber. Pet. 50 (citing Ex. 1306, 2:26–29, 3:53–61, 4:8–15, 4:29–38). The explanation is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶¶ 68, 72, 101–110, 148–150. Patent Owner has not presented contrary arguments with respect to this claimed step. Based on the explanation provided by Petitioner and the testimony of Dr. MacFarlane, Petitioner persuasively has established that the combined teachings of Cohen, Blonder, and Rowan disclose the step of “performing, by an optical time-domain reflectometer (OTDR) module within the optical multiplexor box, OTDR monitoring of an optical fiber selected from: an incoming optical fiber associated with the incoming optical signal and an outgoing optical fiber associated with an outgoing optical signal.”

For the foregoing reasons, we determine that Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over Cohen, Blonder, and Rowan.

6. Claim 8

Claim 8 depends from claim 1 and further recites “wherein the incoming optical signal comprises a wavelength multiplexed signal

including a first signal having a first wavelength multiplexed with a second signal having a second wavelength and wherein splitting the incoming optical signal comprises de-multiplexing the first signal and the second signal, wherein the first signal comprises the optical data signal and the second signal comprises the test optical signal.” Ex. 1301, 7:50–57.

Petitioner asserts: “*Cohen* teaches that the test optical signal has a wavelength λ_m that is distinct from the data optical signal wavelengths, and that WDM 250 demultiplexes these two signals having different wavelengths.” Pet. 52 (citing Ex. 1306, 4:8–14). The argument is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶¶ 130, 131, 152 (cited at Pet. 52). Petitioner’s argument is persuasive. Because wavelength-division multiplexer 250 separates the two signals having two different wavelengths (Ex. 1306, 4:8–14), *Cohen* discloses that splitting the incoming optical signal comprises de-multiplexing the optical data signal and the test optical signal. Patent Owner has not presented arguments additional to those we discussed and rejected above. Petitioner has shown that *Cohen* discloses the limitation added by the recitation in claim 8.

For the foregoing reasons, we determine that Petitioner has shown by a preponderance of the evidence that claim 8 would have been obvious over *Cohen*, *Blonder*, and *Rowan*.

7. Claim 9

Claim 9 is independent. It differs from claim 1 in several respects. First, unlike claim 1, claim 9 does not recite tapping of an optical signal to generate a tapped optical signal, or any operation on a tapped optical signal. Second, claim 9 does not require the receiving of an optical signal at a downstream termination point of an optical fiber to be within an optical

multiplexor box. Third, rather than reciting receiving an incoming optical signal and splitting the incoming optical signal into a data optical signal and a test optical signal, claim 9 recites receiving an optical signal that includes a data optical signal of a first wavelength and a test optical signal of a second wavelength, and de-multiplexing the data optical signal and the test optical signal. Ex. 1301, 7:60–64. Fourth, claim 9 recites that receiving of the optical signal is done by an “optical line card,” and that it is a “phase modulated optical signal” that is received. *Id.* at 7:60–61.

The analysis above for claim 1 applies equally to claim 9, except that the “optical line card” and “phase modulated optical signal” language of claim 9, and the requirement in claim 9 that the data optical signal and the test signal have different wavelengths, need to be separately addressed.

Petitioner asserts that “optical line card” includes any card with an optical interface for connecting to a network. Pet. 38. The assertion is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶ 101 (cited at Pet. 38). Patent Owner has not articulated a different view. On the record before us, and under the rule of broadest reasonable interpretation, we agree with Petitioner. We have no reason to conclude, based on the evidence before us, that “optical line card” requires anything more specific. Accordingly, the discussion above applying the prior art to claim 1 sufficiently accounts for the “optical line card” requirement of claim 9.

With regard to the data optical signal and the test signal having different wavelengths, Petitioner explains that Cohen’s WDM 250 demultiplexes the incoming optical signal into a data optical signal and a test signal and that the data optical signal and the test signal have distinct wavelengths. Pet. 41–42. The assertions are supported by the testimony of

Dr. MacFarlane. Ex. 1302 ¶¶ 130, 131, 159. Patent Owner does not make any argument on the issue pertaining to the requirement for different wavelengths additional to the arguments it asserted in the context of claim 1 pertaining to splitting the incoming data signal. We already discussed and rejected those arguments above in the context of claim 1. For these reasons, Petitioner has persuasively shown that Cohen’s WDM 250 demultiplexes the incoming optical signal into a data optical signal and a test signal and that the data optical signal and the test signal have distinct wavelengths.

Regarding claim 9’s recitation of a “phase modulated optical signal,” Petitioner relies on the disclosure of Rowan. Pet. 22, 39. Petitioner asserts:

The high speed shelf [of Rowan] also includes “RFC,” “IFC,” and “MDM” cards that together phase modulate base band signals, e.g., BPSK, and up-convert and down-convert the phase modulated base band signals to and from radio-frequency (RF) signals *for modulation onto the optical carrier signals*. Ex-1308, 5:5–31, 14:57–15:5. 22:9–45; Ex-1302, ¶ 73.

Pet. 22 (emphasis added). For reasons discussed below, we are not persuaded by Petitioner’s argument. Petitioner has not shown that Rowan discloses receiving any optical signal that is phase-modulated.

Petitioner’s argument, as reproduced above, does not identify or refer to the actual modulation of any optical signal, but refers to what occurs in the electrical domain prior to the modulation of an optical signal. Indeed, Petitioner refers to phase modulation of “base band signals,” and conversion of the “phase-modulated base band signals” to and from radio-frequency RF signals “for modulation onto the optical carrier signals.” *Id.* The explanation stops at providing RF signals “for modulation” onto the optical carrier, short of explaining how the RF signals are modulated onto the optical carrier signal. Patent Owner notes the same:

The Rowan reference does not disclose a phase-modulated optical signal, let alone the receipt of a phase modulated optical signal by an optical line card from an optical fiber. Ex. 2035, ¶ 49. The support cited by Petitioner and Petitioner's expert, Dr. MacFarlane, for this portion of claim 9 is a single passage in Rowan regarding QAM modulated electrical signals including BPSK. Pet. 39, 69; Ex. 1302 ¶ 73, ¶ 157 (citing Ex.308 5:5–31). This passage of Rowan, 5:5–31, *which relates to an electrical signal, does not disclose a phase modulated optical signal* nor does it disclose receipt of a phase modulated optical signal by an optical line card. Ex. 2035, ¶¶ 29, 37, 49.

PO Resp. 16–17 (emphasis added) (footnote omitted). These observations of Patent Owner are supported by the cited testimony of Dr. Goossen.

Ex. 2035 ¶¶ 29, 37, 49. Patent Owner correctly states: “[t]he details of the ‘modulation onto’ [the optical carrier] are not discussed by Petitioners.” *Id.* at 18.

Notably, Petitioner's witness Dr. MacFarlane testifies:

The RFC card carries electrical Radio-frequency (RF) modulated signals to and from the HSO card 1230, and converts the RFC signals to and from intermediate-frequency (IF) modulated signals processed by the IFC cards. The IFC cards up-convert and down-convert, from/to an intermediate frequency, baseband signals processed by the MDM cards. The MDM cards modulate and demodulate phase modulated base band signals e.g., “BPSK.” Ex-1308, 5:5–31, 14:57–15:5, 22:9–45. These phase modulated base band signals are data signals carried on the high-speed optical signals through the processing of the IFC, RFC and HSO cards. *Id.*, 14:57–15:32, 15:55–17:22, 18:6–19:47.

Ex. 1302 ¶ 73. On cross-examination, however, Dr. MacFarlane acknowledges this: “The input and output of the MDM circuit packs are electrical. The output is fed to the IFC. The IFC is fed to the RFC. The RFC is fed to the HSO. *The work that the MDM has done – does is in the electrical domain.*” Ex. 2304, 74:6–10 (emphasis added). Dr. MacFarlane

also testifies on cross-examination that the processed baseband signals provided to IFC cards are electrical. *Id.* at 71:10–16. Dr. MacFarlane further testifies on cross-examination that the incoming signals to the RFC card 1232 are electrical. *Id.* at 68:15–17.

Patent Owner’s Dr. Goossen testifies: “An electrical baseband signal is not an optical signal. One exists in the electrical domain and the other exists in the optical domain.” Ex. 2035 ¶ 47. There is no rebuttal testimony from Dr. MacFarlane on this point. When asked about an optical signal and an electrical signal, Dr. MacFarlane replied that one is in the optical domain and the other in the electrical domain. Ex. 2304, 116:21 to 117:8. There is no disagreement between the experts in that regard.

