UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CIENA CORPORATION, INFINERA CORPORATION, HUAWEI TECHNOLOGIES CO. LTD., AND NOKIA CORP. OF AMERICA,
Petitioner

v.

OYSTER OPTICS, LLC,
Patent Owner

Case IPR2018-00070
Patent No. 8,913,898

PETITIONER CIENA CORPORATION'S NOTICE OF APPEAL

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
Madison Building East, 10B20
600 Dulany Street
Alexandria, VA 22314-5793

Notice is hereby given, pursuant to 37 C.F.R. § 90.2(a), that Petitioner Ciena Corporation ("Petitioner") appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision entered on May 9, 2019 (Paper 54) (the "Final Written Decision") by the United States Patent and Trademark Office, Patent Trial and Appeal Board (the "Board"), and from all underlying orders, decisions, rulings, and opinions. A copy of the Final Written Decision is attached.

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), Petitioner indicates that the issues on appeal include, but are not limited to, the Board's ruling that Petitioner has not demonstrated, by a preponderance of the evidence, that claims 1-25 of U.S. Patent No. 8,913,898 are unpatentable over the prior art, and any findings or determinations supporting or related to that ruling including, without limitation, the Board's interpretation of the claims and prior art, reasons to combine, and the Board's interpretation of expert evidence.

Simultaneous with this submission, a copy of this Notice of Appeal is being filed with the Board. In addition, the Notice of Appeal and the required fee are being filed electronically with the Clerk of Court for the United States Court of Appeals for the Federal Circuit.

Respectfully submitted this 9th day of July, 2019.

Respectfully submitted,

Dated: July 9, 2019

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CERTIFICATE OF SERVICE

The undersigned certifies that, in addition to being filed electronically through Patent Trial and Appeal Board End to End (PTAB E2E), the original version of this Notice of Appeal was filed by overnight express delivery on July 9, 2019 with the Director of the United States Patent and Trademark Office, at the following address:

Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

The undersigned also certifies that a true and correct copy of this Notice of Appeal and the required fee were filed electronically via CM/ECF on July 9, 2019, with the Clerk of Court for the United States Court of Appeals for the Federal Circuit.

The undersigned also certifies that a true and correct copy of this Notice of Appeal was served on July 9, 2019, on counsel of record for Patent Owner Oyster Optics, LLC by electronic mail (by agreement of the parties) at the following addresses:

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Paper 54
Entered: May 9, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CIENA CORPORATION, INFINERA CORPORATION, HUAWEI TECHNOLOGIES CO. LTD., AND NOKIA CORP. OF AMERICA,
Petitioner,

v.

OYSTER OPTICS, LLC,
Patent Owner.

Case IPR2018-00070
Patent 8,913,898 B2

Before JAMESON LEE, RAMA G. ELLURU, and JOHN R. KENNY, *Administrative Patent Judges.*

KENNY, *Administrative Patent Judge*.

DECISION
Final Written Decision
35 U.S.C. § 318(a)

I. INTRODUCTION

This *inter partes* review, instituted pursuant to 35 U.S.C. § 314, challenges the patentability of claims 1–25 ("challenged claims") of U.S. Patent No. 8,913,898 B2 (Ex. 1201, "the challenged patent"), owned by Oyster Optics, LLC ("Patent Owner"). We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons discussed below, we determine Petitioner has not proven by a preponderance of the evidence that any challenged claim is unpatentable.

A. Procedural History

Ciena Corporation, Infinera Corporation, Huawei Technologies Co. Ltd., Huawei Technologies USA Inc., and Alcatel-Lucent USA Inc.[1] (collectively, "Petitioner") filed a Petition (Paper 8, "Pet.") for *inter partes* review of the challenged claims.[2] Patent Owner filed a Preliminary Response (Paper 12). After reviewing the parties' submissions, on May 10, 2018, we instituted an *inter partes* review of all of the challenged claims based on all grounds asserted by Petitioner. Decision on Institution (Paper 14, "Inst. Dec."). Patent Owner filed a Patent Owner Response (Paper 26, "PO Resp."), to which Petitioner filed a Reply (Paper 51, "Pet. Reply"), to which Patent Owner filed a Sur-Reply (Paper 52, "Sur-Reply"). An oral

[1] Nokia of America Corporation was formerly known as Alcatel-Lucent USA Inc. Paper 18; Paper 19, 1.

[2] The Petition was also filed by Coriant (USA) Inc., Coriant North America LLC, Coriant Operations, Inc., and Fujitsu Network Communications, but those entities subsequently settled with Patent Owner and were dismissed from this proceeding. Papers 30, 40.

hearing was held on December 12, 2018. A transcript of the hearing is included in the record. Paper 53 ("Hr'g Tr.").

B. Related Proceedings

The Patent Owner indicates that the challenged patent is at issue in the following lawsuits:

Oyster Optics, LLC v. Infinera Corp., Case No. 2:16-cv-01295 (E.D. Tex.);

Oyster Optics, LLC v. NEC Corp., Case No. 2:16-cv-01296 (E.D. Tex.);

Oyster Optics, LLC v. Nokia Corp., Case No. 2:16-cv-01297 (E.D. Tex.);

Oyster Optics, LLC v. ZTE Corp., Case No. 2:16-cv-01298 (E.D. Tex.) (dismissed without prejudice);

Oyster Optics, LLC v. Fujitsu Network Commc'n, Inc., Case No. 2:16-cv-01299 (E.D. Tex.);

Oyster Optics, LLC v. Ericsson Inc., Case No. 2:16-cv-01300 (E.D. Tex.) (dismissed without prejudice);

Oyster Optics, LLC v. Cisco Sys., Inc., Case No. 2:16-cv-01301 (E.D. Tex.);

Oyster Optics, LLC v. Coriant America Inc., Case No. 2:16-cv-01302 (E.D. Tex.);

Oyster Optics, LLC v. Huawei Tech. Co. Ltd., Case No. 2:16-cv-01303 (E.D. Tex.);

Oyster Optics, LLC v. Ciena Corp., Case No. 2:17-cv-00511 (E.D. Tex.) (transferred to N.D. Cal.); and

Oyster Optics, LLC v. Ciena Corp., Case No. 4:17-cv-05920 (N.D. Cal.).

Patent Owner identifies the following *inter partes* reviews as related proceedings:

Case No.	Patent-at-Issue
IPR2017-01719	6,469,816
IPR2017-01720	6,594,055
IPR2017-01724	6,594,055
IPR2017-01725	6,469,816
IPR2017-01870	8,913,898
IPR2017-01871	7,620,327
IPR2017-01874	8,374,511
IPR2017-01881	8,913,898
IPR2017-01882	7,620,327
IPR2017-02146	8,374,511
IPR2017-02173	7,620,327
IPR2017-02189	6,476,952
IPR2017-02190	6,476,952
IPR2018-00146	9,363,012
IPR2018-00257	8,913,898
IPR2018-00258	7,099,592
IPR2018-00259	7,620,327

Paper 13, 2–4.

C. The Challenged Patent

The challenged patent is directed to a transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber. Ex. 1201, Abstr. A transceiver is a device with a transmitter and a receiver. Ex. 1202 ¶ 123. The transceiver card in the challenged patent includes a transmitter for transmitting data over the first optical fiber and a receiver for receiving data from the second optical fiber. Ex. 1201, Abstr. The card also includes an energy level detector. *Id.* at 2:43–44.

Figure 1 of the challenged patent is reproduced below:

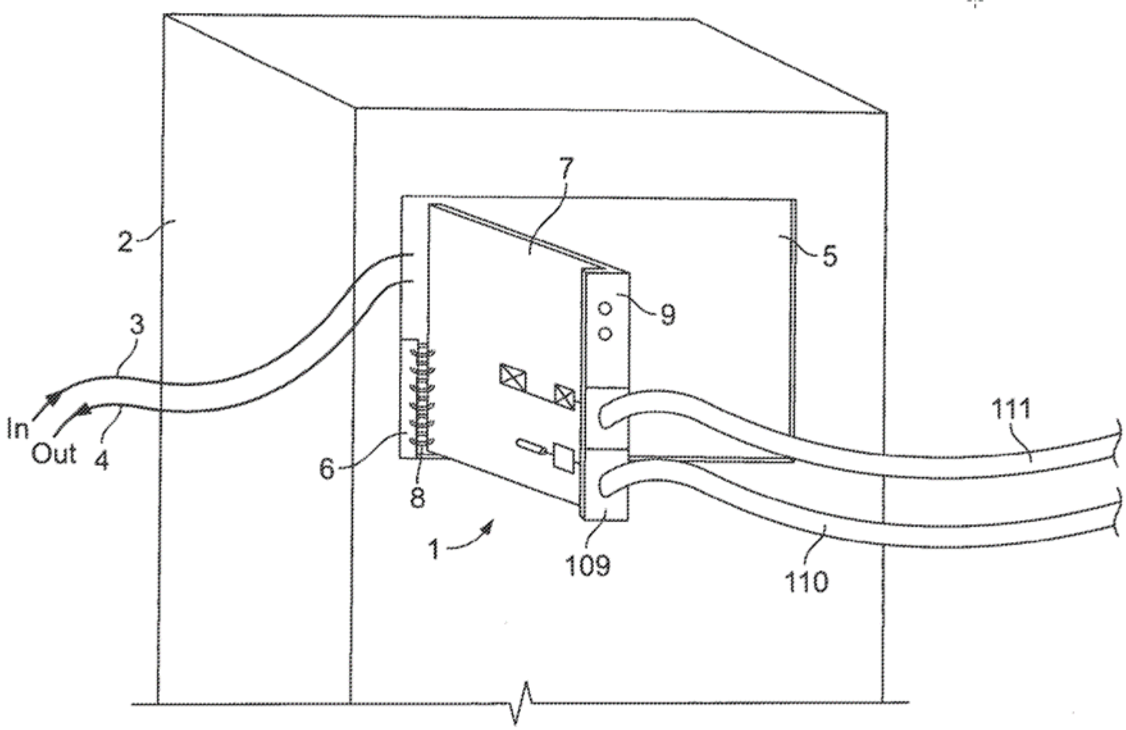

FIG. 1

Figure 1 is a schematic diagram of a transceiver card located in a telecommunications box. Ex. 1201, 4:1–2. An existing telecommunications box 2, for example a multiplexor, is refitted to include transceiver card 1. *Id.* at 4:11–13. Transceiver card 1 includes faceplate 9 and backplane 7, which preferably is a printed circuit board. *Id.* at 4:22–23. Faceplate 9 has fiber connector 109 for connecting to output fiber 110 and input fiber 111. *Id.* at 4:26–28. "Alternately, a single fiber for inputting and outputting signals could be provided." *Id.* at 4:28–29.

Figure 2 of the challenged patent is reproduced below:

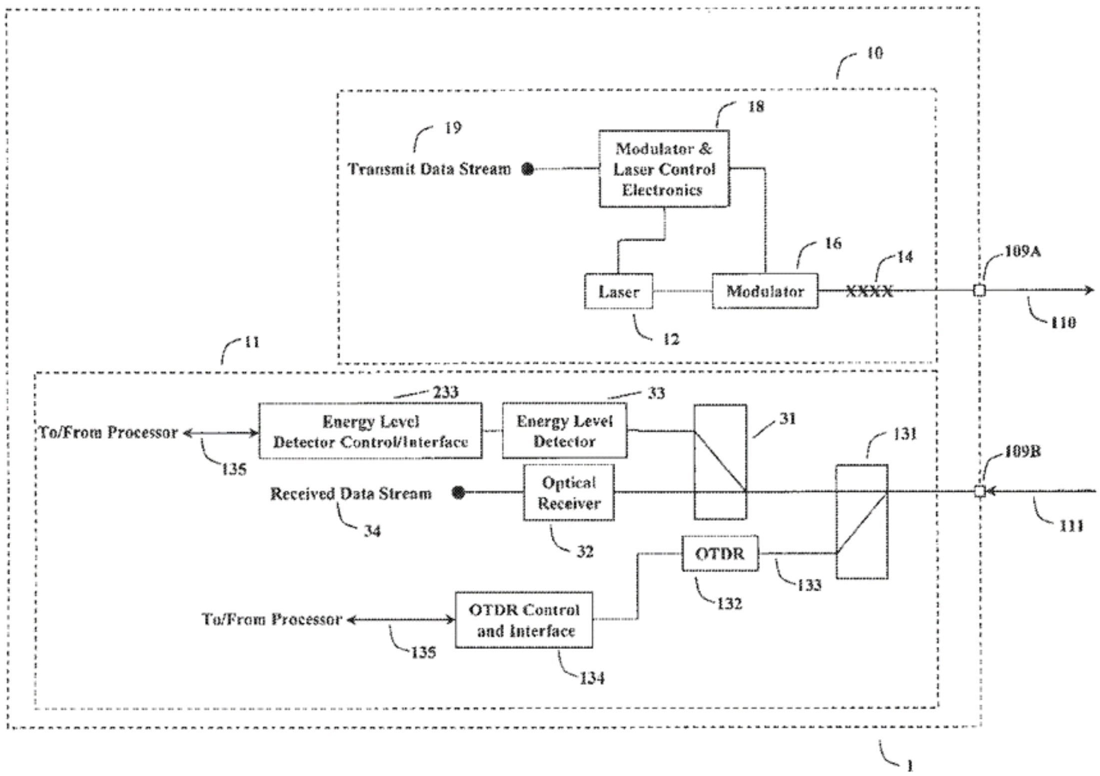

Figure 2

Figure 2 shows transceiver card 1 in more detail. Ex. 1201, 4:30–31. As indicated, transmitter 10 transmits signals over optical fiber 110 via output 109A. *Id.* at 4:31–32, Fig. 2. 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, 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 input 109B of connector 109. Ex. 1201, 4:53–54, Fig. 2. 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 (optical time-domain reflectometer). *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 5:2–5.

Detector 33 monitors the light energy in fiber 111 via the light energy coupled to the detector by splitter 31. Ex. 1201, 5:11–12. If the amplitude drops during monitoring, which may indicate a tap, 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. *Id.* at 5:12–19. 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 OTDR control circuit 134. *Id.* at 5:11–24.