Drs. Goosen and MacFarlane further provide testimony shedding light as to how a person of ordinary skill in the art would have construed a “phase modulated optical signal.” Both experts’ testimony supports a determination that a “phase modulated optical signal” would have been understood as “phase” modulating an “optical” signal. Dr. Goosen testifies that in a phase modulated optical signal, the *phase* of the *optical signal* is modulated. Ex. 2035 ¶ 48. There is no rebuttal testimony from Dr. MacFarlane on this point. When asked about a phase-modulated optical signal, Dr. MacFarlane replied that the *phase* of the *optical signal* can be modulated. Ex. 2034, 117:14–21. Although he used the words “can be,” Dr. MacFarlane does not indicate any other aspect of an optical signal that would be modulated by “phase” modulation. In contrast, Dr. MacFarlane testifies that “[a]n amplitude-modulated optical signal is going to be an optical signal where the *amplitude* is modulated.” *Id.* at 117:17–19 (emphasis added). Thus, we observe no real disagreement between Dr. Goossen and Dr. MacFarlane that

in a phase modulated optical signal, the phase of the optical signal is modulated.

This construction of “phase modulated signal” also is supported by the plain and ordinary meaning of the claim language. The Specification of the ’012 patent does not provide a special definition for the term, and neither party identified any applicable disavowal either in the Specification of the ’012 patent or in the prosecution history. Thus, to the extent it is necessary to provide an express construction for “phase modulated optical signal,” we determine that a “phase modulated optical signal” is an “optical signal,” the “phase” of which has been modulated.

Given this construction, Petitioner has not shown that the proposed combination satisfies the requirement for “phase modulated optical signal,” as we explain below. When asked, “And what card imprints the electrical signal onto the optical signal?,” Dr. MacFarlane responded: “My understanding is that’s done in the HSO circuit pack 1230 through O-to-E elements 220 and E-to-O elements 240. And I think you asked specifically about imprinting or modulating, so, I’m sorry, that would be the E-to-O 240.” Ex. 2034, 74:15–20. Neither Petitioner in its Petition, nor Dr. MacFarlane in his initial Declaration (Ex. 1302) supporting the Petition, explains how Rowan phase modulates the optical carrier signal in the optical domain within the HSO card or E-to-O element 240.

As Patent Owner correctly notes (PO Resp. 21), Rowan expressly states that the optical signal in its optical high-speed channel is intensity modulated. Ex. 1308, 19:10–12. Specifically, Rowan describes: “FIG. 10E illustrates the spectra of the optical high-speed channel 120. The RF waveform of FIG. 10D is *intensity modulated*. The result is a double

sideband signal with a central optical carrier 1041.” *Id.* at 10–13 (emphasis added). Neither Petitioner nor Dr. MacFarlane in his initial Declaration accounts for this disclosure of Rowan.

Additionally, Dr. Goossen testifies that because of the double sideband structure of the spectra, one with ordinary skill in the art would have understood that the optical signal output by Rowan’s HSO card and the optical signal received by Rowan’s HSO card is intensity modulated. Ex. 2305 ¶ 33. We find this testimony of Dr. Goossen to be persuasive, as it is explained coherently and in detail. *Id.* Petitioner has provided no contrary testimony from Dr. MacFarlane to rebut the detailed explanation in paragraph 33 of Dr. Goossen’s Declaration.

In its Reply, Petitioner again cites to Rowan’s description of “QAM” modulation in column 5, already discussed above. Reply, 4–6. Petitioner asserts that QAM includes BPSK and QPSK modulation schemes, which are “pure phase modulation formats.” *Id.* at 4–5. Petitioner also states that Rowan made explicit that “QAM” is to be interpreted as including phase modulation. *Id.* at 4. Petitioner further contends that Patent Owner’s expert Dr. Goossen confirms that QAM “involves the manipulation of phase for modulation.” *Id.* at 7. In summary, Petitioner asserts that a person of ordinary skill in the art would have understood “QAM” as including phase modulation such as BPSK. *Id.* at 5 (citing Ex. 1327 ¶ 8). On the basis that Rowan discloses phase modulation, Petitioner contends that claim 9’s requirement of “phase modulated optical signal” is met by Rowan. *Id.* at 7.

These arguments are misplaced and do not cure the deficiencies in the Petition that are discussed above. As explained above, Rowan’s discussions of QAM, BPSK, and QPSK are directed to modulation of signals in the

electrical domain prior to the generation of any optical signal by modulation of an optical carrier in the E/O converter. That is further confirmed by this statement in Rowan: “the transmit side of an FDM node for use in optical communications networks includes a quadrature amplitude modulation (QAM) modulator, a frequency division multiplexer, and an E/O converter coupled in series.” Ex. 1308, 5:5–9. The QAM modulator, which according to Petitioner includes pure phase modulation formats BPSK and QPSK, is connected *in series* with the E/O converter. Thus, the QAM modulator is not located within the E/O converter.

Petitioner further identifies the following sentence from Rowan as describing that QAM is applied to modulation of an optical signal: “Because FDM node 400 uses spectrally efficient QAM modulation and pulse shaping, the resulting optical waveform is significantly more bandwidth efficient than other optical transmission methods.” Reply, 6 (citing Ex. 1308, 19:16–19). The argument is unpersuasive. The sentence is broad enough to cover sending a QAM modulated electrical signal to an E/O converter, which then generates a modulated optical signal, consistent with our discussions above. It is not sufficiently specific to require QAM modulation of an optical signal.

Also, Dr. Goossen explains that the sentence is referring to QAM phase modulation of electrical base band signals, not optical signals. Ex. 2035 ¶ 45. We agree. We credit the testimony of Dr. Goossen because (1) as discussed above, Rowan’s other descriptions of QAM, BPSK, and QPSK are directed to modulation of signals in the electrical domain prior to the generation of any optical signal in the E/O converter; (2) also as discussed above, the optical signal output by Rowan’s HSO card and the

optical signal received by Rowan's HSO card are intensity modulated; and (3) what is referenced as FDM node 400 is the entirety of the circuitry shown in Rowan's Figure 4, not merely an HSO card or an E/O converter (Ex. 1308, 6:44–45, 19:16–19).

Petitioner presents additional arguments in its Reply to provide an alternative accounting for a “phase modulated optical signal.” Reply, 3–10. These additional arguments, however, are belatedly first presented in the Reply and, thus, are not entitled to consideration. A Reply is not an opportunity for Petitioner to rewrite its Petition to advance new theories, reasoning, or analysis. *See* 37 C.F.R. § 42.23(b) (“A reply may only respond to arguments raised in the corresponding opposition or patent owner response.”); Rules of Practice for Trials Before the Patent Trial and Appeal Board and Judicial Review of Patent Trial and Appeal Board Decisions, Final Rule, 77 Fed. Reg. 48,612, 48,620 (Aug. 14, 2012) (“Oppositions and replies may rely upon appropriate evidence to support the positions asserted. Reply evidence, however, must be responsive and not merely new evidence that could have been presented earlier to support the movant's motion.”). “Respond,” in the context of 37 C.F.R. § 42.23(b), does not mean embark in a new direction with a new approach as compared to the position originally taken in the Petition. Accepting such belatedly presented new arguments would be unjust to the Patent Owner and we decline to do so.

Patent Owner states: “Petitioner should not be allowed to rewrite the Petition through its Reply, and propose a new theory of invalidity—whether that is to provide a different analysis of Rowan or to assert obviousness of a claim element.” Sur-Reply 6. We agree.

Petitioner argues “Rowan’s broad disclosure renders obvious the ‘phase modulated optical signal’ of claim 9 to the combination of Cohen, Blonder, and Rowan in Ground 1-1 and to the combination of Rowan and Deutsch in Ground 2-1. Ex. 1302, ¶¶ 73, 157; Ex. 1327, ¶ 6.” Reply 3. The argument is belated and not entitled to consideration, because the Petition makes no contention that a “phase modulated optical signal” would have been obvious to one with ordinary skill in the art. This is a brand new theory presented by Petitioner in the Reply. We decline to consider it.

Also belatedly presented are Petitioner’s discussions of the specific structures within Rowan’s E/O and O/E converter, e.g., a Mach-Zehnder modulator in the E/O converter and a heterodyne receiver in the O/E converter, and the significance of such structures. Reply, 3, 5, 8–10. According to Petitioner, Rowan uses a Mach-Zehnder modulator to modulate the optical carrier and the Mach-Zehnder modulator was well known for modulating the phase of optical signals. *Id.* at 8. Also, according to Petitioner, a heterodyne receiver is a well-known phase demodulator. *Id.* at 8–9. Petitioner in its Reply argues that because Rowan discloses a structure well known for transmitting a phase modulated optical signal and a structure well known for receiving a phase modulated optical signal, Rowan discloses the “phase modulated optical signal” recited in claim 9. This is a brand new reasoning first presented in the Reply. We decline to consider it.⁷

⁷ Even if we were to consider this belated new argument, it is unpersuasive. Petitioner has not asserted, much less established, that a Mach-Zehnder modulator cannot perform amplitude or intensity modulation, or that a heterodyne receiver cannot perform phase demodulation. The presence of these parts does not mean Rowan performs phase modulation of an optical signal or that a phase modulated optical signal is received.

threshold detector, also not shown in Figure 1, to provide a loss-of-signal alarm. *Id.* at 2:25–28.

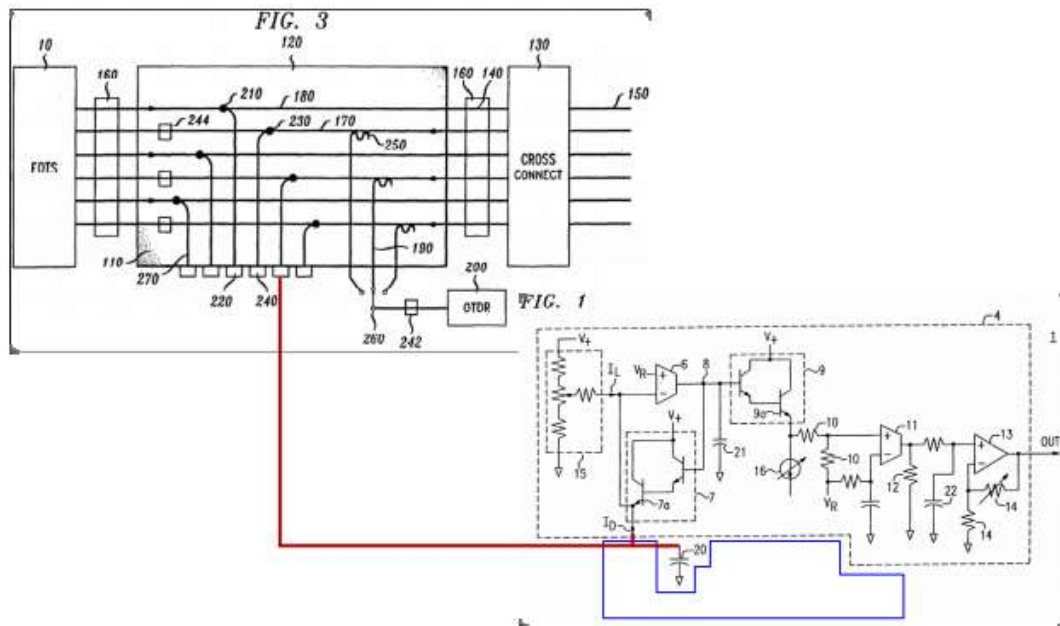
2. Cohen, Blonder, Rowan, and Roberts

Petitioner explains that Cohen discloses monitor/detector 240 to monitor a data optical signal, including measuring average power of the data optical signal. Pet. 29 (citing Ex. 1032 ¶ 164). Petitioner further explains that Cohen does not describe any detail of such a circuit, and therefore one with ordinary skill in the art would have sought out a circuit to perform the processing performed by Cohen’s monitor 240. *Id.* Petitioner asserts that one with ordinary skill in the art would have known to use Roberts’ monitor circuit 4 together with Cohen’s monitor/detector 240 because that would have been “a common sense and predictable combination of known elements each performing the functions they were intended to perform.” *Id.* (citing Ex. 1302 ¶¶ 164, 166, 167). The assertions are supported by the cited testimony of Dr. MacFarlane. For instance, Dr. MacFarlane testifies:

[T]he combination of *Cohen*, *Blonder*, and *Rowan* includes a monitor detector 240 for monitoring average received power of optical signals incoming to a receiver, and discloses that the detector 240 may be an InGaAs detector, which is a type of photodiode. Ex-1306, 5:35–51. The combination of *Cohen*, *Blonder*, and *Rowan*, however, does not disclose how the output of detector 240 is processed to provide a measure of the average received optical power. Thus, a POSITA would have sought out a circuit to perform the processing of the *Cohen* detector—and because *Robert* circuit provides the exact processing required to produce *Cohen*’s average received power—it would have been predictable and a matter of common sense to use *Roberts* power monitor circuit 4 and filter 20 to provide such processing by connecting these *Roberts* components to the output of the *Cohen* detector 240. See Part IX.E. (¶¶76–77).

Ex. 1302 ¶ 164. Although Petitioner mentions application of “common sense,” the assertion is not conclusory because it is supported by adequate explanation and underlying evidence supporting the proposed combination. The reference to “common sense” can be disregarded without substantively undermining Petitioner’s rationale.

Petitioner produces a composite figure of Cohen’s Figure 3 and a portion of Roberts’s Figure 1, on page 30 of the Petition. The figure is reproduced below:



The composite figure with blue and red annotations provided by Petitioner, reflects Petitioner’s proposed combination of Cohen and Roberts, which uses monitor circuit 4 of Roberts, as well as capacitor 20 for filtering the input to monitor circuit 4, in combination with monitor/detector 240 of Cohen. Pet. 29–30. The photodiode of Roberts has been masked out by Petitioner in blue, because Cohen’s monitor/detector 240 already includes a photodiode or equivalent thereof. *Id.* at 30.

Patent Owner has not presented contrary arguments about Petitioner's proposed use of monitor circuit 4 of Roberts with Cohen's monitor/detector 240 to measure the average power of the received data optical signal. For all of the foregoing reasons, we determine that Petitioner has presented reasoning with sufficient rational underpinning to support its proposed combination of Cohen and Roberts, specifically for using monitor circuit 4 of Roberts to measure the average received power of the data optical signal monitored or detected by Cohen's monitor/detector 240.

3. Claim 2

Claim 2 depends from claim 1 and further recites: "filtering the electrical signal indicative of the power with a low pass filter to produce an average power signal; and amplifying the average power signal to produce an amplified power signal." Ex. 1301, 7:5–9. Petitioner identifies capacitor 20 in Figure 1 of Roberts as a "low pass filter" that performs the filtering step. Pet. 53. Regarding the step of "amplifying the average power signal," Petitioner states: "*Roberts's* monitor 4 includes an operational amplifier that performs the claim 2 'amplifying the average power signal to produce an amplified power signal.'" *Id.* With respect to the limitations added by claim 2, Dr. MacFarlane testifies:

In the combination of *Cohen*, *Rowan*, *Blonder*, and *Roberts* (see *supra* X.C.1 ¶¶ 164–168), filter 20 of *Roberts* is an example of the claimed "low pass filter" that is "filtering the electrical signal indicative of the power" from *Cohen's* photodetector 240, and *Roberts's* monitor circuit 4 performs the claimed "amplifying the average power signal to produce an amplified power signal." See *supra* Parts IX.E. (¶¶ 76–77), X.C.1 (¶¶ 164–168); Ex. 1312, 2:4–13, 3:15–20.

Ex. 1302 ¶ 170. Dr. MacFarlane further testifies:

Within monitor circuit 4 is an operational amplifier 6 with a non-linear feedback circuit 7 that together operate as a transconductance amplifier producing a voltage at node 8 that is proportional to the logarithm of the bias current through the photodiode. *Id.* at 2:4–13.

Id. ¶ 77.

Petitioner’s arguments with respect to the limitation added by claim 2 are consistent with and supported by the cited evidence including the cited testimony of Dr. MacFarlane. Patent Owner has not presented arguments separate from those it asserts in the context of claim 1 which we already discussed and rejected above. Thus, we determine that Petitioner’s proposed combination of Cohen, Blonder, Rowan, and Roberts is appropriate and that the proposed combination teaches the limitation added by claim 2: “filtering the electrical signal indicative of the power with a low pass filter to produce an average power signal; and amplifying the average power signal to produce an amplified power signal.”

The limitations incorporated from independent claim 1 by reason of claim 2’s dependence from claim 1 already have been discussed above in the analysis of claim 1. For the foregoing reasons, Petitioner has proved by a preponderance of the evidence that claim 2 would have been obvious over Cohen, Blonder, Rowan, and Roberts.

4. Claim 3

Claim 3 depends from claim 2 and further recites “wherein processing the tapped optical signal includes providing the tapped optical signal to a photodetector and amplifying an output of the photodetector.” Ex. 1301, 7:11–14. Petitioner asserts:

As discussed above with respect to element [1d] and claim 2, *Cohen* discloses providing the tapped optical signal from splitter 230 to

Cohen's photodetector 240 (or alternatively to *Roberts* photodiode 2), and amplifying the output of the photodetector with *Roberts* monitor circuit 4.

Pet. 54. Dr. MacFarlane offers testimony effectively stating the same.

Ex. 1302 ¶ 172.

The above-reproduced argument of Petitioner shows that Petitioner has relied on the same amplifying activity of the same amplifier within *Roberts*' monitor circuit 4 to meet two different amplifying steps that have to occur at different points of the overall process of claim 3. Thus, Petitioner's argument and the supporting testimony of Dr. MacFarlane are unpersuasive.