Figure 3 of the challenged patent is reproduced below:

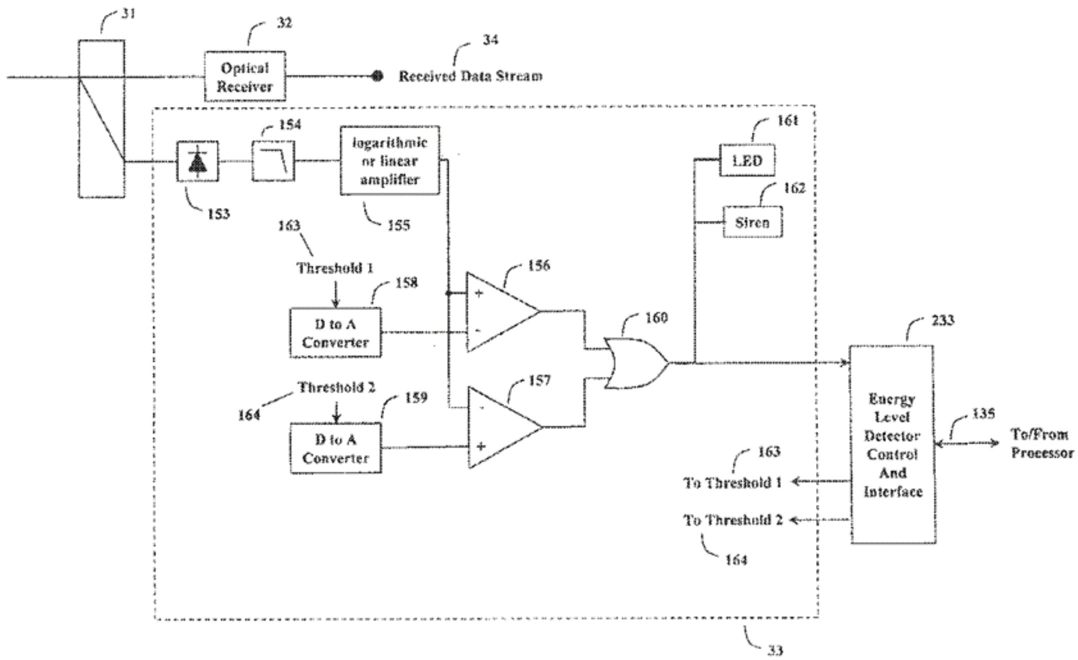

Figure 3

Figure 3 shows energy level detector 33 in more detail. Ex. 1201, 5:25–26. As indicated, photodetector 153 measures the optical signal coupled to the input of energy level detector 33 by coupler/splitter 31. *Id.* at 5:31–33. The output of photodetector 153 is an electrical voltage whose level correlates to the optical power at the input to photodetector 153. *Id.* at 5:33–37. The electrical signal may be conditioned and scaled by either a logarithmic or linear amplifier 155. *Id.* at 5:42–44. The electrical signal, after being scaled by linear or logarithmic amplifier 155, is compared to reference voltages by comparators 156 and 157. *Id.* at 5:60–6:5. The outputs of comparators 156 and 157 are provided to OR gate 160. *Id.* at Figure 3. An alarm state exists when OR gate 160 is high. *Id.* at 6:5–6.

D. Illustrative Claims

Petitioner challenges claims 1–25 of the challenged patent, of which claims 1 and 14 are independent and are reproduced below:

> 1. A transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the transceiver card comprising:
>
> a transmitter having a laser, a modulator, and a controller configured to receive input data and control the modulator to generate a first optical signal as a function of the input data;
>
> a fiber output optically connected to the transmitter and configured to optically connect the first optical fiber to the transceiver card;
>
> a receiver configured to receive a second optical signal from the second optical fiber and to convert the second optical signal to output data;
>
> fiber input optically connected to the receiver and configured to optically connect the second optical fiber to the transceiver card; and
>
> an energy level detector optically connected between the receiver and the fiber input to measure an energy level of the second optical signal, wherein the energy level detector includes a plurality of thresholds.
>
> 14. A transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the transceiver card comprising:
>
> a transmitter having a laser, a modulator, and a controller configured to receive input data and control the modulator to generate a first optical signal as a function of the input data;
>
> a fiber output optically connected to the transmitter and configured to optically connect the first optical fiber to the transceiver card;

a receiver configured to receive a second optical signal from the second optical fiber and to convert the second optical signal to output data;

a fiber input optically connected to the receiver and configured to optically connect the second optical fiber to the transceiver card; and

an energy level detector configured to measure an energy level of the second optical signal, the energy level detector including a threshold indicating a drop in amplitude of the second optical signal.

E. Evidence Relied Upon by Petitioner

Petitioner relies on the following references:[3]

Reference		Issue/Copyright Date	Exhibit
Chikama	Modulation and Demodulation Techniques in Optical Heterodyne PSK Transmission Systems	Mar. 1990	Ex. 1208
Choy	U.S. Patent No. 5,825,949	Oct. 20, 1998	Ex. 1210
Corke	U.S. Patent No. 5,510,917	Apr. 23, 1996	Ex. 1206
DeSalvo	U.S. Patent No. 6,980,747 B1	Dec. 27, 2005	Ex. 1211
Fatehi	U.S. Patent No. 4,878,726	Nov. 7, 1989	Ex. 1214
Mock	U.S. Patent No. 5,790,285	Aug. 4, 1998	Ex. 1209
Reiner	U.S. Patent No. 4,419,595	Dec. 6, 1983	Ex. 1213
Swanson	U.S. Patent No. 6,433,904 B1	Aug. 13, 2002	Ex. 1207
Takahashi	U.S. Patent No. 5,680,246	Oct. 21, 1997	Ex. 1212

[3]The challenged patent is a continuation of U.S. Application No. 12/590,185, filed on Nov. 4, 2009, now U.S. Pat. No. 8,374,511 B2 ("'511 patent"), which is a continuation of U.S. Application No. 10/188,643, filed on July 3, 2002, now U.S. Pat. No. 7,620,327 B2 ("'327 patent"). Ex. 1401, 1:7–10. The '327 patent claims the benefit of U.S. Provisional Application No. 60/303,932, filed on July 9, 2001. *Id.*

Petitioner also relies on a declaration and a supplemental declaration from its expert, Dr. Duncan MacFarlane (Exs. 1202 and 1226). Patent Owner relies on a declaration from its expert, Dr. Keith Goossen (Ex. 2033).

F. Asserted Grounds

Petitioner presents the following grounds of unpatentability based on 35 U.S.C. § 103(a):

Ground	Claims Challenged	References
1a	1, 3–8, 10–12, 14, 15, and 17–23	Corke, Swanson, and Chikama
1b	13 and 25	Corke, Swanson, Chikama, and Mock
2a	1, 5–9, 11, 12, 14, 15, and 19–24	Choy, DeSalvo, and Takahashi
2b	2 and 16	Choy, DeSalvo, Takahashi, and Reiner
2c	3, 4, 10, 17, and 18	Choy, DeSalvo, Takahashi, and Fatehi

G. Real Parties in Interest

Petitioner identifies Alcatel-Lucent USA Inc., Alcatel-Lucent SA, Ciena Corporation, Coriant (USA) Inc., Coriant North America, LLC, Coriant Operations, Inc., Infinera Corporation, Fujitsu Limited, Fujitsu Network Communications, Inc., Nokia Corp., Huawei Technologies Co., Ltd., Huawei Technologies USA Inc., and Huawei Enterprise USA Inc. as real parties in interest. Pet. 75. Pursuant to 37 C.F.R. § 42.8, Coriant (USA) Inc., Coriant North America LLC, and Coriant Operations, Inc. also identify the following entities, which were identified in corporate disclosure statements and/or named as defendants in *Oyster Optics, LLC v. Coriant America Inc.*, Case No. 2:16-cv-01302 (E.D. Tex.), but do not admit that they are real parties in interest: Tellabs, Inc., Coriant America Inc., Coriant International Group LLC, Marlin Management Company, LLC, and Oaktree

Capital Management, L.P. *Id.* Patent Owner identifies Oyster Optics, LLC as its real party interest. Paper 10, 2.

II. DISCUSSION

A. Patent Owner's Argument that this Proceeding Must Be Dismissed

Patent Owner argues that, in our Institution Decision, we erred as a matter of law by not addressing every challenged claim and every asserted ground in the Petition and, therefore, this proceeding must be terminated. PO Resp. 19–20, 23. Patent Owner asserts that the provisions of 37 C.F.R. § 42.108 (a–c) require the Board to analyze every claim challenged in the Petition. *Id.* at 20. Section 42.108(a) 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.'" *Id.* Section 42.108(b) 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.* Section 42.108(c) recites, in relevant part, "[i]nter 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." For the reasons discussed below, we are not persuaded by Patent Owner's arguments.

Patent Owner does not explain how, either before or after *SAS Institute, Inc. v. Iancu,*[4] section 42.108(c) necessitates an analysis that covers every single challenged claim and every single asserted ground in the Petition. PO Resp. 18–23. The provision expressly permits the Board to

[4] 138 S. Ct. 1348 (2018).

institute a review of any asserted ground of unpatentability in an *inter partes* petition upon a determination that the petition demonstrates that there is a reasonable likelihood that at least one of the claims challenged is unpatentable. 37 C.F.R. § 42.108(c).

Further, *SAS Institute* requires the Board, when instituting, to institute review of all claims challenged in a petition. In *SAS Institute*, the Supreme Court, interpreting 35 U.S.C. § 314, held that a petitioner "is entitled to a final written decision addressing all of the claims it has challenged . . . ." 138 S. Ct. at 1359–60. Title 35, section 314(a), directs, in relevant part, that the Director may not authorize an inter partes review to be instituted "unless the Director determines that the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." The Supreme Court determined that "Section 314(a) does not require the Director to evaluate every claim individually. Instead, it simply requires him to decide whether the petitioner is likely to succeed on 'at least 1' claim." *Id.* at 1356. The Court explained: "[o]nce that single claim threshold is satisfied, it doesn't matter whether the petitioner is likely to prevail on any *additional* claims; the Director need not even consider any other claim before instituting review." *Id.* (emphasis original). Further, the Court emphasized: "Rather than contemplate claim-by-claim institution . . . the language [of section 314(a)] anticipates a regime where a reasonable prospect of success on a single claim justifies review of all." *Id.*

The Supreme Court's interpretation of 35 U.S.C. § 314(a), upon which 37 C.F.R. § 42.108(c) was promulgated, does not require a claim-by-claim and ground-by-ground analysis in order to institute a review of an *inter review* petition, as urged by Patent Owner. And the unambiguous requirement of 37 C.F.R. § 42.108(c), as discussed above, is consistent with the Supreme Court's directive in *SAS Institute*. Thus, Patent Owner's reading of 37 C.F.R. § 42.108(c) is not persuasive. PO Resp. 18–23. Further, no interpretation by Patent Owner of the Board's rules could override the Supreme Court's interpretation of the statute upon which those rules are promulgated. *SAS Inst.*, 138 S. Ct. at 1355; PO Resp. 20–23.

B. Level of Ordinary Skill in the Art

An ordinarily skilled artisan is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *Id.* The prior art of record can also reflect the level of ordinary skill in the art. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Dr. MacFarlane proposes an assessment of the level of skill in the art with respect to the challenged patent that a person of ordinary skill in the art "would have had at least a 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." Ex. 1202 ¶ 19. In our Institution Decision, we adopted this definition by Dr. MacFarlane but changed "at least five years of experience" to "five years of experience" to close an otherwise open range of experience. Inst. Dec. 20 n.3.

Dr. Goossen testifies that another modification should be made. Ex. 2033 ¶ 25. Dr. Goossen testifies that merely having a Master of Science degree in Electrical Engineering would not provide an individual with ordinary skill because: "An M.S. in Electrical Engineering can be completed without taking any optical transmission systems courses." *Id.* According to Dr. Goossen, to have ordinary skill, a person having fewer than five years of experience in designing optical transmission systems would need to have an Master of Science in Electrical Engineering[5] and to have taken extensive coursework in optical transmission systems. *Id.*

In the Reply and in the accompanying supplemental declaration by Dr. MacFarlane (Ex. 1226), neither Petitioner nor Dr. MacFarlane disputes the modification we made in the Institution Decision or the modification that Dr. Goossen proposes. In the Patent Owner Response, Patent Owner similarly does not dispute the modification we made in the Institution Decision. Having reviewed the prior art asserted in this proceeding and having considered the testimony by both declarants, we adopt Dr. MacFarlane's definition as we modified it in the Institution Decision with the further modification proposed by Dr. Goossen. Therefore, we find that an ordinarily skilled artisan would have a Bachelor of Science Degree in

[5] Dr. Goossen addresses Dr. MacFarlane's inclusion of a M.S. in Electrical Engineering in the definition of the level of skill in the art, but does not address Dr. MacFarlane's inclusion of M.S. degrees in related fields. Ex. 2026 ¶ 25. Because Dr. Goossen did not object to Dr. MacFarlane's inclusion of B.S. degrees in related fields, we assume that he did not intend to exclude M.S. degrees in related fields from the definition of level of skill in the art. *Id.* Our analysis in this Decision, however, would not be affected by the inclusion or exclusion of M.S. degrees in related fields from the definition of the level of skill in the art in this case.

Electrical Engineering or a related field and five years of experience in designing optical transmission systems, or would have a Master of Science in Electrical Engineering or a related field with extensive coursework in optical transmission systems.

C. Claim Construction

In an *inter partes* review where (as here) the petition was filed before November 13, 2018, claims of 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) (2017).[6] Consistent with the broadest reasonable construction standard, claim terms are presumed to have their ordinary and customary meaning as understood by one of ordinary skill in the art in the context of the entire patent disclosure at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). An inventor may provide a meaning for a term that is different from its ordinary meaning by defining the term in the specification with "reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). But limitations are not to be read from the specification into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). In addition, we may not "construe claims during an *inter partes* review so broadly that its constructions are unreasonable under general

[6] A recent amendment to this rule does not apply here because the Petition was filed on October 23, 2017. *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; 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) for all IPR Petitions filed on or after November 13, 2018).

claim construction principles." *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015). Finally, only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g. Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

In the Petition, Petitioner does not propose a construction for any claim term. Instead, Petitioner merely proposes that the challenged claims "should be given their broadest reasonable construction in light of the specification." Pet. 19. In its Preliminary Response, Patent Owner argues that the phrase "the energy level detector includes a plurality of thresholds" in claim 1 should be construed "to require that a single detector measure an optical signal and include a plurality of thresholds." Prelim. Resp. 36–37. In our Institution Decision, we determined that we did not need to construe the phrase in claim 1 of "the energy level detector includes a plurality of thresholds," but we construed the phrase "laser having a transmitter," recited in claims 1 and 14, and addressed whether the terms "a transceiver card," "a first optical fiber," and "a second optical fiber" in the preambles of claims 1 and 14 are limiting. Inst. Dec. 16–20.