The step required by claim 3 sets forth and refines the recited step in claim 1 of "processing the tapped optical signal to produce an electrical signal indicative of a power of the data optical signal." Specifically, the amplifying step recited in claim 3 is within the processing step of claim 1 "to produce an electrical signal indicative of a power of the data optical signal." Petitioner disagrees that the limitation of claim 3 modifies the "to produce an electrical signal indicative of a power of the data optical signal" limitation of claim 1. In its Reply, Petitioner states: "Petitioner respectfully submits that the Board is mistaken in suggesting that the amplifier generates the 'electrical signal indicative of a power' (Institution Decision, 55)—that signal is instead generated by the photodetector." Paper 27, 22. The plain language of claim 3, however, makes the amplifying referenced in claim 3 a part of the "processing the tapped optical signal" step of claim 1, which produces the electrical signal indicative of a power of the data optical signal.

Claim 2, the limitations of which are incorporated into claim 3, also recites an amplifying step, i.e., amplifying the average power signal to

produce an amplified power signal. That average power signal is produced by another step within claim 2, i.e., “filtering the electrical signal indicative of the power [of the data optical signal] with a low pass filter to produce an average power signal.”

Thus, the amplifying step added by claim 3 and the amplifying step incorporated from claim 2 amplify different signals and are performed at different times in the overall claimed process. Specifically, the amplifying step of claim 3 is a part of producing a signal indicative of the power of the data optical signal, and the amplifying step of claim 2 acts on a filtered version of the already produced signal indicative of a power of the data optical signal.

When analyzing claim 2, Petitioner already, as discussed above, relied on the amplifying activity in monitor circuit 4 of Roberts to meet the amplifying step required by claim 2, *which occurs after generation of the electrical signal indicative of the power of the data optical signal*. Petitioner has not explained how it could also use the same activity of the same component to meet the amplifying step recited in claim 3, *which is used to generate the electrical signal indicative of the power of the data optical signal*. Thus, we are unpersuaded that Petitioner’s proposed combination of prior art teaches the limitation added by claim 3.

In the Decision on Institution, we identified this deficiency in the Petition. Paper 11, 34–35. In its Reply, Petitioner does not provide an adequate response. Petitioner asserts “the Institution Decision finds that the amplifying of Claim 3 could not be performed by the same amplifier that performed the amplifying of Claim 2.” Paper 27, 21. Petitioner also asserts that “[n]othing in the claims of the ’012 Patent, however, requires that a

different amplifier be used, and there is not support in the specification that there is a separate amplifier.” *Id.*

Petitioner incorrectly states our articulation of the deficiency in the Petition. The problem is not that Petitioner has relied on the same amplifier to meet two amplifying steps. We do not determine that two amplifier units are required. That is not the problem we see in Petitioner’s analysis. Rather, the issue and the problem, as we have explained above, is that Petitioner has used the same activity of the same amplifier to meet two separate amplifying steps that must be performed at different times, under different circumstances, with different inputs, to produce different outputs.

For the foregoing reasons, Petitioner has not proved by a preponderance of the evidence that claim 3 would have been obvious over Cohen, Blonder, Rowan, and Roberts.

5. Claim 5

Claim 5 is independent and includes many of the same limitations as recited in claim 1. However, unlike claim 1, it does not require the splitting step to be performed within an optical multiplexor box. Also unlike claim 1, it does not require the processing step that produces an electrical signal indicative of data encoded in the incoming optical signal to be within an optical multiplexor box. With regard to the receiving step, while claim 1 recites “receiving an incoming optical signal at a downstream termination point, located within an optical multiplexor box, of an optical fiber,” claim 5 recites “receiving, by an optical multiplexor box, an incoming optical signal at a downstream termination of a downstream optical fiber.” The analysis of claim 1, as discussed above, on the basis of Cohen, Blonder, and Rowan is unaffected by these differences, and remains equally applicable.

Compared to claim 1, claim 5 adds a filtering step and an amplifying step. Those are the same filtering step and amplifying step recited in claim 2. The analysis of claim 2, as discussed above, on the basis of Cohen, Blonder, Rowan, and Roberts is equally applicable.

Furthermore, compared to claim 1, claim 5 adds a comparing step and a generating step: “comparing the amplified power signal to a threshold; and generating an alarm in accordance with a result of said comparing.” For these steps, Petitioner asserts: “*Roberts*’s circuit includes a ‘threshold detector’ coupled to the output of the monitor circuit 4 for providing a ‘loss-of-signal alarm.’ See *supra* IX.B.4; Ex. 1312, 2:25–29; Ex-1302, ¶ 183. These features of *Roberts* perform the steps of [comparing step of claim 5] and [generating an alarm step of claim 5]. *Id.*” Pet. 56. Petitioner’s assertions are consistent with and supported by the cited evidence and the testimony of Dr. MacFarlane. Ex. 1312, 2:25–29; Ex. 1302 ¶¶ 183, 184. Patent Owner has not presented arguments additional to those we already have addressed and rejected in the context of claim 1.

For all of the foregoing reasons, we determine that Petitioner has proved by a preponderance of the evidence that claim 5 would have been obvious over Cohen, Blonder, Rowan, and Roberts.

H. Alleged Obviousness of Claims 1, 8,
and 9 as Obvious over Deutsch and Rowan

1. Deutsch

Deutsch is directed to a method and device for continuous monitoring an optical transmission line. Ex. 1309, 2. Deutsch describes:

[T]he method according to the invention for monitoring an optical transmission line is characterized in that a test signal is coupled into the monitored transmission line without interruption

of the monitored line, that the test signal reflected by the transmission line is coupled out without interruption of the monitored line, that the frequency of the test signal is chosen to be outside of the transmission band of the transmitted signal, and that an assessment of the quality of the transmission line, or of an error in the transmission line, is made by measurement of the reflected test signal.

Id. Deutsch also describes:

The aforementioned objective is further realized by a method for monitoring optical transmission lines that is characterized in that a fraction of a transmitted incoming signal (SIN) is coupled out without interruption of the monitored line, and that an assessment of the quality of the transmission line or an error in the transmission line is made by measurement of the coupled out signal (SSUP). In this method; continuous and uninterrupted monitoring of the optical transmission line is also possible, in which the transmitted signal itself, that is, a fraction of it, is directly used to measure the quality of the transmission line.

Id. at 3. Deutsch further describes:

It is advantageous if the last-named method is applied in combination with the first-named method, because assessment can then be made about the quality of the transmission line or errors in the transmission line, such as an increasing drop in transmission power or a threatening failure of the transmission line, from both measured quantities, namely, the reflected signal of the test signal and the coupled out fraction of the transmitted signal.

Id.

Figure 1 of Deutsch is reproduced below:

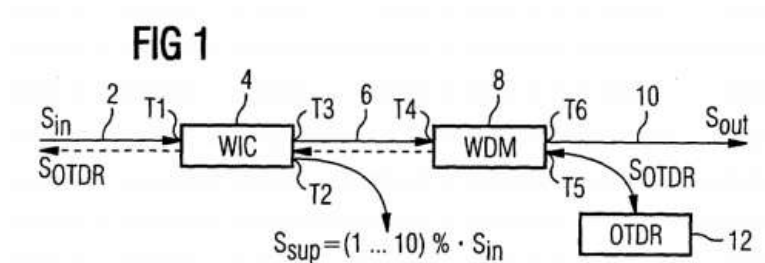


Figure 1 shows an embodiment of Deutsch's module for monitoring optical transmission lines. *Id.* at 6. WIC 4 is wavelength independent coupler, and WDM 8 is wavelength division multiplexor. *Id.* WIC couples out a power fraction of the incoming signal S_{IN} , in a range of from 1 to 10%. *Id.* The remainder is sent on transmission line 6 to WDM 8. *Id.* At gate T5 of WDM 8, an OTDR signal S_{OTDR} is coupled into or out of the transmission path from or to OTD refractometer (OTDR) 12. *Id.* At gate T6 of WDM 8, output signal S_{out} is coupled out and provided to transmission line 10. *Id.* The wavelength of signal S_{OTDR} lies outside the transmission band of the transmitted signal. *Id.*

Figure 3 of Deutsch is reproduced below:

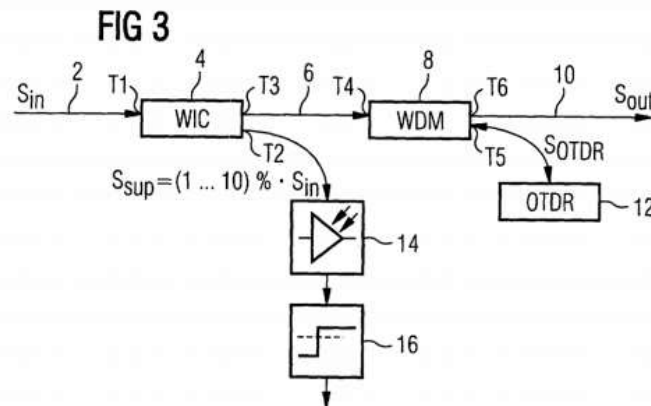


Figure 3 shows the module of Figure 1, but with additional components illustrated, i.e., photodetector 14 and logic circuit 16. *Id.* Photodetector 14 receives the coupled out fraction S_{SUP} of the transmitted signal S_{in} , and provides a corresponding measured value to logic circuit 16. *Id.* Logic circuit 16 makes a threshold determination, to indicate the quality of the transmission line or establishes an error in the transmission line. *Id.* Logic circuit 16 also generates an alarm based on its threshold determination. *Id.*

Figure 6 of Deutsch is reproduced below:

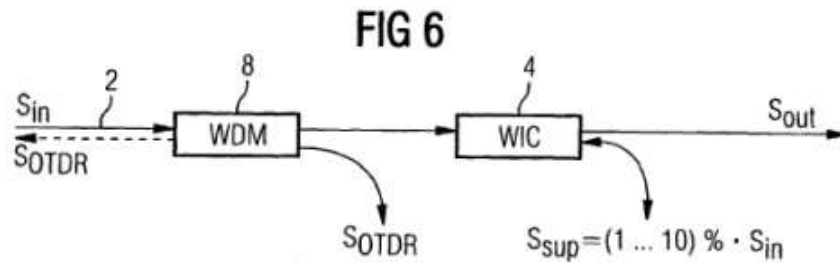


Figure 6 is another preferred embodiment according to Deutsch. *Id.* at 7.

For this embodiment, Deutsch states:

FIG. 6 is the schematic diagram t [sic] of a module for monitoring an optical transmission lines, in which the same components are used as in the exemplary embodiment of FIG. 1. Departing from FIG. 1, however, the wavelength multiplexer 8 here is arranged in the transmission direction, which is represented by the signals S_{in} and S_{out} , in front of coupler 4. The test signal S_{OTDR} coupled into the wavelength multiplexer 8 serves to monitor the incoming part of the monitoring line. This exemplary embodiment of the invention has the additional advantage that filtering of the OTDR signal can be dispensed with because this signal is coupled out before coupler 4 and therefore cannot reach the detector.

Id. at 7.

Figure 7 of Deutsch is reproduced below:

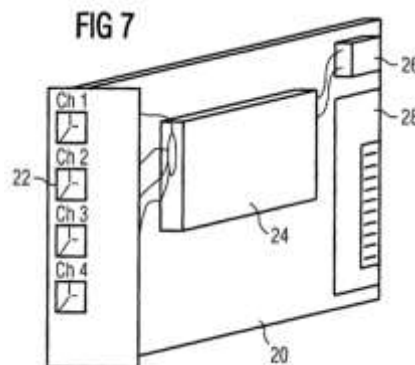


Figure 7 of Deutsch illustrates the physical structure of Deutsch's plug-in module as implemented on circuit board 20. Ex. 1309, 7. Deutsch describes:

FIG. 7 shows a plug-in unit with a circuit board 20, comprising the monitor module 24, a panel with OWG couplings 22, especially couplings for channels 1 to 4, an output 26 for an electrical alarm or a power supply and a network interface 28. The one network interface is advantageous in that the computer capacity of the computer in which the plug-in unit is installed can be utilized via this plug-in unit, in order to perform evaluations of signals measured in the monitoring module (OWG=optical waveguide).

Id.

2. Deutsch and Rowan

Petitioner explains:

Deutsch teaches a plug-in unit that is designed “to provide continuous monitoring of an optical transmission line or an optical network by the simplest possible means” by including both OTDR and power monitoring “in one module” that can be inserted into an “existing transmission system” and “integrated in existing hardware without additional means.” Ex-1309, p. 2, ll. 28–29, p. 5, ll. 19–20; *see also* p. 4, ll. 23–26, p. 7, ll. 22–37; Ex-1302, ¶¶ 186–87. *Rowan*, like the “box” described in the '012 patent, is representative of such existing transmission systems, and teaches that its system is flexible, scalable, and modular, with certain cards being replaceable with other cards. Ex-1308, 20:9–51; Ex-1302, ¶¶ 185, 189–190. A POSITA would have been motivated to incorporate the *Deutsch* plug-in module into the *Rowan* system based on the benefits as stated above and as further described in *Deutsch* as follows:

A great advantage of the device according to the invention lies in the optical combination of the components WIC (wavelength independent coupler) and WDM (wavelength division multiplexer) in one module that supplies the

required function. The module need only be inserted in an existing transmission system.

Ex-1309, p. 4, ll. 23–26.

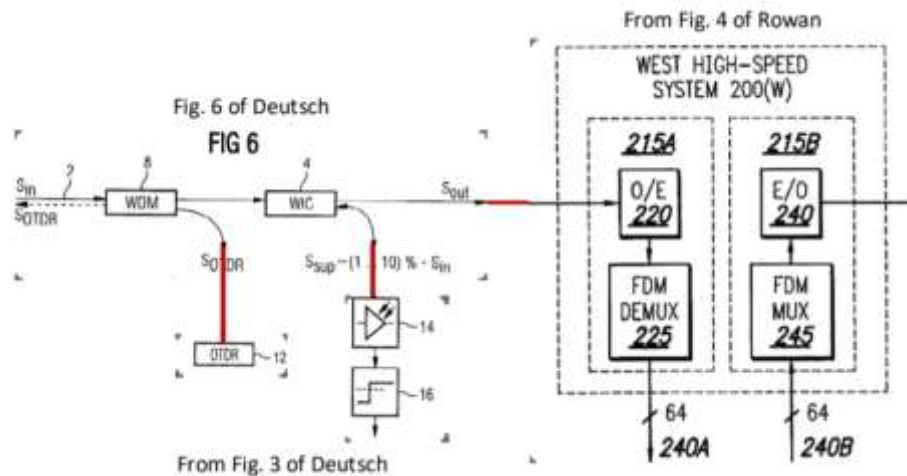
Pet. 60–61. Petitioner further explains:

To integrate the *Deutsch* plug-in module into the Rowan system, it would have been a simple reconfiguration of the *Rowan* system (for which it is designed) by replacing one card, such as one of nine IF cards, with the *Deutsch* module, which would have provided the benefit of the continuous and non-disruptive monitoring of the optical transmission lines. Ex-1302, ¶¶ 190–191.

Id. at 61–62.

Petitioner’s assertions are supported by the cited testimony of Dr. MacFarlane, and we find them to have a rational underpinning. Patent Owner has not presented contrary arguments directed to Petitioner’s rationale for combining the teachings of Deutsch and Rowan. We are persuaded by Petitioner’s reasoning that it would have been obvious to one with ordinary skill in the art to use the plug-in module of Deutsch in Rowan’s system, by replacing one of Rowan’s cards with Deutsch’s plug-in module on a card, the details of which are discussed below.

A composite figure of Deutsch’s Figures 3 and 6 and Rowan’s Figure 4, as presented on page 62 of the Petition, is reproduced below:



The composite figure, with red annotations provided by Petitioner, depicts how the plug-in module of Deutsch would have been coupled to Rowan's system, i.e., by coupling S_{OUT} from Deutsch to receiver 215A in Rowan's West High-Speed System 200(W). Pet. 62–63. Dr. MacFarlane explains: “The left side of the figure illustrates a schematic of the *Deutsch* plug in module, with the optical path, WIC, and WDM as shown in Fig. 6, and the OTDR and power monitor detailed in Fig. 3. *Deutsch* discloses that Fig. 6 is a variation of Fig. 1 and that Fig. 3 applies to the Fig. 1 embodiment. *Id.*, p. 6.” Ex. 1302 ¶ 193. Patent Owner has not presented contrary arguments regarding Petitioner's proposed manner of connecting Deutsch's plug-in module to Rowan's system. We are persuaded by Dr. MacFarlane's explanation and by the cited disclosures of Deutsch and Rowan that the above-reproduced illustration represents combined teachings of Deutsch and Rowan that would have been obvious to one with ordinary skill in the art.

3. Claim 1

Claim 1 recites “A telecommunications monitoring method, comprising” Ex. 1301, 6:51. Deutsch discloses a telecommunications monitoring method. Ex. 1308, 2, 3.

Claim 1 recites “receiving an incoming optical signal at a downstream termination point, located within an optical multiplexor box, of an optical fiber.” Ex. 1301, 6:52–54. According to Petitioner’s proposed combination of Deutsch and Rowan, Deutsch’s plug-in module is implemented as a card that receives an incoming fiber at coupling 22 (Ex. 1309, Figure 7) and placed on Rowan’s shelf, and an incoming optical signal on a fiber is directed to and received at coupling 22. Pet. 68. In the Response, Patent Owner has not presented contrary arguments.

Petitioner’s assertions are persuasive. They are supported by the evidence Petitioner cites including the testimony of Dr. MacFarlane, as we discuss below. Petitioner has established coupling 22 of Deutsch’s plug-in module as a downstream termination point of an optical fiber, located within an optical multiplexor box, when the module is implemented on a card and placed on Rowan’s shelf.