In its Response, Patent Owner argues that in this Decision, as we did in our Institution Decision, we should address whether the terms "a transceiver card," "a first optical fiber," and "a second optical fiber" in the preambles of claims 1 and 14 are limiting. PO Resp. 18–19.

For this Decision, we do not need to construe the phrases "laser having a transmitter" and "the energy level detector includes a plurality of thresholds" because the dispositive issues addressed in this Decision do not involve those limitations.[7] We need only determine whether the recitations of "a transceiver card," "a first optical fiber," and "a second optical fiber" in the preambles of claims 1 and 14 are limiting.[8]

1. The Preamble Recitations of a Transceiver Card, a First Optical Fiber, and a Second Optical Fiber Are Claim Limitations

In our Institution Decision, we determined that the recitations of "a transceiver card," "a first optical fiber," and "a second optical fiber" in the preambles of claims 1 and 14 were limiting. Inst. Dec. 18–19. We noted that Patent Owner in the Preliminary Response suggested these recitations were limiting and that, in the Petition, Petitioner does not disagree. *Id.* at 19 (citing Prelim. Resp. 26, 29; Pet. 20). We also explained that the terms "a transceiver card," "a first optical fiber," and "a second optical fiber" in the preamble, respectively, provide antecedent bases for the terms "the transceiver card," "the optical fiber," and "the second optical fiber" in the bodies of claims 1 and 14. *Id.*

Following institution, Patent Owner argues that we should reach the same conclusion regarding these recitations for this Decision. PO Resp. 18–19. Patent Owner argues that the terms "a transceiver card," "a first optical fiber," and "a second optical fiber" provide antecedent bases for elements in the bodies of claims 1 and 14. *Id.* at 19. Thus, Patent Owner asserts that we should at least construe the recitations of "a transceiver card," "a first optical fiber," and "a second optical fiber" in the preambles to be claim limitations.

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[7] In addition, in the Petition and trial briefing, neither party has asked us to construe those limitations.

[8] We do not need to address whether the recitation of "a telecommunications box" in the preambles of claims 1 and 14 is a limitation because the dispositive issues addressed in this Decision do not involve that term.

Id. In its Reply, Petitioner presents no arguments or evidence against construing these terms as limitations and does not dispute that it treated these terms as limiting in the Petition. Pet. Reply, *passim*.

"[W]hether to treat a preamble as a claim limitation is determined on the facts of each case in light of the claim as a whole and the invention described in the patent." *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 952 (Fed. Cir. 2005) (quoting *Storage Tech. Corp. v. Cisco Sys., Inc.*, 329 F.3d 823, 831 (Fed. Cir. 2003)). If the body of the claim "sets out the complete invention," the preamble is not ordinarily treated as limiting the scope of the claim. *Schumer v. Lab. Comput. Sys., Inc.*, 308 F.3d 1304, 1310 (Fed. Cir. 2002). But the preamble is limiting if it recites essential structure that is important to the invention or necessary to give meaning to the claim. *NTP, Inc. v. Research In Motion, Ltd.*, 418 F.3d 1282, 1305–06 (Fed. Cir. 2005); *SanDisk Corp. v. Memorex Prods., Inc.*, 415 F.3d 1278, 1284 n.2 (Fed. Cir. 2005). That means if the claim drafter "chooses to use both the preamble and the body to define the subject matter of the claimed invention, the invention so defined, and not some other, is the one the patent protects." *Bicon*, 441 F.3d at 953 (quoting *Bell Commc'ns Research, Inc. v. Vitalink Commc'ns Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995) (emphasis omitted)). Further, when the limitations in the body of the claim "rely upon and derive antecedent basis from the preamble, then the preamble may act as a necessary component of the claimed invention." *Eaton Corp. v. Rockwell Int'l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003).

Neither party disputes our conclusion in the Institution Decision, which we repeat here, that "a transceiver card," "a first optical fiber," and "a second optical fiber," respectively, provide antecedent bases for the terms "the transceiver card," "the first optical fiber,"[9] and "the second optical fiber" in the body of claim 14. Inst. Dec. 19. Further, Patent Owner argues that we should construe at least the terms "a transceiver card," "a first optical fiber," and "a second optical fiber" as limitations, and Petitioner provides no reason not to. PO Resp. 12–13; Pet. Reply, *passim*. Accordingly, we construe the recitations of "a transceiver card," "a first optical fiber," and "a second optical fiber" in the preambles of claims 1 and 14 as claim limitations.

2. The Recited First and Second Optical Fibers Are Separate Transmit and Receive Fibers

Patent Owner asserts that the first and second optical fibers recited by claims 1 and 14 must be separate transmit and receive fibers. PO Resp. 27. Petitioner does not dispute this assertion. Pet. Reply, *passim*. Petitioner, in fact, relies only on separate receive and transmit fibers for its showing of obviousness. Pet. 22 ("[A] POSITA would have found it obvious, in view of Swanson's disclosure, that Corke's optical device could be implemented in a physical transceiver card, and that the device could include two separate fibers for transmission and reception . . . ."), 28.

For clarity, we, nevertheless, address why we agree with Patent Owner that the first and second optical fibers recited by claim 14 must be separate receive and transmit fibers. In particular, the parties dispute whether an ordinarily skilled artisan would have combined Corke and Swanson to yield separate transmit and receive fibers, rather than merely a bidirectional fiber that would both transmit and receive signals. PO Resp.

[9] This was referred to as "the optical fiber" in the Institution Decision. Inst. Dec. 19.

21–32; Pet. Reply 3–9. Although Petitioner does not argue that a bidirectional fiber disclosed in Corke would constitute the recited first and second optical fibers, to avoid any mistaken impression that such a fiber could, we address why it would not.

Claims 1 and 14 themselves specify that the first optical fiber is for transmission, reciting "*transmitting* data over a *first optical fiber*" and "a fiber output optically connected to the *transmitter* and configured to optically connect the *first optical fiber* to the transceiver card." (Emphases added.) Similarly, claims 1 and 14 indicate that the second optical fiber is for reception, reciting "*receiving* data over a *second optical fiber*," "a receiver configured to *receive* a second optical signal from the *second optical fiber*," and "a fiber input optically connected to the *receiver* and configured to optically connect the *second optical fiber* to the transceiver card." (Emphases added.)

The specification of the challenged patent similarly teaches that, with two optical fibers, one is for transmission and the other is for reception. In particular, the specification describes a fiber for outputting signals from the transceiver card (output fiber 110) and a fiber for inputting signals to the transceiver card (input fiber 111). Ex. 1201, 4:26–28. Transmitter 10 "transmits signals over optical fiber 110." *Id.* at 4:31–32. And "[o]ptical signals are received at connector 109 from fiber 111." *Id.* at 4:53–54.

Further, claims 1 and 14 separately recite the first and second optical fibers, which indicates the fibers are distinct. When "a claim lists elements separately, 'the clear implication of the claim language' is that those elements are 'distinct component[s]' of the patented invention." *Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1254 (Fed.

Cir. 2010) (quoting *Gaus v. Conair Corp.*, 363 F.3d 1284, 1288 (Fed. Cir. 2004)); *see also Regents of Univ. of Minnesota v. AGA Med. Corp.*, (holding that recited first and second disks are separate disks); *Engel Indus., Inc. v. Lockformer Co.*, 96 F.3d 1398, 1404–05 (Fed. Cir. 1996) (holding that a "second portion" and a "return portion," "logically cannot be one and the same"). And there is no other recitation in claim 1 or 14 or any of their dependent claims that indicates the first and second optical fiber can be the same fiber. *See CAE Screenplates, Inc. v. Heinrich Fiedler GmbH & Co. KG*, 224 F.3d 1308, 1317 (Fed. Cir. 2000).

The specification of the challenged patent also indicates that the first and second optical fibers are distinct by disclosing that a single fiber that both transmits and receives signals is an alternative to first and second optical fibers, rather than constituting those fibers. Ex. 1201, 4:28–29. In particular, after describing first and second optical fibers (output fiber 110 and input fiber 111), the specification states: "*Alternately*, a single fiber for inputting and outputting signals could be provided." *Id.* (emphasis added).

In light of Patent Owner's undisputed assertion that the recited first and second optical fibers are separate transmit and receive fibers, the language of claims 1 and 14, and the specification of the challenged patent, we agree with Patent Owner that the recited first and second optical fibers are separate transmit and receive fibers.

D. The Burden of Proof

To prevail in challenging Patent Owner's claims, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). "In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in an *inter partes review*). Furthermore, Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

E. 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) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). One seeking to establish obviousness must articulate sufficient reasoning to support the conclusion of obviousness. *See Magnum Oil*, 829 F.3d at 1380 ("To satisfy its burden of proving obviousness, a petitioner . . . must . . . articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness." (citing *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007))). Prior art references must be "considered together with the knowledge of one of ordinary skill in the pertinent art." *See Paulsen*, 30 F.3d at 1480 (citations omitted). Also, "it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." *In re Preda*, 401 F.2d 825, 826 (CCPA 1968). Further, although common sense, common wisdom, and common knowledge may be properly considered in an obviousness analysis, they "cannot be used as a wholesale substitute for reasoned analysis and evidentiary support, especially when dealing with a limitation missing from the prior art references specified." *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361–62 (Fed. Cir. 2016).

F. Asserted Obviousness Based on the Corke Grounds

1. Overview of Corke

Corke relates to optical communication monitoring and to a control device for connection with optical fibers. Ex. 1206, 1:11–13. Figures 1(a) and 1(b) of Corke (Ex. 1206) are reproduced below:

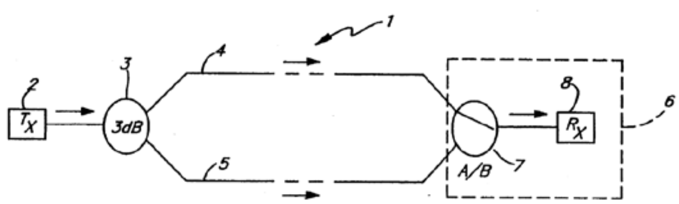


FIG. 1a

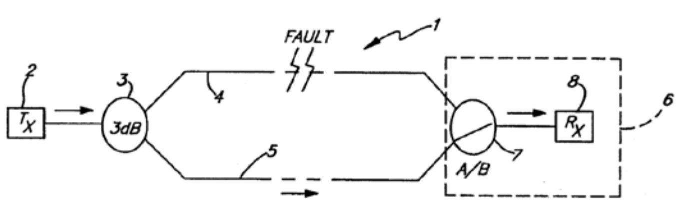


FIG. 1b

Figures 1(a) and 1(b) are schematic representations of optical communications system 1, which includes signal transmitter unit 2, 3 dB coupler 3, primary optical fiber 4, secondary optical fiber 5, and communication and control device 6. Ex. 1206, 5:8–10, 36–46. Communication and control device 6 includes switching means 7 that directs signals to receiver 8 from either primary optical fiber 4 or secondary optic fiber 5. *Id.* at 5:46–49.

In both Figures 1(a) and 1(b), signal transmitter unit 2 transmits signals to 3dB coupler 3, which directs the signals onto both optical fibers 4 and 5. Ex. 1206, 5:38–44. Figure 1(a) shows system 1 in normal use, where both optical fibers 4 and 5 are operating correctly. *Id.* at 5:49–54. In that case, switch means 7 directs signals from primary optical fiber 4 to receiver 8. *Id.* Figure 1(b) shows system 1 when primary optical fiber 4 is faulty. *Id.* at 5:54–57. In that case, switch means 7 directs signals from secondary optical fiber 5 to receiver 8. *Id.* As illustrated, the communication along optical fibers 4 and 5 is unidirectional: traveling from the 3dB coupler to switch 7, not vice versa.

Figure 2 of Corke, which illustrates a preferred embodiment of communication monitoring and control device 6 (Ex. 1206, 5:61–63), is reproduced below:

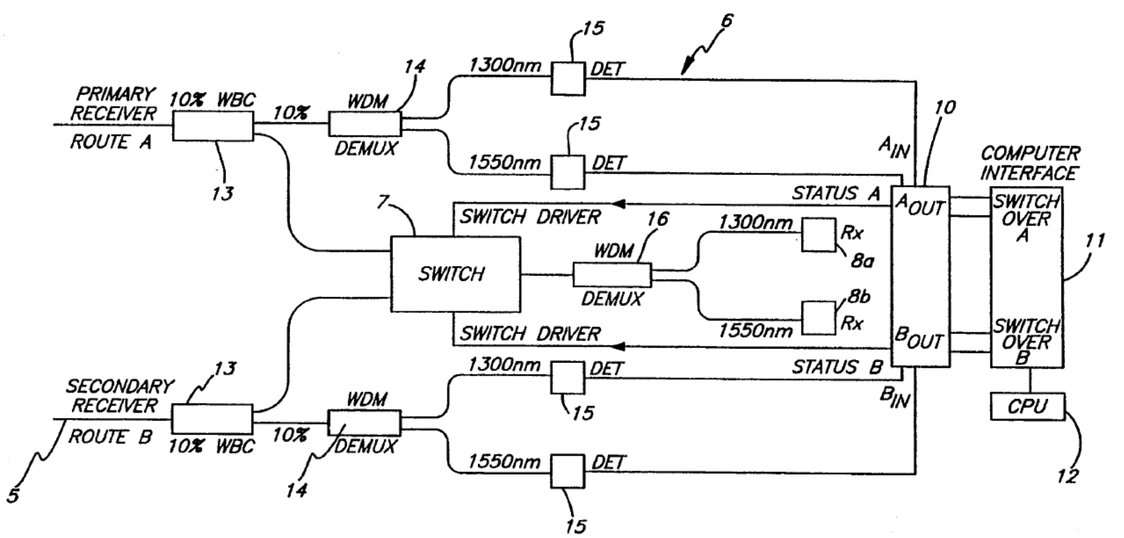


FIG. 2

Figure 2 illustrates a logical communication control device. Ex. 1206, 5:11–13. As shown in Figure 2, communication monitoring and control device 6 includes control circuit 10, tap couplers 13, wave division demultiplexers 14, photodetectors 15, and wave division demultiplexer 16. *Id.* at 6:1–21. Tap couplers 13 connect the device to respective primary and secondary optical fibers labeled as "PRIMARY RECEIVER" for "ROUTE A" and "SECONDARY RECEIVER" for "ROUTE B." *Id.* at Fig. 2. In this embodiment, each incoming optical fiber is tapped by a corresponding tap coupler to direct ten percent of the incoming light to a corresponding demultiplexer 14, which outputs 1300 nm and 1550 nm demultiplexed signals to associated photodetectors 15. *Id.* at 6:3–16. Each tap coupler 13 directs ninety percent of the light from its associated incoming optical fibers to switch 7, which is a single pole, double throw optical switch. *Id.* at 5:63–64, 6:16–21. The output of switch 7 is connected to demultiplexer 16, which provides 1300 nm and 1550 nm demultiplexed signals to receivers 8a and 8b, respectively. *Id.*

Tap couplers 13 continuously divert ten percent of the incoming signals to detectors 15, so that both the primary and secondary incoming optical fibers are monitored continuously at each wavelength independently. Ex. 1206, 6:22–26. If both optical fibers are in "good condition," control circuit 10 defaults to controlling switch 7 to direct signals of the primary optical fiber to receivers 8a and 8b. *Id.* at 6:26–29. If a fault occurs in the primary optical fiber, as detected by a sufficient drop in intensity at a corresponding detector, and if sufficient signal intensity is detected on the secondary optical fiber, control unit 10 causes switch 7 to direct signals from the secondary optical fiber to receivers 8a and 8b. *Id.* at 6:30–40.

Figure 3 of Corke is reproduced below:

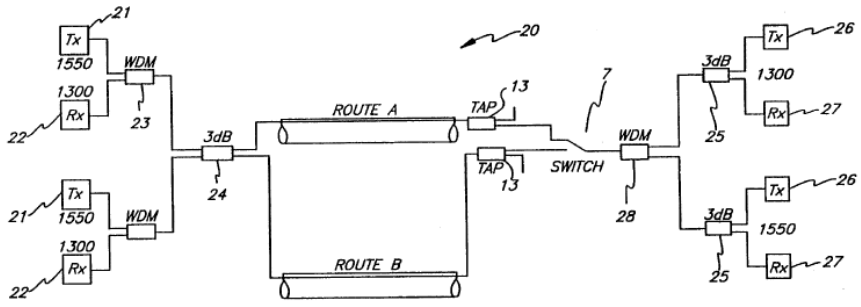


FIG. 3

Figure 3 illustrates an alternative embodiment of a communications system incorporating Corke's invention. Ex. 1206, 5:14–16. As shown, in this embodiment, transmit ports 21 and receive ports 22 are on one end of system 20. *Id.* at 7:59–60. The other end contains both transmit ports 26 and receive ports 27. *Id.* at 7:63–65. Routes A and B lie between the two ends of this system. *Id.* at 7:61–63. Corke notes that the "use of the few added components" in system 20 "allows the system 20 to be used for route-protected bi-directional communications." *Id.* at 7:65–67.

Figure 4 of Corke is reproduced below:

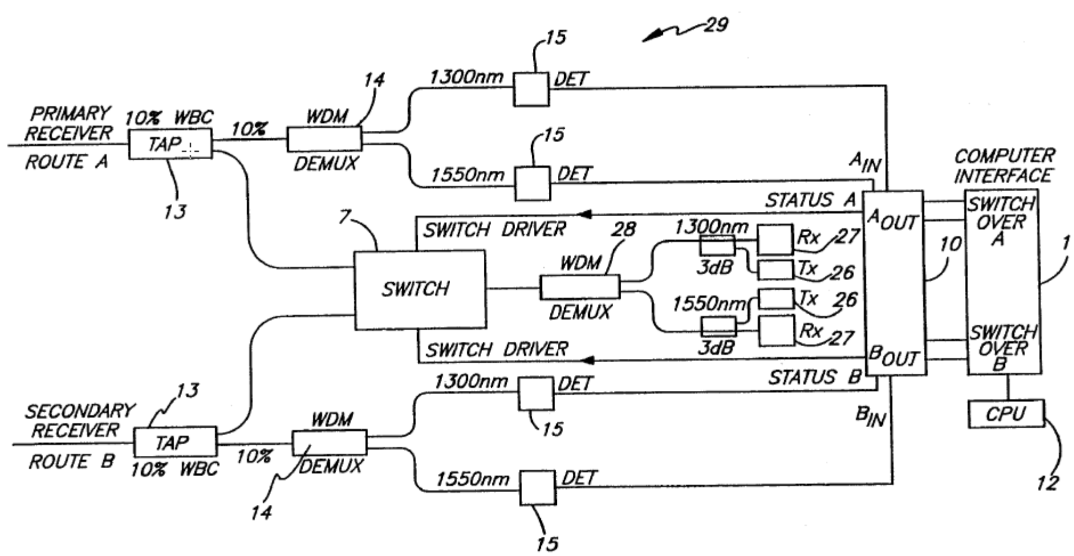


FIG. 4

Figure 4 illustrates an alternative embodiment of Corke's optical communication control device (29) for use in system 20. Ex. 1206, 5:17–19. As shown, device 29 is similar to device 6 of Figure 2, with the exceptions that device 29 contains transmit circuits 26 (in addition to receive circuits 27) and additional 3 db couplers for bidirectional communication. *Id.* at 8:5–10.

Figure 7 of Corke is reproduced below:

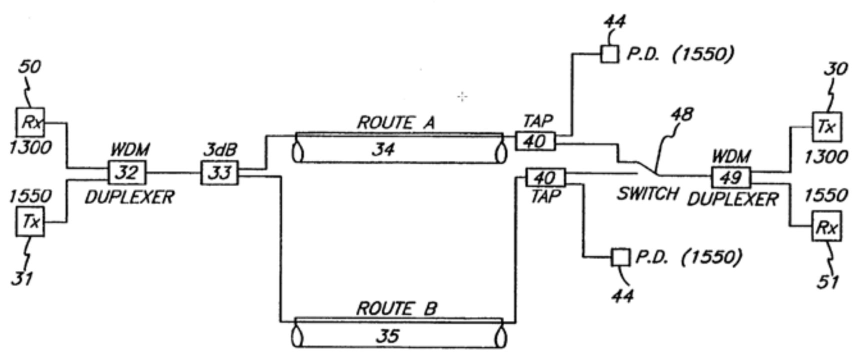


FIG. 7

Figure 7 is a representation of a dual wave length, bidirectional system. Ex. 1206, 5:28–29. In Figure 7, detector 44 monitors primary route A and detector 44 monitors secondary route B. *Id.* at 9:15–18. Both detectors monitor the 1550 nm signal because that signal is more susceptible to bend-induced loss than the 1300 nm signal. *Id.* at 9:18–22.

2. Overview of Swanson

Swanson discloses an optical transmission system that includes a transmitter and a receiver with certain transmission characteristics, "such as output power level, decision threshold level, etc., that are adjustable in response to bit error rate information." Ex. 1207, 3:22–26. Included "at the receiving end of the optical link," between the transmitter and the receiver, is a "bit error rate estimator," which "estimates the bit error rate of the received information signal, and provides [the] bit error rate information . . . to optimize the performance of the transmission system." *Id.* at 3:26–33. Swanson contemplates using a forward error correction (FEC) coder in its system. *Id.* at 3:7–18, 5:3–32.

Swanson describes, with respect to its system, that bidirectional transmission can be achieved using "two fibers . . . (one transmitting in each direction)," or "one fiber can be used with the eastbound and westbound traffic on different wavelengths." Ex. 1207, 4:19–24. Swanson further describes that the "bidirectional interface may consist of one card having both a transmitter and a receiver." *Id.* at 4:31–33.

3. Overview of Chikama

Chikama describes "[m]odulation and demodulation techniques" "for an optical PSK (phase-shift keying) heterodyne transmission system operating at 560 Mbits/s and 1.2 Gbit/s." Ex. 1208, 309, Abstr. Chikama notes that "PSK/DPSK [differential phase-shift keying] modulation has several attractive features," including that "it is relatively easy to design the demodulator and select the lasers, especially the transmitter laser." *Id.* at 309. Chikama describes that in "PSK/DPSK, external modulation is usually adopted so various lasers with structures and configurations which narrow the laser linewidth are available." *Id.* For direct PSK modulation, Chikama explains that the proposed methods of "injection locking and optical PLL[10] techniques" "require two lasers, and the modulation frequencies are limited by the injection locking bandwidth and the PLL bandwidth." *Id.* Accordingly, "direct PSK modulation was not as practical as external

[10] Phase-Locked Loops. Ex. 1208, 6.

modulation." *Id*. Chikama describes a "conventional Ti:$LiNbO_3$ straight-line phase modulator" that is used for PSK modulation of a lightwave signal. *Id*.

4. Claims 1 and 14

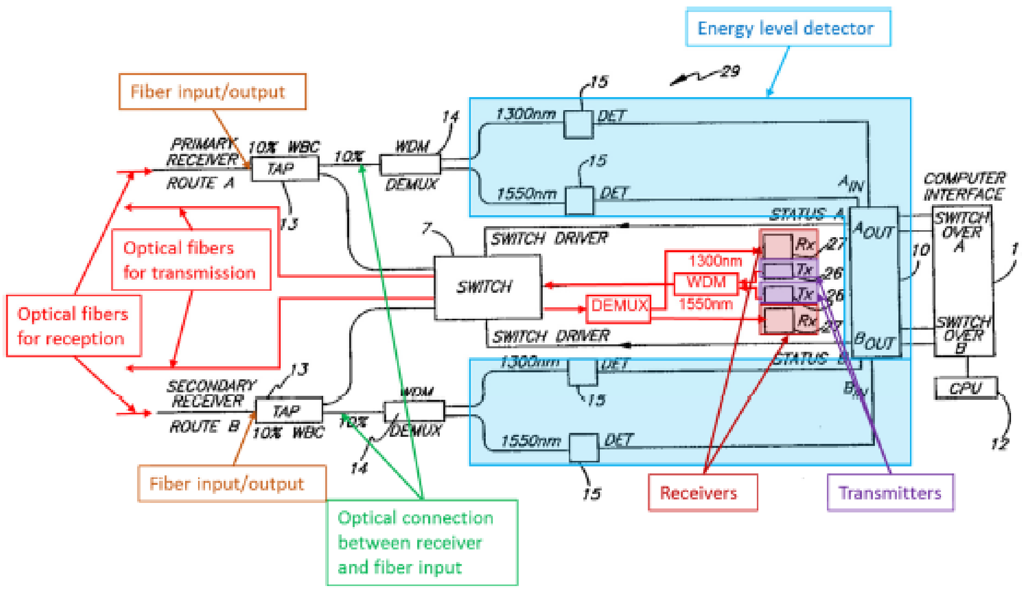
Claims 1 and 14 recite a transceiver card comprising a transmitter, a receiver, first and second optical fibers, and an energy level detector. Petitioner proposes modifying Corke based on Swanson to yield a transceiver card with a transmitter, receiver, and an energy level detector (taught by Corke) and the recited first and second optical fibers (taught by Swanson) to meet the limitations of claims 1 and 14.[11] Pet. 20–33. As set forth below, we determine that Petitioner has not provided a sufficient rationale for its proposed combination of Corke and Swanson and, therefore, has not proven that the combination of Corke, Swanson, and Chikama would have rendered either claim 1 or 14 obvious.

a. Petitioner's Proposed Combination of Corke and Swanson

As Petitioner acknowledges, instead of using separate fibers for reception and transmission, Corke uses "the same optical fiber for bidirectional communication." Pet. 21. Petitioner argues that Swanson, however, discloses that separate transmit and receive fibers can be used for bidirectional communication in place of bidirectional fibers. *Id*. (citing Ex. 1207, 4:21–24). Petitioner asserts that, in light of Swanson, an ordinarily skilled artisan would have been motivated to replace Corke's bidirectional optical fibers for bidirectional communication with separate optical fibers for transmission and reception. Pet. 21. Dr. MacFarlane

[11] Petitioner relies on Chikama as teaching the use of a laser, modulator, and controller in a transmitter. Pet. 23–26.

provides the following annotated version of Figure 4 of Corke illustrating Petitioner's proposed modification to Corke (Ex. 1202 ¶ 122):



This annotated version of Figure 4 of Corke ("Annotated Corke Figure 4") illustrates optical device 29 as configured to attach optical fibers for reception to taps 13 and optical fibers for transmission to switch 7.

b. Petitioner's Rationale for Modifying Corke to Include the Recited First and Second Optical Fibers and the Parties' Arguments Regarding that Rationale

i. The Petition

In the Petition, Petitioner provides the following rationales for modifying Corke to include the recited first and second optical fibers based on the teachings of Swanson.

First, Petitioner argues that an ordinarily skilled artisan would have combined Corke and Swanson to improve system performance. Pet. 8. Petitioner asserts that "Swanson discloses an optical transmission system that includes a transmitter and a receiver with certain transmission characteristics, 'such as output power level, decision threshold level, etc., that are adjustable in response to bit error rate information.'" *Id.* (quoting Ex. 1207, 3:22–26). Petitioner argues that "[i]ncluded 'at the receiving end of the optical link,' between the transmitter and the receiver [in Swanson], is a 'bit error rate estimator,' which 'estimates the bit error rate of the received information signal, and provides [the] bit error rate information . . . to optimize the performance of the transmission system.'" *Id.* (quoting Ex. 1207, 3:26–33). Further, Petitioner argues that Swanson contemplates using forward error correction (FEC) coder in its system. *Id.* (citing Ex. 1207, 3:7–18, 5:3–32, Fig. 3). According to Petitioner, Swanson's conventional wavelength division multiplexing (WDM) system is generally similar to Corke's optical system, and both relate to compact transceiver devices with embedded monitoring of the link. *Id.* Also, according to Petitioner, Corke contemplates improving system performance using bit error correction. *Id.* at 8–9 (citing Ex. 1206, 2:50–57, 10:27–37). Petitioner further asserts that an ordinarily skilled artisan would have been motivated, in view of Swanson, to use FEC as an error detection algorithm in Corke's optical device, modified for bit error detection. *Id.* at 9. Petitioner argues that, as a result, an ordinarily skilled artisan would have combined Corke and Swanson. *Id.* at 8. Petitioner cites the testimony of Dr. MacFarlane to support these arguments. *Id.* at 7–9 (citing Ex. 1202 ¶¶ 60–62).