Coupling 22 represents a “downstream” termination point of an optical fiber, because that is where optical signals would exit the fiber and enter the internal circuitry of Deutsch’s plug-in module. Ex. 1309, 7. The placement of Deutsch’s card, on which the plug-in module of Deutsch is implemented, on Rowan’s shelf means the card is located within an optical multiplexor box. In that regard, Petitioner asserts: “A ‘shelf’ is an industry term for a box having card slots, and is analogous to prior art multiplexor box discussed in the ’012 patent. Ex-1302, ¶ 72.” Pet. 21; *see also* Pet. 37. The assertion is supported by the cited testimony of Dr. MacFarlane. Ex. 1302 ¶ 72. Dr. MacFarlane further testifies that Rowan’s shelf “is an optical multiplexor box.” *Id.* ¶ 201. In the Patent Owner Response, Patent Owner has not argued otherwise. We are persuaded by Petitioner that

placing Deutsch's plug-in module on Rowan's shelf in the location of a card results in coupling point 22 being located within an optical multiplexor box.

Claim 1 further recites "splitting, within the optical multiplexor box, the incoming optical signal into a data optical signal and a test optical signal." Ex. 1301, 6:55–57. Petitioner explains that in its proposed combination of Deutsch and Rowan, Deutsch's plug-in module, installed on Rowan's shelf, includes WDM 8, which splits or demultiplexes the incoming optical signal into an OTDR signal S_{OTDR} (a test optical signal) and a data optical signal S_{in} . Pet. 62, 70. The explanation is supported by the testimony of Dr. MacFarlane. Ex. 1302 ¶¶ 205–208, 232. Notwithstanding Patent Owner's arguments to the contrary, which are discussed below, Petitioner has established that its proposed combination of Deutsch and Rowan discloses "splitting, within the optical multiplexor box, the incoming optical signal into a data optical signal and a test optical signal." Specifically, in the illustration on page 62 of the Petition and reproduced above, the data optical signal is S_{in} continuing down to WIC 4, and the test optical signal is S_{OTDR} being coupled out and directed to OTDR 12.

Patent Owner argues that WDM 8 does not do anything to the input signal S_{in} , but simply passes it through. PO Resp. 28. The assertion is misplaced, because Petitioner is not relying on S_{in} as the incoming optical signal. Rather, the entirety of what is coming in, including the reflected elements of optical time domain reflectometer OTDR and S_{in} , together constitute the incoming optical signal, as shown on page 62 of the Petition and reproduced above. Pet. 62, 70. If there is no such reflected component, there would be no signal S_{OTDR} for WDM 8 to filter out and provide as an output. Patent Owner is incorrect in stating that "the only input to WDM 8

is S_{in} and the only relevant output shown is to WIC 4,” and “the sole input to WDM 8 is signal S_{in} on transmission line 2.” PO Resp. 28–29.

Claim 1 further recites “tapping the data optical signal to produce a tapped optical signal.” Ex. 1301, 6:58–59. Petitioner explains that in its proposed combination of Deutsch and Rowan, wavelength independent coupler WIC 4 receives data optical signal S_{in} from WDM 8 and splits a fraction of that to produce a monitoring signal S_{SUP} which is the claimed tapped optical signal. Pet. 70. The explanation is supported by the evidence Petitioner cites including testimony of Dr. MacFarlane. Ex. 1309, 6:1–15, 7:11–18; Ex. 1302 ¶¶ 211, 212. Patent Owner has not argued otherwise. Petitioner has shown that the combined teachings of Deutsch and Rowan disclose the step of “tapping the data optical signal to produce a tapped optical signal.”

Claim 1 further recites “processing, within the optical multiplexor box, the data optical signal to produce a data electrical signal indicative of data encoded in the incoming optical signal.” Ex. 1301, 6:60–62. Petitioner explains that in its proposed combination of Deutsch and Rowan, optical-to-electrical converter 220 within Rowan’s high speed shelf is an optical receiver that receives the data optical signal from Deutsch’s plug-in module and converts the received optical signal to a corresponding electrical signal. Pet. 71. The explanation is supported by the evidence Petitioner cites including testimony of Dr. MacFarlane. Ex. 1308, 14:10–14, 15:6–32; Ex. 1302 ¶¶ 213–216, 233, 234. Patent Owner has not argued otherwise. Petitioner has shown that the combined teachings of Deutsch and Rowan disclose the step of “processing, within the optical multiplexor box, the data

optical signal to produce a data electrical signal indicative of data encoded in the incoming optical signal.”

Claim 1 further recites “processing the tapped optical signal to produce an electrical signal indicative of a power of the data optical signal.” Ex. 1301, 6:63–64. Petitioner explains that in its proposed combination of Deutsch and Rowan, the tapped optical signal from WIC 4, or S_{SUP} , is received by optical photodetector 14, which converts it to a corresponding electrical signal indicative of the power/intensity of the S_{in} signal. Pet. 71–72. The explanation is supported by the evidence Petitioner cites including testimony of Dr. MacFarlane. Ex. 1309, Abstr., 4:31–32; Ex. 1302 ¶¶ 217–219. Patent Owner has not argued otherwise. Petitioner has shown that the combined teachings of Deutsch and Rowan disclose the step of “processing the tapped optical signal to produce an electrical signal indicative of a power of the data optical signal.”

Claim 1 further recites “performing, by an optical time-domain reflectometer (OTDR) module within the optical multiplexor box, OTDR monitoring of an optical fiber selected from: an incoming optical fiber associated with the incoming optical signal and an outgoing optical fiber associated with an outgoing optical signal.” Ex. 1301, 6:66 to 7:4. Petitioner explains that in its proposed combination of Deutsch and Rowan, Deutsch’s OTDR module 12 receives and evaluates the S_{OTDR} signal, i.e., “performs OTDR monitoring of an incoming optical [fiber] associated with the incoming optical signal ([1g]) or the test optical signal ([9e]).” Pet. 72. The explanation is supported by the evidence Petitioner cites including testimony of Dr. MacFarlane. Ex. 1309, 2, 3, 7; Ex. 1302 ¶¶ 191, 221–223, 236, 236. Patent Owner has not asserted arguments additional to what we

already have discussed and rejected above. Petitioner has shown that the combined teachings of Deutsch and Rowan disclose the step of “performing, by an optical time-domain reflectometer (OTDR) module within the optical multiplexor box, OTDR monitoring of an optical fiber selected from: an incoming optical fiber associated with the incoming optical signal and an outgoing optical fiber associated with an outgoing optical signal.”

For all of the foregoing reasons, Petitioner has proved by a preponderance of the evidence that claim 1 would have been obvious over Deutsch and Rowan.

4. Claim 8

Claim 8 depends from claim 1 and further recites “wherein the incoming optical signal comprises a wavelength multiplexed signal including a first signal having a first wavelength multiplexed with a second signal having a second wavelength and wherein splitting the incoming optical signal comprises de-multiplexing the first signal and the second signal, wherein the first signal comprises the optical data signal and the second signal comprises the test optical signal.” Ex. 1301, 7:50–57.

Petitioner asserts: “The SOTDR and SIN signals [of Deutsch] have different wavelengths, and thus, disclose the claim 8 feature of ‘the first signal and the second signal, wherein the first signal comprises the optical data signal and the second signal comprises the test optical signal.’” Pet. 73. The argument is supported by the evidence Petitioner cites including testimony of Dr. MacFarlane. Ex. 1309, 6:1–15, 7:11–18; Ex. 1302 ¶¶ 224, 225. Patent Owner has not asserted arguments additional to what we already have discussed and rejected above. Petitioner has shown that the combined

teachings of Deutsch and Rowan disclose the limitation additionally recited in claim 8.

For the foregoing reasons, Petitioner has proved by a preponderance of the evidence that claim 8 would have been obvious over Deutsch and Rowan.

5. Claim 9

To account for the “phase modulated optical signal” requirement of claim 9, Petitioner relies on the same analysis of this requirement, based on Rowan, it provides in the context of alleged obviousness of claim 9 over Cohen, Blonder, and Rowan. Pet, 22, 39, 69. That analysis has been discussed and rejected above, and need not be repeated here. For the same reasons discussed above regarding this limitation of claim 9 and the disclosures of Rowan, Petitioner has not proved by a preponderance of the evidence that claim 9 would have been obvious over Deutsch and Rowan.

I. Alleged Obviousness of Claims 2, 3, 5, 6, and 10
over Deutsch, Rowan, and Walsh

1. Walsh

Walsh discloses an optical power meter. Ex. 1311, 4:14–17. “The power meter can resolve very small losses in order to detect both intrinsic and extrinsic loss factors in the fiber optic link.” *Id.* at 4:17–19. The power meter includes an optical energy to current converter that receives the optical energy transmitted through the fiber and converts it to a current proportional to the average power in the light transmission. *Id.* at 4:19–23.