Second, Petitioner argues that Swanson describes, for bidirectional communication, that separate transmit and receive fibers can be used as an alternative to bidirectional fibers and, therefore, an ordinarily skilled artisan would have understood that Corke's optical device could include two separate fibers for transmission and reception. Pet. 9. Petitioner argues that Swanson describes "using a conventional WDM system for bidirectional transmission, which can be achieved using 'two fibers . . . one transmitting in each direction,' or 'one fiber can be used with the eastbound and westbound traffic on different wavelengths.'" *Id.* (quoting Ex. 1206, 4:19–24); *see also id.* at 21. Petitioner argues that this teaching is directly applicable to Corke's optical device, which is used for "route-protected bi-directional communication" and which carries "optical wavelength division multiplexed signals." *Id.* at 9 (quoting and citing Ex. 1206, 1:46–49, 5:61–6:21, 7:56–67, Figs. 2–4). According to Petitioner, therefore, an ordinarily skilled artisan accordingly would have found it obvious that, as described by Swanson, an optical device that includes transmitters and receivers, and is used for bidirectional communication, such as Corke's optical device, can include separate fibers for transmission and reception. *Id.*; *see also id.* at 22 (arguing an ordinarily skilled artisan "would have found it obvious, in view of Swanson's disclosure, that Corke's optical device . . . could include two separate fibers for transmission and reception"). Petitioner cites the testimony of Dr. MacFarlane to support these arguments. *Id.* at 9 (citing Ex 1202 ¶¶ 59–62); *id.* at 22 (citing Ex. 1202 ¶¶ 121–126).

ii. Patent Owner's Response

Patent Owner argues that an ordinarily skilled artisan would not have been motivated to modify Corke in view of Swanson to include separate transmit and receive fibers because doing so would eliminate Corke's ability to determine if a route's fiber for transmission is compromised by monitoring received signals over the same fiber. PO Resp. 34. Patent Owner argues that Corke's embodiments showing transmission and reception of optical communications at a common node (the embodiments with bidirectional communications) each use a single "primary" fiber on

Route A operating bidirectionally and a single "secondary" fiber on Route B also operating bidirectionally. *Id.* at 28. Patent Owner argues that Figures 4 and 7 of Corke illustrate this arrangement. *Id.* According to Patent Owner, Corke's decision to use a single, bidirectional fiber for each route represents a critical element of its system. *Id.* Patent Owner asserts that by monitoring the received signal, Corke is able to determine whether the bidirectional fiber is intact and capable of successfully carrying a transmitted signal. *Id.* Patent Owner argues that, with Petitioner's proposed modification, Corke would lose that ability. *Id.* at 30. Therefore, according to Patent Owner, an ordinarily skilled artisan would not have been motivated to modify Corke to include separate input and output fibers. *Id.* at 30–31.[12] [13] Patent Owner

[12] Patent Owner also argues Dr. MacFarlane was obligated to explain how switch 7 would have worked in Annotated Corke Figure 4, and Patent Owner suggests that Dr. MacFarlane's failure to do so means Petitioner did not satisfy its burden of proof. PO Resp. 31–33; Sur-Reply 8–9. Petitioner disagrees. Pet. Reply 9–10. We do not find that Dr. MacFarlane had to explain how switch 7 would have worked in Annotated Corke Figure 4. We are persuaded that an ordinarily skilled artisan would have been able to configure that switch for that embodiment. Patent Owner does not demonstrate that Corke provides underlying details for the switch used in Corke Figure 4. PO Resp. 31–33; Sur-Reply 8–9. Therefore, Corke presumably relies on the knowledge of an ordinarily skilled artisan to configure the actual switch shown in Corke Figure 4, and Dr. MacFarlane can do the same with respect to Annotated Corke Figure 4.

[13] Patent Owner also argues that Corke's teachings regarding wavelength dependent degradation further undermines Petitioner's proposed modification. PO Resp. 29–31; Sur-Reply 6–8. Petitioner disagrees. Pet. Reply 6–7. We do not need to resolve this dispute because we do not base our decision on Corke's teachings regarding wavelength dependent degradation.

cites the testimony of Dr. Goossen to support these arguments. *Id.* at 28–34 (citing Ex. 2033 ¶¶ 28–51).

iii. Petitioner's Reply

In its Reply, Petitioner argues that, in its Petition and in Dr. MacFarlane's accompanying declaration, Petitioner established that incorporating separate fibers for transmission and reception was a well-known alternative to using a single bidirectional fiber. Pet. Reply 2. Petitioner notes that Dr. MacFarlane testified in his original declaration that "[t]he advent of Erbium Doped Fiber Amplifiers (EDFAs) prompted oscillation and instabilities in single fiber bidirectional links, and these effects were deleterious to data transport." *Id.* (quoting Ex. 1202 ¶ 27). Petitioner further quotes Dr. MacFarlane's testimony that "a[n ordinarily skilled artisan] would have been motivated to combine" Corke and Swanson "particularly as in-line EDFAs became widespread in fiber optic communication systems and the advantage of a fiber-pair was understood by the community." *Id.* (quoting Ex. 1202 ¶ 122[14]). Petitioner argues that Patent Owner does not dispute these known advantages. *Id.*

Petitioner also argues that Dr. Goossen acknowledges that long-distance communication systems employing EDFAs typically used fiber-pairs rather than a single bidirectional fiber because the amplifiers perform better with unidirectional fibers. Pet. Reply 2 (citing Ex. 2033 ¶ 30, Ex. 1225, 45:5–18). Petitioner asserts that Dr. Goossen mistakenly thought the benefits of using fiber pairs with EDFAs were inapplicable to Corke because Corke was limited to short-distance communications like CATV (cable TV).

[14] The Petition mistakenly identifies this quote as being in paragraph 27 of the declaration. Pet. Reply 2.

Id. (citing Ex. 2033 ¶ 30). According to Petitioner, however, Corke refers generally to telecommunications equipment, which includes long-distance communications such as a telephone call from Los Angeles to New York. *Id.* at 2–3 (citing Ex. 1206, Abstr., 3:32–4:12; Ex. 1225, 9:21–11:18). Petitioner asserts that "the very portion of Corke that mentions CATV discusses telephone transmission as well: 'a 6 dB band for permitted performance that may be acceptable for digital transmission over a telephone route.'" *Id.* at 3 (quoting Ex. 1206, 10:40-52 (emphasis omitted)).

Petitioner argues that Dr. Goossen "acknowledged that he was aware of 'long-distance communication'—'longer than 100 kilometers'—with unidirectional fibers in both directions, such as long-distance phone calls from Los Angeles to New York . . . noting the difficulty with using bidirectional fibers for long distances." Pet. Reply 3 (quoting and citing Ex. 1225, 43:10-45:3, Ex. 2033 ¶30). Petitioner further argues that Corke teaches long-distance telecommunications, such as telephone transmission, and, therefore, an ordinarily skilled artisan would have been aware of the benefits of using fiber-pairs for better performance and would have been motivated to combine Swanson's teaching of fiber-pairs with Corke. *Id.* (citing Pet. 7–10, Ex. 2033 ¶¶ 27, 122, 126).

Petitioner also asserts that Corke does not teach away from using unidirectional fibers because it does not criticize, discredit, or otherwise discourage alternatives to bidirectional fibers. Pet Reply 4. Further, Petitioner argues Corke discloses embodiments that use unidirectional fibers. *Id.* (citing Ex. 1206, Abstr., 3:53–4:13, 8:51–9:7, Fig. 6). According to Petitioner, Figure 6 of Corke discloses a unidirectional system with signal monitoring for route switching. *Id.*

Further, Petitioner contends that Corke's disclosure of both unidirectional and bidirectional fiber embodiments shows that Corke's core objective for monitoring received signal strength is not merely to determine whether the same fiber is suitable for transmission. Pet. Reply 5. Rather, according to Petitioner, Corke objectively seeks the broader purpose of "route monitoring and protection." *Id.* (quoting Ex. 1206, Abstr.; citing Ex. 1206, 1:35–54, 3:7–18; Ex. 1226 ¶ 7). Petitioner asserts that Corke discloses the importance of its unidirectional fiber implementations by disclosing that its preferred embodiment of the invention is shown in Figure 2, which has no transmission. *Id.* at 5–6 (citing Ex. 1206, 5:37–6:55, Fig 2). Petitioner concludes that therefore "it is clear that determining routes for transmission is not Corke's primary purpose for monitoring received signal strength." *Id.* at 6 (emphasis omitted). In addition, Petitioner asserts that Patent Owner's argument that Corke teaches that signal strength must be measured on a wavelength-by-wavelength basis ignores Corke Figure 7, which monitors only the received 1550 nm signal. *Id.* at 6–7 (citing Ex. 1206, 9:8–14; also citing Ex. 1206, Abstr., 2:31–43).

Petitioner also argues that a fiber fault is not the only type of fault that could result in a loss of received signal strength and other components could fail, such as a transmitter at an upstream location. Pet. Reply 7 (citing Ex. 1225, 27:8–28:12 (Dr. Goossen's deposition testimony)). According to Petitioner, if a remote transmitter failed, leading to a fault detection, switching to the secondary bidirectional fiber under the sole assumption of primary fiber breakage would not address the problem, since the received signal—from the remote transmitter—would still be poor. *Id.* Petitioner asserts that such a policy would erroneously mark a primary fiber in good condition as being faulty. *Id.*

In addition, Petitioner argues that a unidirectional pair would have achieved performance similar to that of a bidirectional fiber. Pet. Reply 7. Petitioner argues that Dr. Goossen acknowledged that the fault in the fiber that Corke contemplated was damage to a buried fiber by an earth excavating machine. *Id.* at 7–8 (citing Ex. 1225, 49:17–50:16). According to Petitioner, such an event would have likely also damaged a second fiber that was buried together as would have been the case with fiber-pairs applicable to high data rate systems, such as Corke. *Id.* at 8 (citing Ex. 1226 ¶¶ 8–9).

Petitioner further argues that, even if Patent Owner were correct that modifying Corke to use fiber-pairs would reduce the ability of some of Corke's embodiments to detect certain faults, that potential disadvantage would not constitute a teaching away from the use of fiber pairs. Pet. Reply 8.

iv. Patent Owner's Sur-Reply

In its Sur-reply, Patent Owner argues that Petitioner cannot rely upon any benefit that Corke would gain from using unidirectional fibers with EDFA amplifiers because Corke does not use EDFA amplifiers in any embodiment and Petitioner did not advance any combination where Corke is modified to include an EDFA. Sur-Reply 3–4. Patent Owner also argues that, although Corke has embodiments with unidirectional fibers, those embodiments are for unidirectional communication. *Id.* at 4–5 (noting that Corke Figure 6, which was cited by Petitioner, is a "unidirectional monitoring system"). According to Patent Owner, Corke uses only bidirectional fibers for bidirectional communications. *Id.*

Patent Owner further argues that, although Corke may teach the desirability of achieving route monitoring and protection, the way Corke teaches doing so for bidirectional embodiments is by monitoring the bidirectional fiber of each route to determine route quality for transmission. Sur-Reply 5. Patent Owner argues that Petitioner's modification to Corke fails to achieve Corke's desired route monitoring and protection because it has no route monitoring of the transmission routes. *Id.* at 6. Further, Patent Owner asserts that, although the embodiment of Corke Figure 7 monitors only one wavelength, that embodiment monitors the wavelength that is more susceptible to fiber damage or bend-induced loss. *Id.* at 6–7.

In addition, Patent Owner argues that Dr. MacFarlane's testimony that both fibers in a fiber pair would likely experience the same damage is contradicted by prior testimony by Dr. MacFarlane that in a fiber pair, the transmission and reception fibers could experience different quality defects. Sur-Reply 7 (citing Ex. 2032, 83:8–16; also citing Ex. 2033 ¶ 39).

c. Analysis of Claims 1 and 14

We determine that Petitioner has not proven that an ordinarily skilled artisan would have combined Corke and Swanson as proposed, and in particular, has not proven that an ordinarily skilled artisan would have modified Corke to include the recited first and second optical fibers.

i. The Petition Does Not Set Forth a Sufficient Rationale for Adding the Recited First and Second Optical Fibers to Corke's System

As discussed above, the Petition provides two rationales why an ordinarily skilled artisan would have added the recited first and second optical fibers to Corke: (i) to improve system performance by including

Swanson's error correction algorithm in Corke's system and (ii) because it was well known that unidirectional fibers could replace bidirectional fibers. Pet. 8–9. Neither suffices for Petitioner's modification.

First, Petitioner has not presented any persuasive argument or evidence showing that adding Swanson's error correction algorithm to Corke would have motivated an ordinarily skilled artisan to add unidirectional fibers to Corke. Pet. 8–9. As Petitioner notes, Swanson discloses the use of both unidirectional and bidirectional fibers. *Id.* at 9. Therefore, Swanson's algorithm does not require unidirectional fibers, and Petitioner does not set forth any persuasive evidence that unidirectional fibers would be preferable for the algorithm. *Id.* at 8–9. Thus, on this record, Swanson's error correction algorithm would not have motivated an ordinarily skilled artisan to add the recited first and second optical fibers to Corke.

Second, the mere fact that an ordinarily skilled artisan arguably knew that unidirectional fibers could be used with Corke's system would not have motivated an ordinarily skilled artisan to add those fibers to Corke. The mere fact that prior art elements could be combined or modified does not constitute a motivation to combine or modify them. In *Personal Web Technologies*, the Federal Circuit addressed "reasoning [that] seem[ed] to say no more than that a skilled artisan, once presented with the two references, would have understood that they *could be* combined." *Personal Web Techs., LLC v. Apple, Inc.*, 849 F.3d 987, 993 (Fed. Cir. 2017) (emphasis original). The Federal Circuit held, however, that such reasoning "is not enough: it *does not* imply a motivation to pick out those two references and combine them to arrive at the claimed invention." *Id.* at 993–94 (emphasis added). Similarly, in *Belden Inc.*, the Federal Circuit held:

"obviousness concerns whether a skilled artisan *not only could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention." *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (emphasis original). Further, in *In Touch Technologies*, the Federal Circuit disapproved of an expert's testimony "because her testimony primarily consisted of conclusory references to her belief that one of ordinary skill in the art *could* combine . . . references, not that they *would* have been motivated to do so." *InTouch Techs., Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (emphasis original).