The power meter also includes a current-to-voltage converter in the form of a transimpedance amplifier. *Id.* at 4:27–29. The transimpedance

amplifier converts the current to a negative voltage proportional to the amplitude of the current. *Id.* at 4:30–32.

About the measured power level of the input optical signal, Walsh describes:

The output of the transimpedance amplifier is coupled to a voltage-to-frequency converter that converts the voltage output of the transimpedance amplifier to a pulse train having a frequency proportional to the amplitude of the voltage signal. This pulse train increments a counter that is read in periodic intervals by a microprocessor. The microprocessor reads the digital output of the counter and resets this counter to begin counting the number of pulses in the next time period. This digital value provided by the counter then is a digital representation of the optical power level.

Id. at 4:32–41.

Figure 5 of Walsh is reproduced below:

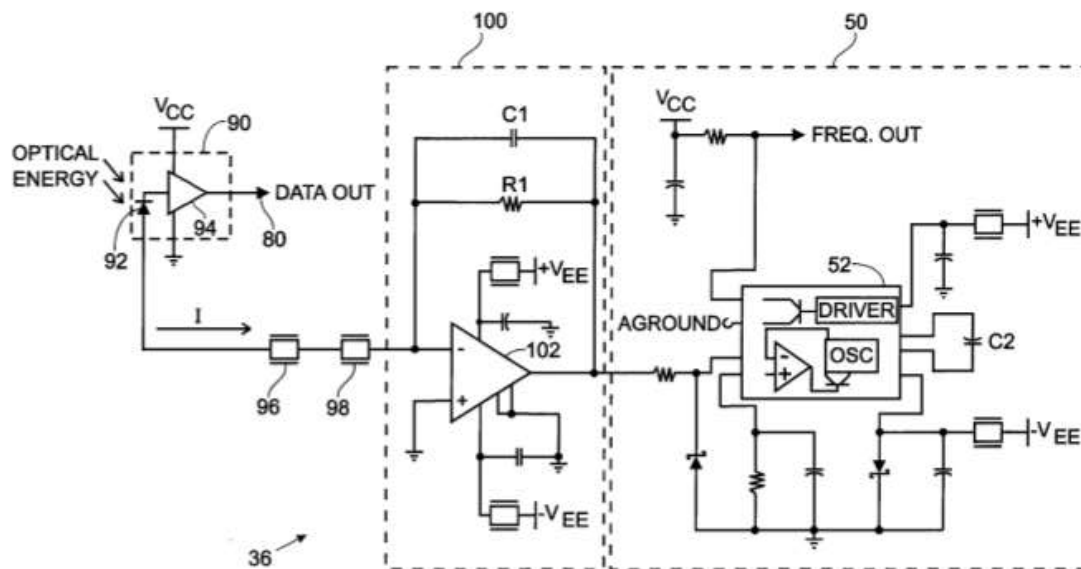


Fig. 5

Figure 5 shows a schematic diagram of an embodiment of Walsh's optical power meter. *Id.* at 6:39–40. Optical energy is received by photodiode 92 which converts optical energy to current I . *Id.* at 6:43–45.

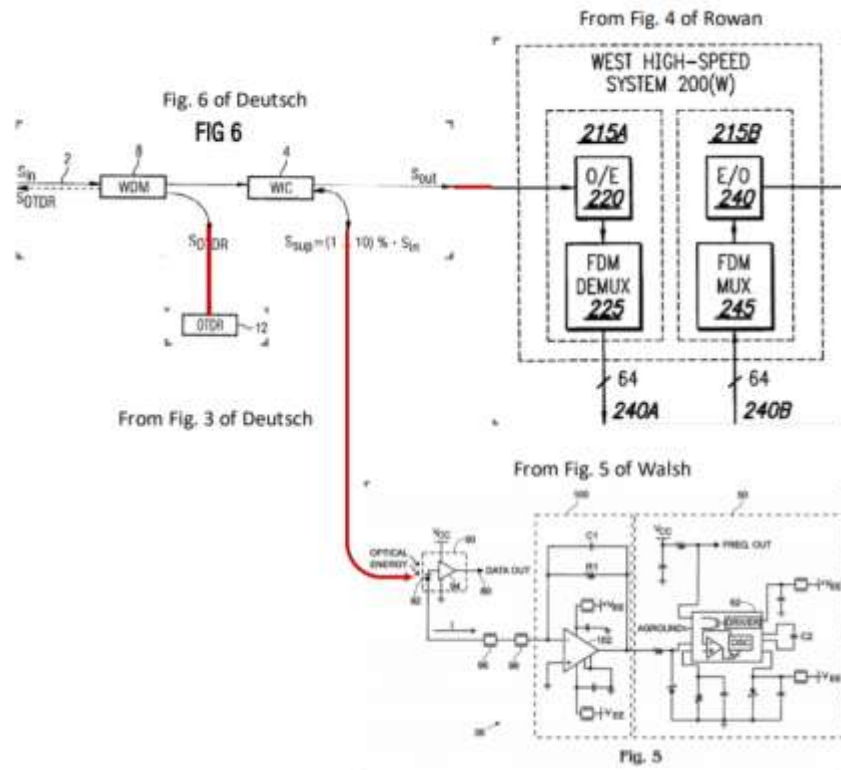
Current I is passed to a high frequency filter comprised of multi-layered ferrites 96 and 98, and the output from the filter is DC current. *Id.* at 6:50–53. The DC current is provided to current-to-voltage converter 100, which includes transimpedance amplifier 102. *Id.* at 6:53–55. The transimpedance amplifier produces a negative voltage that is proportional to current I. *Id.* at 6:65–67. The output of transimpedance amplifier 102 is coupled to a negative voltage-to-frequency converter which produces a digital pulse train `FREQ_OUT` the frequency of which is proportional to the amplitude of the negative voltage generated by current-to-voltage converter 100, which in turn is proportional to the average power of the received light transmission. *Id.* at 7:1–17.

2. Proposed Combination of Deutsch, Rowan, and Walsh

Petitioner describes its proposed combination of Deutsch, Rowan, and Walsh, by reference to its proposed combination of Deutsch and Rowan, already discussed above, and adds:

In this *Rowan/Deutsch/Walsh* combination, the photodetector 14 and logic circuit 16 of *Deutsch* are replaced with the circuits in Fig. 5 of *Walsh*. Ex. 1302, ¶ 239. Alternatively, the photodiode 14 of *Deutsch* could be connected to ferrite bead 96 in place of *Walsh*'s photodiode 92. *Id.* This combination of elements is illustrated in the figure below, reproduced from the Declaration of Dr. MacFarlane. *Id.* The figure includes the previous composite figure of Fig. 4 of *Rowan* and Figs 3 and 6 of *Deutsch* presented in the Group 2-1 combination (*see supra* X.C), further combined with Fig. 5 of *Walsh*. *Id.*

Pet. 64–65. That composite figure is reproduced below:



Id. at 65. The figure illustrates a schematic diagram according to Petitioner’s proposed combination of Deutsch, Rowan, and Walsh, with annotated red lines provided by Petitioner indicating optical paths interconnecting different parts of Deutsch, Rowan, and Walsh. *Id.*

Petitioner’s articulated reasoning is based on rational underpinning for the following reasons. Walsh’s Figure 5 illustrates an optical power meter. Ex. 1311, 4:14–17; 6:39–40. Petitioner proposes to replace Deutsch’s photodetector 14 and logic circuit 16 with Walsh’s optical power meter. In Deutsch, photodetector 14 receives the coupled out fraction S_{SUP} of the transmitted signal S_{in} , and provides a corresponding measured value to logic circuit 16. Ex. 1309, 6. Logic circuit 16 makes a threshold determination to indicate the quality of the transmission line, or establishes an error in the transmission line. *Id.* Logic circuit 16 also generates an alarm based on its threshold determination. *Id.* It would have been logical for one with

ordinary skill in the art to replace Deutsch's photodiode 14 and logic circuit 16 with Walsh's optical power meter, because both are essentially performing the same function, i.e., monitoring and detecting the quality of the transmission line by measuring the level of transmission. Patent Owner has not presented contrary arguments directed to Petitioner's rationale for combining the teachings of Deutsch, Rowan, and Walsh.

We are persuaded by Petitioner's reasoning that it would have been obvious to one with ordinary skill in the art to replace Deutsch's photodiode 14 and logic circuit 16 with Walsh's optical power meter. We also are persuaded by Petitioner's alternative reasoning that it would have been obvious to one with ordinary skill in the art to preserve photodiode 14 of Deutsch, in which case Walsh's optical power meter, sans its photodiode 92, would replace Deutsch's logic circuit 16, because only one photodiode is necessary. It can either be Deutsch's photodiode 14 or Walsh's photodiode 92.