In sum, the Petition does not set forth a sufficient rationale for adding the recited first and second optical fibers to Corke.

ii. An Ordinarily Skilled Artisan Would Not Have Wanted to Add the Recited First and Second Optical Fibers to Corke's System.

Based on the record before us, we also find that there are significant reasons why an ordinarily skilled artisan would not have wanted to add the recited first and second optical fibers to Corke's system. Ex. 2033 ¶ 42. We credit Dr. Goossen's testimony that Petitioner's proposed substitution of a pair of unidirectional fibers for bidirectional fibers "would have eliminated the ability of a node in Corke to determine if a route's fiber is compromised by monitoring received signals received over that same fiber." *Id.* Dr. Goossen explains: "[t]he substitution of two unidirectional fibers for each one of Corke's bidirectional fibers would cause Corke's control unit 10 to select a route for signal transmission without any data indicating whether the unidirectional transmission fiber was experiencing signal loss." *Id.* "This modification eliminates Corke's ability to select a fiber for transmission with a significantly reduced risk of signal degradation or performance loss." *Id.*

As a result, an ordinarily skilled artisan "would understand that Corke's use of bidirectional fibers increases the likelihood that Corke is able to transmit over a fiber that will not fail or otherwise degrade the transmission." *Id.* ¶ 47. Therefore, Dr. Goossen testifies, and we credit this testimony, that with Petitioner's proposed modification, Corke's reliable transmission safeguard is lost. *Id.* ¶ 48.

Corke's disclosure supports Dr. Goossen's testimony. Corke's embodiments with bidirectional transmission and reception of optical communications disclose the use of a single "primary" fiber operating bidirectionally and a single "secondary" fiber, which also operate bidirectionally. Ex. 1206, Figs. 3, 4, 7, and 8; *see also* Ex. 2033 ¶ 28. In particular, Figures 3, 4, 7, and 8 of Corke depict embodiments with bidirectional communication, and each of these embodiments use bidirectional fibers. Corke describes system 20 in Figure 3 as providing "route-protected bi-directional communications" (Ex. 1206, 7:65–67), and Figure 4 illustrates an optical communications control device 29 for use in the system of Figure 3. *Id.* at 8:3–5. In Figures 3 and 4, a primary bidirectional optical fiber extends over Route A, and secondary bidirectional optical fiber extends over Route B. *Id.* at 7:56–8:10, Figs. 3 and 4; Ex. 2033 ¶ 41. Referring to Figure 4, Dr. MacFarlane, in fact, acknowledges that Corke's optical device transmits and receives over the same fiber, e.g., primary receiver route A, using bidirectional communication. Ex. 1202 ¶ 122. Each of the embodiments of Figures 7 and 8 also uses a bidirectional fiber along primary route A and a bidirectional fiber along secondary route B. Ex. 1206, 9:8–14, 9:23–44, Figs. 7 and 8; Ex. 2033 ¶¶ 32–33.

Further, Corke uses bidirectional fibers for bidirectional communications for a specific reason. As Dr. Goossen explains, Corke teaches that it is advantageous to use bidirectional fibers for bidirectional communication because with those fibers, Corke's system can rely upon the detection of signals received by a node of a communications link to determine which bidirectional fiber, or route, should be used to transmit signals. Ex. 2033 ¶ 31. Corke's Abstract teaches that with bidirectional embodiments, route transmission in one direction (e.g., reception) determines route quality in the other direction (e.g., transmission): "In bi-directional communication systems, performance of a wave length *moving in one direction* through a route *determines route quality for transmission* in the other direction, as well." Ex. 1206, Abstr. (emphases added). Corke's Summary of the Invention similarly describes that, for systems with bidirectional transmission, "the *performance quality* of at least one selected single wave length *travelling in only one direction*, the comparison serving to monitor the quality *for transmission* at the wave length in *both directions* along the route." *Id.* at 3:1–6 (emphases added); *see also id.* at 3:19–30, 4:43–62. Because Corke's bidirectional embodiments can determine the quality of the transmission fiber based on the quality of the received signal along the same fiber, "when a primary bidirectional fiber is damaged or severed . . . a node in Corke's system can decide to switch to a secondary route for transmission and reception of optical signals based on the detected quality of received signals." Ex. 2033 ¶ 32; Ex. 1206, 1:11–17, 5:42–44. For example, Corke describes that when detector 15 in the embodiment of Figure 4 detects a drop in intensity of a received signal along route A, control unit 10 directs switch 7 to direct the receive and transmit signals along route B. Ex. 1206, 6:30–40.[15] For the embodiment of Figure 7, Corke similarly describes that: "If the route A cable is disturbed or severed, the 1550 nm monitor system detects that condition and automatically switches to route B. The 1330 nm signal travelling in the opposite direction is also directed on to the route B cable." Ex. 1206, 9:11–14; *see also* Ex. 2033 ¶ 33. For the embodiment of Figure 8, Corke similarly discloses that "if route A should fail it would be detected by the detector 44 . . . and upon determining the intensity at the detector has fallen below the specified digital threshold value it would switch the switch to access route B, (assuming that route B monitored status was acceptable)." Ex. 1206, 9:33–40; *see also* Ex. 2033 ¶ 33. As a result: "[t]he signal from the transmitter 130 would then automatically be diverted through route B to the receiver 151, while the signal from transmitter 30 is received at receiver 50 through route B." Ex. 1206, 9:41–44; *see also* Ex. 2033 ¶ 33.

We credit Dr. Goossen's testimony that Corke's advantageous method of deciding which transmission fiber to use for bidirectional communications based on monitoring the received signal necessarily requires bidirectional fibers. Ex. 2033 ¶ 37. As Dr. Goossen testifies, in Corke's system, the decision to select the route for transmission/reception occurs entirely at a single node co-located with the switch 7/48 while the other node implements a coupler between transmitter/receiver ports and the fibers of Route A and Route B. *Id.*; *see also* Ex. 1206, Figs. 1a, 1b, 2–4, and 6–9. As Dr. Goossen

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[15] This passage in Corke expressly addresses the embodiment of Figure 2, but is applicable to the embodiment of Corke Figures 3 and 4, because the latter embodiment operates similarly to that of Corke Figure 2 with the exception of Figure 3 and 4's bidirectional communication. Ex. 1206, 7:65–8:10.

further explains, the node's switch setting and route selection are determined by the node's control circuit based only on information in that node, specifically including a measurement of the average intensity of optical signals received by that node. Ex. 2033 ¶ 37.

Therefore, Dr. Goossen testifies an ordinarily skilled artisan would have understood that Corke could not use a measurement of the average intensity of received optical signals to make a decision about the quality of a transmission fiber unless the characteristics of the received signals were linked to the characteristics of the transmission fiber. *Id.* And, as Dr. Goossen further testifies, an ordinarily skilled artisan would have regarded a system having plural unidirectional fibers, or fiber-pairs, per route as having an insufficient link between the characteristics of received signals and the characteristics of the transmission fiber because there would be no direct monitoring by the transmitting node of any characteristic of the unidirectional transmission fiber. *Id.* We credit this testimony by Dr. Goossen.

Further, we credit Dr. Goossen's testimony that an ordinarily skilled artisan would have recognized that, for bidirectional communications, bidirectional fiber links are less expensive than unidirectional fiber links because bidirectional links require fewer fiber components (e.g., because one link is used rather than two). Ex. 2033 ¶¶ 29–30. Therefore, an ordinarily skilled artisan would have preferred bidirectional fibers for such communications absent a need for the additional expense of the unidirectional fibers, a need for which Petitioner has not demonstrated. *Id.*

In sum, we find an ordinarily skilled artisan would have not wanted to add the recited first and second optical fibers to Corke's system.

iii. Petitioner's Arguments that Unidirectional Fibers Would Have the Same Performance as Bidirectional Fibers for Bidirectional Communications in Corke Are Not Persuasive

Petitioner does not dispute that its proposed modification to Corke would eliminate the ability of a node in Corke to determine if a transmission route's fiber is compromised by monitoring signals received over that same fiber. Pet. Reply 4–10. Instead, as indicated above, Petitioner argues that Cork's resulting loss in ability to make this determination is of no significance because (i) "using a unidirectional fiber-pair would have achieved performance similar to that with a bidirectional fiber," and (ii) Corke's method of monitoring of received signals to determine the path of a transmission signal over the same fiber can lead to unnecessary switching of fiber routes due to remote transmitter failure. *Id.* at 7–8. We are not persuaded by either argument.

First, we are not persuaded that a unidirectional fiber pair in Corke's system would perform similarly to a bidirectional fiber. Petitioner does not set forth persuasive evidence proving this assertion. Pet. Reply 7–8. Petitioner argues that Dr. Goossen testified that the fault in the fiber that Corke addressed was damage to a buried fiber by an earth excavating machine. *Id.* at 7–8 (citing Ex. 1225, 49:17–50:16). Petitioner further argues that Dr. MacFarlane testifies that an earth excavating machine that inadvertently contacts a unilateral fiber of a fiber pair would likely damage the other fiber of the pair. *Id.* (citing Ex. 1226 ¶¶ 8–9). Petitioner concludes, therefore, that a unidirectional fiber pair in Corke's system would perform similarly to a bidirectional fiber.

We are not persuaded. Although Petitioner argues that Dr. Goossen testified that the fault in the fiber Corke contemplated was damage to a buried fiber by an earth excavating machine, the testimony Petitioner cites refers to the inadvertent contact by an earth excavating machine as an "example" of what could require Corke to switch over to a redundant fiber. Pet Reply 7–8; Ex. 1225, 49:17–50:16. That testimony does not preclude other examples. And Petitioner cites no testimony from Dr. MacFarlane regarding a purported lack of other examples. Pet. Reply 7–8. Similarly, Dr. MacFarlane's testimony that an earth excavating machine would "likely" damage both fibers in a pair does not mean that Corke would not, as it does, want to test the actual fiber used for transmission. The term "likely" is not synonymous with "always." Accordingly, Dr. MacFarlane's use of the term "likely" merely indicates that more than fifty percent of the time if a transmission fiber in a pair is damaged its corresponding reception fiber would also be damaged. The possibility that the corresponding reception fiber is not damaged, however, could still warrant checking the actual fiber used for transmission, rather than relying on the sometimes faulty assumption that reception fiber would have the same damage as the adjacent transmission fiber. Consistent with that fact, Dr. MacFarlane testified during cross examination that he could envision certain situations where a transmission fiber could be damaged or severed without any damage or severance to the reception fiber. Ex. 2032, 83:8–16. In context, we find that Dr. MacFarlane's testimony supports following Corke's teachings for bidirectional communications and testing the actual fiber used for transmission, rather than merely assuming a distinct reception fiber will have the same properties.

Second, we are not persuaded that the issue Petitioner raises regarding remote transmitter failures would have motivated Petitioner's proposed modification. Petitioner argues that, in addition to fiber faults, Corke's system could suffer a transmitter failure in an upstream location, noting that Dr. Goossen testified that the transmitter in an upstream location could fail. Pet. 7–8 (citing Ex. 1225, 27:8–28:12). Petitioner argues that if a remote transmitter failed, Corke's system with bidirectional fibers would switch the transmission fiber for no good reason. *Id.* Petitioner suggests that the signal problem that Corke would detect would be the result of the transmitter and not the fiber, but indicates that Corke could not distinguish them. *Id.* Petitioner implies that this problem supports its proposed modification, but provides no persuasive evidence or explanation why it would. *Id.* Based on Petitioner's own Annotated Corke Figure 3A, with Petitioner's modification, Corke's system would also switch from using Route A to Route B based on a lack of signal on a reception fiber on Route A due to a remote transmitter failure. Ex. 1202 ¶ 122, Annotated Corke Figure A (reproduced above), switch 7. Therefore, whatever problem Corke might have with the failure of a remote-transmitter, Corke would have that same problem with Petitioner's proposed modification. Accordingly, Petitioner has not demonstrated that its proposed modification would provide any advantage regarding switching based on the failure of a remote transmitter.

In sum, Petitioner has not persuaded us that the loss of Corke's ability to determine if a transmission fiber is compromised by monitoring signals received over the fiber used for transmission due to Petitioner's proposed modification would be insignificant.

iv. Petitioner's Arguments that Corke Does Not Require Bidirectional Fibers Are Unavailing

As discussed above, Petitioner argues that Corke does not teach away from using unidirectional fibers with its system and that Corke's primary purpose purportedly is not monitoring received signals to determine the path of a transmission signal. Pet. Reply 4–6. These arguments, however, are unavailing.

Petitioner argues that Corke does not teach away because "Corke discloses [the unidirectional fiber] implementation as the "preferred embodiment of the invention" shown in FIG. 2, with no transmission whatsoever." Pet. Reply 5–6 (citing Ex. 1206, 5:37–6:55, Fig 2). Citing Dr. MacFarlane's testimony, Petitioner also argues that Corke's primary objective is not to determine whether a fiber is suitable for transmission by monitoring the received signal on the fiber. Pet. Reply 5–6; Ex. 1226 ¶ 7. Instead, according to Petitioner and Dr. MacFarlane, Corke's primary objective is route monitoring and route protection, and Corke performs route monitoring even when there is no transmission on the same fiber. Pet. Reply 5–6; Ex. 1226 ¶ 7. According to Petitioner and Dr. MacFarlane, therefore, an ordinarily skilled artisan would have understood Corke's route monitoring could be applied for both unidirectional and bidirectional fibers. Pet. Reply 5–6, Ex. 1226 ¶ 7.

These arguments by Petitioner miss the point. Corke teaches that it is undesirable to add unidirectional fibers for bidirectional communications, even if Corke does not teach away from the use of unidirectional fibers for unidirectional communications or does not limit all of its objectives to bidirectional communication. First, Corke does not, as Petitioner suggests, refer to its unilateral transmission embodiment of Figure 2 as "the preferred embodiment." Pet. Reply 5–6. Corke refers to Figure 2 as "*a* preferred embodiment." Ex. 1206, 5:11–13, 5:61–63 (emphasis added). And Corke discloses that Figure 2 is a preferred embodiment for unidirectional communication. *See id.* at Figs. 1A and 1B (signal path arrows), Fig. 2 (absence of transmitters), and 7:65–67 (comparing Figures 2 and 3, and stating "Accordingly, use of the few added components [in Figure 3] allows the system 20 to be used for route-protected bi-directional communication."). That Corke uses unidirectional fibers in embodiments for unidirectional communication does not mean Corke teaches using unidirectional fibers for bidirectional communication. To the contrary, as discussed above, Corke teaches that bidirectional fibers should be used for bidirectional embodiments.

Similarly, Dr. MacFarlane's testimony that an ordinarily skilled artisan would have understood that unidirectional fibers could be used with Corke's embodiments also misses the point. Ex. 1226 ¶ 7. Even though Corke discloses the use of unidirectional fibers for unidirectional communications, Corke teaches using bidirectional fibers for bidirectional communications to secure advantages that occur only with bidirectional fibers for those communications (e.g., determining the quality of a transmit path through the quality of a received signal over the same fiber).

In sum, Petitioner's arguments that Corke does not require bidirectional fibers or teach away from unidirectional fibers are unavailing.

v. Petitioner's Reply Arguments Are Not Persuasive

In its Reply, Petitioner argues that an ordinarily skilled artisan would have been motivated to use bidirectional fibers due to the use of EDFAs in long distance communications. Pet. Reply 1–3. This argument is unpersuasive for several reasons.

First, this argument is untimely. A petitioner must set forth the motivation to combine references in the petition, and cannot wait to do so in the reply. 37 C.F.R. § 42.23(b); *Intelligent BioSys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369–70 (Fed. Cir. 2016). Petitioner's Reply cites nowhere in the Petition where Petitioner argued that the use of EDFAs in long-distance communications would have motivated the use of bidirectional fibers in Corke's system. Pet. Reply 1–3. In fact, the discussion in the Petition of why an ordinarily skilled artisan would have combined Corke and Swanson or modified Corke to add unidirectional fibers does not even mention EDFAs or long-distance communications. *See* Pet. 7–9, 20–22.

Petitioner argues that in his original declaration, Dr. MacFarlane: (i) testified that EDFA fibers prompted oscillation in single fiber bidirectional links and those effects were deleterious to data transport and (ii) referred to EDFAs when he opined that an ordinarily skilled artisan would have been motivated to combine Corke and Swanson. Pet. Reply 2 (citing Ex. 1202 ¶¶ 27, 122, 126). To the extent, however, that Petitioner wanted to rely upon EDFAs as a motivation for adding unidirectional fibers to Corke, it should have included that motivation in its Petition. Even if we were to overlook that gap in the Petition, however, and incorporate the cited testimony by Dr. MacFarlane into the Petition, the cited testimony makes no mention of any long-distance communications and does not set forth any other reason why an ordinarily skilled artisan would have wanted to use EDFAs with Corke's system. Ex. 1202 ¶¶ 27, 122, 126. The cited testimony merely refers to purportedly known advantages with unidirectional fibers, which is too general to support Petitioner's proposed modification. *Id.* We further note that Petitioner and Dr. MacFarlane set forth no persuasive evidence that Corke discloses the use of EDFAs. *See* Pet. Reply 1–3; Ex. 1202 ¶¶ 27, 122,

126. Accordingly, the cited testimony from Dr. MacFarlane's original declaration does not provide a sufficient rationale for using unidirectional fibers in Corke's system.

In the Reply, Petitioner tries to fill in the gaps in Dr. MacFarlane's testimony to provide a reason to use the EDFAs with Corke's system and hence a reason to use unidirectional fibers. Pet. Reply 1–3. Petitioner argues that Corke discloses long-distance communications and that long-distance communications would typically use EDFA amplifiers. *Id.* at 2–3. Despite submitting a supplemental declaration from Dr. MacFarlane, however, Petitioner does not submit any testimony from Dr. MacFarlane to support these assertions. *Id.* Instead, Petitioner relies on testimony from Dr. Goossen, taken out of context, and attorney argument, the combination of which we do not find persuasive. *Id.*

Petitioner notes that Dr. Goossen testified that long-distance communication systems often employed EDFA amplifiers and therefore typically used fiber pairs. Pet. Reply 2 (citing Ex. 2033 ¶ 30, Ex. 1225, 45:5–18). Petitioner further notes that Corke discloses "telecommunications equipment" and transmission over a telephone route. *Id.* at 2–3. Petitioner argues that Dr. Goossen admits the term "telecommunication equipment" includes long-distance communications, such as a telephone call from Los Angeles to New York, and, therefore, Corke discloses long-distance communications that include EDFA amplifiers, which would motivate the use of unidirectional fibers. *Id.*

We are not persuaded by these arguments. The mere fact that the term "telecommunications equipment" could include equipment for long-distance communications would not demonstrate that an ordinarily skilled artisan would have used EDFAs with Corke. Petitioner provides no persuasive reason why the term could not, consistent with its ordinary usage, also include equipment for local communications, which Petitioner has not argued would involve EDFAs. Pet. Reply 1–3. And given that Corke discloses the use of bidirectional fibers for bidirectional communications, which Petitioner argues would not be useful for long-distance communications, it would seem just as likely, if not more likely, that Corke was referring to telecommunications equipment that could be used with its disclosed fibers (e.g., equipment for local communications).

Further, in the cited testimony, Dr. Goossen was not asked what the term "telecommunications equipment" in Corke referred to, but rather what the term "telecommunications" meant in the challenged patent. Ex. 1225, 9:14–10:2. Dr. Goossen answered that the term "telecommunications" generally meant communicating through remote distances and gave an example of Los Angeles to New York as a remote distance. *Id.* Dr. Goossen admitted, however, that he had not looked up the dictionary definition of the term and, without a definition, could not say whether a string from a house to a tree house (a local communication) would also constitute telecommunications. Ex. 1225, 10:1–12:3. And Petitioner cites nowhere where its counsel asked Dr. Goossen what the term "telecommunication equipment" in Corke referred to. *See* Pet. Reply 1–3. Moreover, as Petitioner notes, Dr. Goossen expressly testified that Corke's system was intended only for short-distance communications. Pet. Reply 2; Ex. 2033 ¶ 30.

In context, we do not find that Dr. Goossen's testimony supports Petitioner's assertion that Corke discloses using its system for long-distance communications. We also note that Corke specifically discloses that "a 6 dB band for permitted performance . . . may be acceptable for digital transmission over a telephone route." Ex. 1206, 10:40–52; Pet. Reply 2–3. . Petitioner does not address this disclosed 6 dB band in arguing that the Corke's disclosure of this telephone route implicates long distance communications. Pet. Reply 2–3. In light of Petitioner's failure to present any testimony from its expert that Corke purportedly discloses applications involving long distance communications or any persuasive evidence from any source addressing Corke's technical disclosure regarding telephone routes, we determine that Petitioner has not proven that Corke discloses long-distance communications that would have motivated an ordinarily skilled artisan to use unidirectional fibers.[16]

In sum, we determine EDFA amplifiers and Corke's alleged disclosure of long-distance communications do not provide a sufficient rationale for Petitioner's proposed combination.

vi. Petitioner Has Not Proven Any Benefit to Unidirectional Fibers that Would Outweigh Their Detriments

Petitioner argues that, even if modifying Corke to use fiber-pairs would reduce Corke's ability to detect certain fiber faults, an ordinarily skilled artisan would still have made Petitioner's proposed modification. Pet. Reply 8. As Petitioner notes (at *id.*), a given course of action can have simultaneous advantages and disadvantages, and the mere existence of a disadvantage does not necessarily obviate a motivation to combine.

[16] Petitioner also fails to explain why if Corke were directed to applications that required the use of unidirectional fibers for bidirectional communications Corke only discloses the use of bidirectional fibers for that purpose. Ex. 1206, Abstr.

Medichem, S.A. v. Rolabo SL, 457 F.3d 1157, 1165 (Fed. Cir. 2006). "The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another." *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1348 (Fed. Cir. 2000). "Instead, the benefits, both lost and gained, should be weighed against one another." *Id*.

On this record, however, only the disadvantages to Petitioner's proposed modification have been proven—most significantly, the loss of the ability to determine the quality of the transmission path based on the quality of a signal received over that path. The extra system expense that would needlessly be borne with Petitioner's modification has also been shown. Ex. 2033 ¶ 29. As discussed above, we find Petitioner has not proven that an ordinarily skilled artisan would have perceived any advantages to Petitioner's proposed modification. Therefore, weighing an absence of proven advantages versus the proven disadvantages leads to the conclusion that an ordinarily skilled artisan would not have made Petitioner's proposed modification.

In sum, Petitioner has not persuaded us that an ordinarily skilled artisan would have added the recited first and second optical fibers to Corke. Accordingly, we determine that Petitioner has not proven that the combination of Corke, Swanson, and Chikama would have rendered either claim 1 or 14 obvious.

5. Claims 3–8, 10–13, 15, 17–23, and 25

Dependent claims 3–8, 10–13, 15, 17–23, and 25 each depend directly or indirectly from either independent claim 1 or 14. The additional arguments and evidence presented in the Petition for these dependent claims are directed only to the limitations added by those claims, and do not remedy the deficiencies set forth above in Petitioner's showing for the obviousness of claims 1 and 14. Pet. 34–43. Accordingly, we determine that Petitioner has not proven that the combination of Corke, Swanson, and Chikama would have rendered any of claims 3–8, 10–12, 15, and 17–23 obvious and has not proven that the combination of Corke, Swanson, Chikama, and Mock would have rendered either claim 13 or 25 obvious.

G. Asserted Obviousness Based on the Choy Grounds

1. Overview of Choy

Choy describes a communications system with "wavelength division multiplexer (WDM)" units, where each WDM unit includes pluralities of "Input/Output cards (IOCs)" and "Laser/Receiver Cards (LRC)." Ex. 1210, 2:37–47. Figure 6 of Choy is reproduced below:

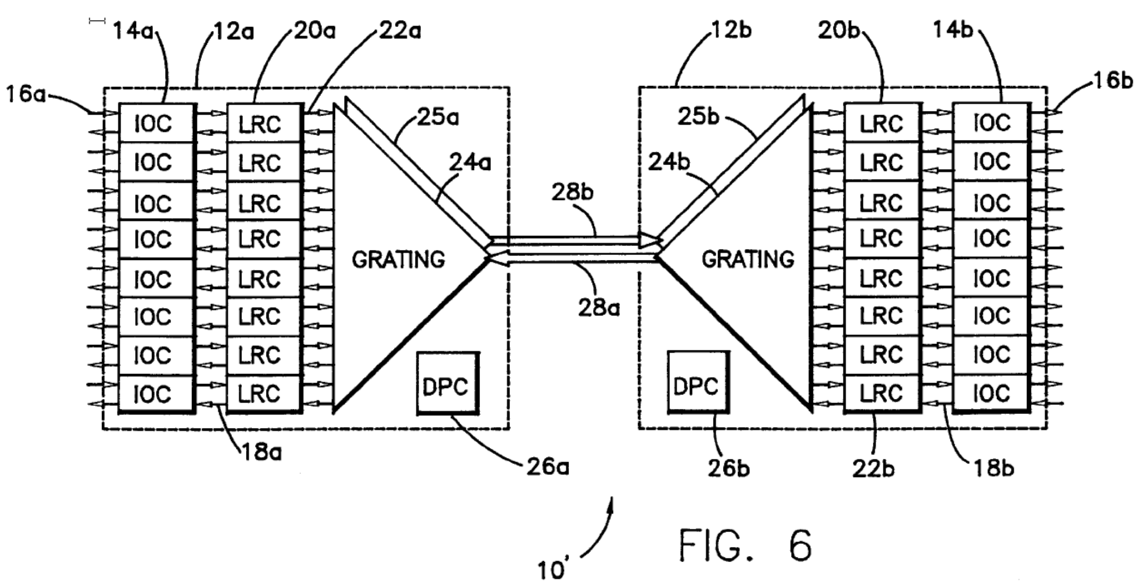

FIG. 6

Choy Figure 6 is a block diagram of optical system 10', which includes WDMs 12a and 12b, input/output cards 14a and 14b, LRCs 20a and 20b, optical gratings 24a, 24b, 25a, and 25b, and diagnostic processor cards 26a and 26b. Ex. 1210, 3:46–48.

Corke teaches that each LRC includes transmitter and receiver sections to transmit and receive optical signals and is "coupled by two single mode fibers to an optical multiplexer and demultiplexer, embodied within a grating." Ex. 1210, Abstr., 2:41–51, 3:56–4:39, 5:55–6:36, 8:44–9:38, FIGS. 3A and 3B. Figure 3A of Choy is reproduced below:

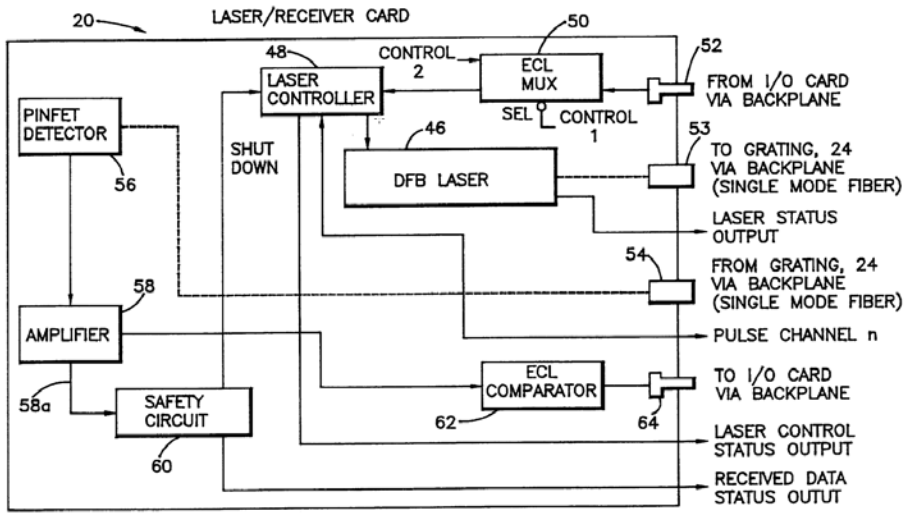

FIG. 3A

Figure 3A depicts LRC 20, which includes laser 46 and PINFET[17] detector 56. Petitioner maps the laser controller 48, ECL mux 50, and DFB laser 46 to the transmitter recited by claims 1 and 14. Pet. 46. Further, Petitioner maps PINFET detector 56, amplifier 56, safety circuit 60 and ECL comparator to the receiver recited by claims 1 and 14. *Id.*

2. Overview of DeSalvo

DeSalvo discloses an optical receiver unit with an EDFA optical preamplifier. Ex. 1211, Fig. 2. Figure 2 of DeSalvo is reproduced below:

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[17] Positive-intrinsic-negative field-effect transistor. Ex. 1218, 42.