3. Claim 2

Claim 2 depends from claim 1 and further recites "filtering the electrical signal indicative of the power with a low pass filter to produce an average power signal; and amplifying the average power signal to produce an amplified power signal." Ex. 1301, 7:5–9. Petitioner identifies ferrites 96 and 98 of Walsh as such a filter "filtering the electrical signal indicative of the power." Pet. 74. Regarding the step of "amplifying the average power signal," Petitioner states: "Walsh's amplifier 100 also includes a transimpedance amplifier 102 that performs the claim 2 limitation of 'amplifying the average power signal to produce an amplified power signal.'" *Id.* For its assertions regarding the filtering step and the

amplifying step, Petitioner cites to the testimony of Dr. MacFarlane who essentially makes the same statements as Petitioner. Ex. 1302 ¶ 241.

Petitioner's arguments with respect to claim 2 are supported by the evidence Petitioner cites including the testimony of Dr. MacFarlane. Patent Owner has not presented arguments additional to those it has asserted in the context of claim 1 and which we have discussed and rejected above. We are persuaded by Petitioner that its proposed combination of prior art teaches the filtering and amplifying steps additionally recited by claim 2. We determine that Petitioner has proved by a preponderance of the evidence that the subject matter of claim 2 as a whole would have been obvious over Deutsch, Rowan, and Walsh.

4. Claim 3

Claim 3 depends from claim 2 and further recites "wherein processing the tapped optical signal includes providing the tapped optical signal to a photodetector and amplifying an output of the photodetector." Ex. 1301, 7:11–14. Petitioner asserts:

As discussed above with respect to claim 2, *Deutsch* (Ex-1309, p. 4 ll. 31–32) and *Walsh* (Ex-1311, 6:39–58) interchangeably disclose the claimed feature of "wherein processing the tapped optical signal includes providing the tapped optical signal to a photodetector," and *Walsh* (at Ex-1311, 6:52-7:17) discloses amplifier circuit [102], which performs the claimed feature of "amplifying an output of the photodetector." See *supra* X.D., X.F.1. Ex-1302, ¶¶ 74, 75, 237–239. 243.

Pet. 74–75. Dr. MacFarlane offers testimony effectively stating the same. Ex. 1302 ¶ 243.

Petitioner's argument and the supporting testimony of Dr. MacFarlane are unpersuasive. The above-reproduced argument of Petitioner shows that

Petitioner has relied on the same amplifying activity of the same amplifier 102 within Walsh's optical power meter to meet two different amplifying steps that have to occur at different points of the overall process of claim 3. That claim 3 requires two different amplifying steps occurring at different points of the overall process of claim 3 has been explained above in Section II.G.4. discussing alleged obviousness of claim 3 over Cohen, Blonder, Rowan, and Roberts. That analysis applies here but need not be reiterated.

In its Reply, Petitioner makes the same argument for claim 3 on the alleged ground of obviousness over Deutsch, Rowan, and Walsh, as it does for claim 3 on the alleged ground of obviousness over Cohen, Blonder, Rowan, and Roberts. Reply, 21–24. The argument already has been discussed and rejected above in Section II.G.4 discussing alleged obviousness of claim 3 over Cohen, Blonder, Rowan, and Roberts. That analysis applies here but need not be reiterated.

For the foregoing reasons, Petitioner has not proved by a preponderance of the evidence that claim 3 would have been obvious over Deutsch, Rowan, and Walsh.

5. Claim 5

Claim 5 is independent and includes many of the same limitations as recited in claim 1. However, unlike claim 1, it does not require the splitting step to be performed within an optical multiplexor box. Also unlike claim 1, it does not require the processing step that produces an electrical signal indicative of data encoded in the incoming optical signal to be within an optical multiplexor box. With regard to the receiving step, while claim 1 recites “receiving an incoming optical signal at a downstream termination point, located within an optical multiplexor box, of an optical fiber,” claim 5

recites “receiving, by an optical multiplexor box, an incoming optical signal at a downstream termination of a downstream optical fiber.” The analysis of claim 1, as discussed above, on the basis of Deutsch and Rowan is unaffected by these differences, and remains equally applicable.

Compared to claim 1, claim 5 adds a filtering step and an amplifying step. Ex. 1301, 7:35–38. Those are the same filtering step and amplifying step recited in claim 2. *Id.* at 7:6–9. The analysis of claim 2, as discussed above, on the basis of Deutsch and Rowan is equally applicable.

Furthermore, compared to claim 1, claim 5 adds a comparing step and a generating step: “comparing the amplified power signal to a threshold; and generating an alarm in accordance with a result of said comparing.” For these steps, Petitioner asserts: “*Walsh’s* system compares the amplified received optical power to upper and lower user defined limits (i.e., thresholds) ([5j]) and sets an alarm condition if the received power level falls outside of the limits ([5k]). *See supra* X.B.2; Ex-1311, 7:50–55; Ex-1302, ¶¶ 254–255.” Pet, 76–77. Petitioner’s assertion is consistent with and supported by the evidence Petitioner cites including the testimony of Dr. MacFarlane. Ex. 1311, 7:50–55; Ex. 1302 ¶¶ 254, 255.

Patent Owner has not presented arguments additional to those it has asserted in the context of claim 1 and which we have discussed and rejected above. We are persuaded by Petitioner that its proposed combination of prior art teaches the subject matter of claim 5.

For the foregoing reasons, Petitioner has proved by a preponderance of the evidence that the subject matter of claim 5 would have been obvious over Deutsch, Rowan, and Walsh.

6. Claim 6

Claim 6 depends from claim 5 and further recites “wherein comparing the amplified power signal comprises comparing the amplified power signal to a plurality of thresholds and wherein generating the alarm comprises generating the alarm in accordance with a corresponding plurality of results.”

Petitioner asserts:

The combination of *Rowan*, *Deutsch*, and *Walsh* discloses claim 6, which depends from claim 5, and discloses claim 10, which depends from claim 9. *Walsh*’s comparison of the optical power to upper and lower user defined limits and setting of an alarm condition if either limit is crossed discloses the claim 6 steps of “comparing . . . to a plurality of thresholds” and “generating the alarm in accordance with a corresponding plurality of results,” and the claim 10 steps of “monitoring . . . against a threshold to generate a signal indicative of a change . . . satisfying at least one threshold criterion; and monitoring . . . against a plurality of thresholds and generating a signal indicative of a change in data optical signal power satisfying at least one threshold criterion in accordance with a plurality of comparisons corresponding to the plurality of thresholds.” See *supra* X.B.2, X.D; Ex-1311, 7:51–8:7; Ex-1302, ¶¶ 74–75, 256–260.

Pet. 77–78.

We do not discuss claim 10 here, because Petitioner’s analysis of claim 10 shares the same deficiencies we discussed above in the context of claim 9. With respect to claim 6, however, Petitioner’s assertions are supported by the evidence Petitioner cites including the testimony of Dr. MacFarlane. Ex. 1311, 7:51 to 8:7; Ex. 1302 ¶¶ 74, 75, 256–260.

For claim 6, Patent Owner has not presented arguments additional to those it has asserted in the context of claim 1 and which we have discussed

and rejected above. We are persuaded by Petitioner that its proposed combination of prior art teaches the subject matter of claim 6.⁸

For the foregoing reasons, Petitioner has proved by a preponderance of the evidence that the subject matter of claim 6 would have been obvious over Deutsch, Rowan, and Walsh.

7. Claim 10

Claim 10 depends from claim 9. The deficiencies of Petitioner's arguments with regard to a "phase modulated optical signal" required by claim 9, as determined above in the context of claim 9 as unpatentable over Deutsch and Rowan, carry over to claim 10 as well, and are not cured by Petitioner's application of Walsh. Petitioner has not proved by a preponderance of the evidence that the subject matter of claim 10 would have been obvious over Deutsch, Rowan, and Walsh.

III. CONCLUSION

Petitioner has shown by a preponderance of the evidence that claims 1 and 8 would have been obvious over Cohen, Blonder, and Rowan.

Petitioner has shown by a preponderance of the evidence that claims 2 and 5 would have been obvious over Cohen, Blonder, Rowan, and Roberts.

Petitioner has shown by a preponderance of the evidence that claims 1 and 8 would have been obvious over Rowan and Deutsch.

⁸ We understand Petitioner's reference to "Walsh's comparison of the optical power to upper and lower user defined limits and setting of an alarm condition of either limit is crossed" to be referring to that which Petitioner relies on from Walsh to meet the comparing step and generating step in claim 5 of the '012 patent, as noted above in the context of claim 5.

Petitioner has shown by a preponderance of the evidence that claims 2, 5, and 6 would have been obvious over Rowan, Deutsch, and Walsh.

Petitioner has not shown that any of claims 3, 9, and 10 is unpatentable on any ground alleged in the Petition.

IV. ORDER

It is

ORDERED that claims 1, 2, 5, 6, and 8 have been proved unpatentable; and

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

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Patent 9,363,012 B2

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