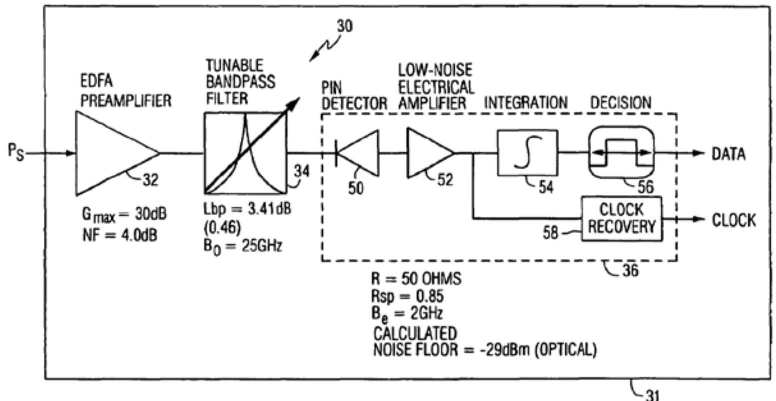


FIG. 2

Figure 2 is a block diagram of optically amplified receiver 30 that is contained in a housing or on printed circuit card assembly 31. Ex. 1211, 3:23–24, 5:30–33. Receiver 30 includes EDFA preamplifier 32. *Id.* at 5:40–41. Signal P_s enters EDFA preamplifier 32, which outputs the signal to tunable bandpass filter 34, which provides its output to optical-to-electrical conversion circuit 36. *Id.* at 5:40–58.

3. Overview of Takahashi

Takashi is directed to an optical amplifier and optical transmission apparatus. Ex. 1212, 1:6–7. Figure 9 of Takahashi is reproduced below:

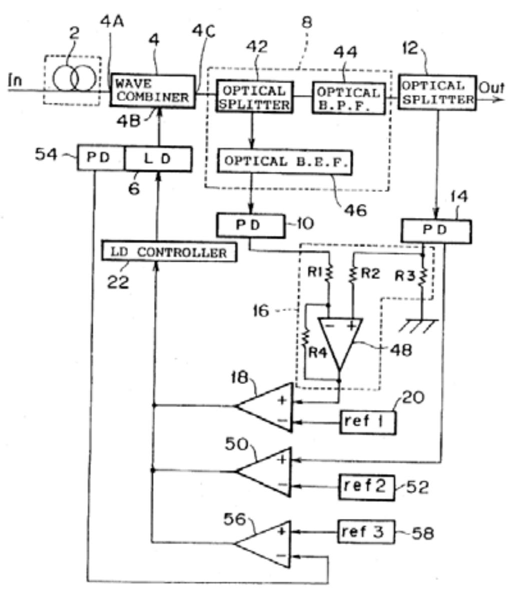


Figure 9 is a block diagram of an EDFA. Ex. 1212, 3:17–18. This EDFA includes a circuit for performing automatic power control of the pumping power source, which includes photodiode 54, comparator 56, and reference voltage from source 58. *Id.* at 8:63–9:7. The output of comparator 56 is provided to LD controller 22. *Id.* at 9:7–8.

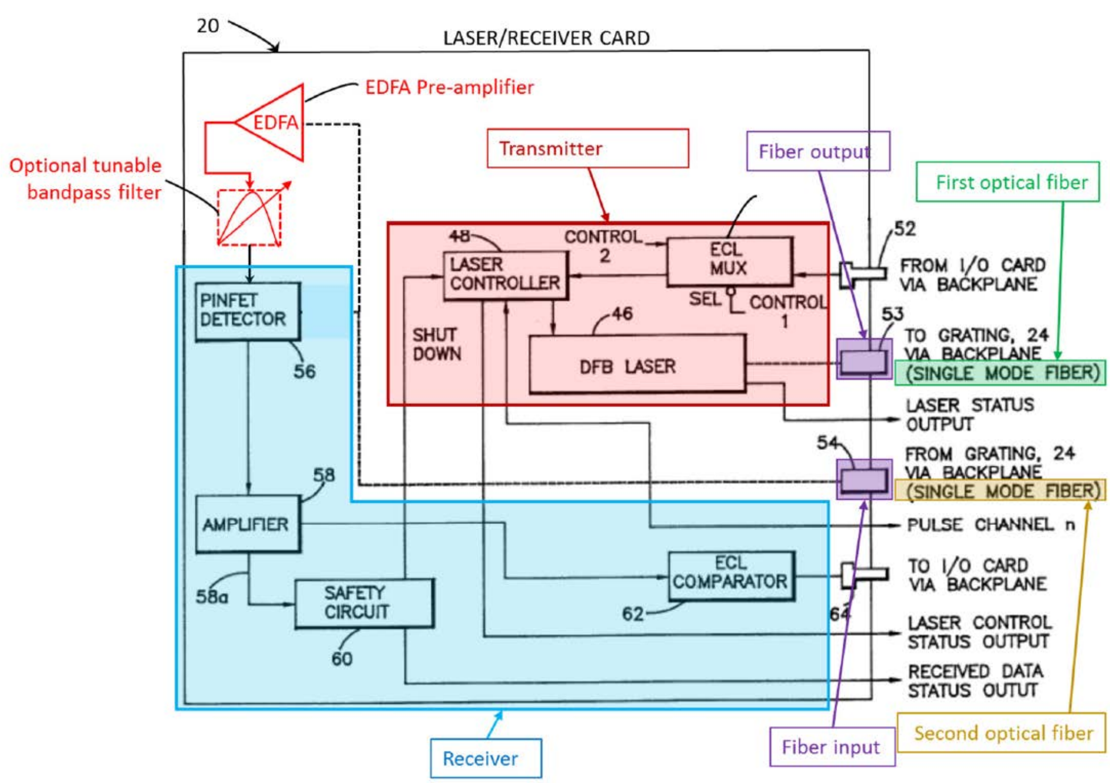
4. Claims 1 and 14

As set forth below, we determine that Petitioner has not provided a sufficient rationale for its proposed combination of Choy and DeSalvo, and, therefore, has not proven that the combination of Choy, DeSalvo, and Takahashi would have rendered either claim 1 or 14 obvious.

a. Petitioner's Proposed Combination of Choy, DeSalvo, and Takahashi

Petition proposes combining Choy, DeSalvo, and Takahashi. Pet. 43. First, Petitioner argues that Choy's LRC is a transceiver card. Pet. 11, 15 ("an optical transceiver card such as "Choy's LRC"). Petitioner then argues that an ordinarily skilled artisan would have found it obvious to add an EDFA preamplifier to Choy's LRC based on the teachings of DeSalvo. *Id.* at 52 ("would have found it obvious, in view of DeSalvo, to include an EDFA preamplifier in Choy's LRC."); *see also id.* at 51, 57. Petitioner argues that an ordinarily skilled artisan would have coupled this EDFA preamplifier to connector 54 in Choy's LRC to preamplify the received optical signal and, in that configuration, the EDFA preamplifier would forward the amplified signal to the PINFET detector 56. *Id.* at 52. Further, Petitioner argues that an ordinarily skilled artisan would have included the energy level detector circuitry of Takahashi in the EDFA preamplifier. *Id.* at 52–58.

Petitioner argues the resulting combination would have a transceiver card (Choy's LRC) with an EDFA preamplifier (taught by DeSalvo) containing an energy level detector (taught by Takahashi), where the energy level detector would be optically connected between the receiver (PINFET detector 56, amplifier 58, safety circuit 60, and ECL comparator 62) and the fiber input (connector 54) (i.e., would have the recited transceiver card comprising the recited energy level detector). This combination is illustrated in an annotated version of Figure 3A of Choy contained in Dr. MacFarlane's first declaration (Ex. 1202 ¶ 222), which is reproduced below:



This annotated version of Choy Figure 3A illustrates the addition of an EDFA preamplifier and an optional tunable bandpass filter to Choy's Laser/Receiver Card ("LRC") 20. Annotations in the figure also identify the components in Figure 3A of Corke that Petitioner maps to the receiver, transmitter, fiber input, fiber output, and first and second optical fibers recited by claims 1 and 14.

b. Petitioner's Rationale for Adding an EDFA Preamplifier to Choy's LRC and the Parties' Arguments Regarding that Rationale

We focus on Petitioner's rationale for adding an EDFA preamplifier to Choy's LRC based on the teachings of DeSalvo because that is the disputed part of Petitioner's proposed combination. PO Resp. 51–61.

In the Petition, Petitioner argues an ordinarily skilled artisan would have added an EDFA preamplifier, as taught by DeSalvo, to Choy's LRC to counter demultiplexing losses (Pet. 14), to increase transmission distances (*id.* at 16), to benefit large channel count and high data rate systems (*id.*), and to allow PIN detectors to be used to increase the reliability of the receiver and reduce power consumption (*id.* at 15).

In the Patent Owner Response, Patent Owner argues that an ordinarily skilled artisan would not have added an EDFA preamplifier to Choy's LRC based on DeSalvo's teaching because DeSalvo teaches adding an EDFA preamplifier in the signal path prior to demultiplexing, and Choy's demultiplexer is not on its LRC. PO Resp. 51–60. Patent Owner argues that, in Figure 2 of DeSalvo, reproduced above, DeSalvo's EDFA preamplifier is placed in the signal path immediately before tunable bandpass filter 34, which Patent Owner argues is DeSalvo's demultiplexer. *Id.* at 55. Patent Owner further argues that Choy's demultiplexer is grating 24, which as shown in Choy Figures 2 and 6, reproduced above, is not on Choy's LRC. *Id.* at 56.

Patent Owner further argues that, even if an ordinarily skilled artisan wanted to increase the amplification in Choy by using an EDFA preamplifier, the artisan would have added that preamplifier to the signal path prior to demultiplexing. PO Resp. 59 (citing Ex. 2033 ¶¶ 86–87). Patent Owner also argues that (i) Choy's LRC does not face demultiplexing losses like DeSalvo (*id.* at 56–57), (ii) adding bandpass filter 34 to Choy's LRC would make no sense because Choy's LRC already has a filtered signal (*id.*), (iii) Choy's LRC employs single channel input and output signals so large channel count would not motivate adding an EDFA preamplifier (*id.* at 57–58), (iv) Choy's LRC's communicate short distances with other cards so long-distance transmission would not motivate the addition of an EDFA preamplifier (*id.* at 58–59), and (v) the ability to use a PIN detector would not motivate adding an EDFA preamplifier because Choy's PINFET detector 56 includes detection and amplification functionality (*id.* at 59–60).

In the Reply, Petitioner argues that Choy's grating acts as a demultiplexer on its receiving side and that the demultiplexing by this grating introduces demultiplexing losses, which adding an EDFA preamplifier to Choy's LRC would counter. Pet. Reply 19. Petitioner also argues that adding a tunable bandpass filter to Choy's LRC would be useful to remove noise introduced by the EDFA.[18] *Id.* at 20. Petitioner further contends that Choy and DeSalvo are analogous art. *Id.* In addition,

[18] Petitioner appears to make this argument solely to counter Patent Owner's assertion that it would be futile to incorporate a bandpass filter in Choy's LRC. Pet. Reply 19–20. To the extent that Petitioner intended to present this as an actual reason that would motivate an ordinarily skilled artisan to make its proposed modification, we are not persuaded. We credit Dr. Goossen's testimony that an ordinarily skilled artisan would not have wanted to add a tunable bandpass filter to Choy's LRC when the LRC already receives a demultiplexed or tuned signal. Ex. 2033 ¶ 90. Further, Dr. MacFarlane's testimony to the contrary is conclusory and, therefore, is entitled to little weight. Ex. 1202 ¶ 92.

Petitioner asserts that communications between LRCs in the WDM units on either sides of fiber links are at a distance of 75km. *Id.* at 20–21. Also, Petitioner argues that a PINFET detector does not amplify a signal. *Id.* at 21–22.

In the Sur-Reply, Patent Owner repeats its argument that even if an ordinarily skilled artisan wanted to include additional amplification, such as an EDFA preamplifier, to Choy's system, an ordinarily skilled artisan would have added it before Choy's demultiplexer (i.e., before the grating in Choy). Sur-Reply 16. Patent Owner also argues that the energy loss associated with the demultiplexing in Choy would be low. *Id.*

c. Petitioner Has Not Provided a Sufficient Rationale for Adding an EDFA Preamplifier to Choy's LRC

Petitioner has not provided a sufficient rationale for adding an EDFA preamplifier to Choy's LRC. As mentioned, Petitioner argues an ordinarily skilled artisan would have added an EDFA preamplifier, as taught by DeSalvo, to Choy to counter demultiplexing losses (Pet. 14), to increase transmission distances (*id.* at 16), to benefit large channel count and high data rate systems (*id.*), and to allow PIN detectors to be used to increase the reliability of the receiver and reduce power consumption (*id.* at 15). But even if we were to agree with Petitioner that an ordinarily skilled artisan would have added an EDFA preamplifier to Choy's system for those reasons, Petitioner has not provided a persuasive reason why, based on DeSalvo's teachings, an ordinarily skilled artisan would have added that EDFA preamplifier to Choy's LRC when DeSalvo teaches adding the EDFA preamplifier to the reception signal path prior to demultiplexing, which in Choy's system is prior to Choy's LRC.

As Dr. Goossen testifies, DeSalvo, as shown Figure 2 (reproduced above), teaches placing its EDFA preamplifier in the reception signal path before its demultiplexer, tunable bandpass filter 34. Ex. 2033 ¶¶ 84–85, 91 ("demultiplexer, specifically the tunable bandpass filter 34 . . . ."); Ex. 1211 Fig. 2. As Dr. Goossen further testifies, Choy's demultiplexer is its grating, which as shown in Choy Figures 2 and 6, reproduced above, Choy's grating (24) is not on Choy's LRC. Ex. 2033 ¶ 90. Therefore, if an ordinarily skilled artisan wanted to add optical amplification at the receiving node of Choy, the ordinarily skilled artisan would have added that amplifier in the reception signal path before Choy's demultiplexer in the reception optical path, and, therefore, before Choy's LRC. Ex. 2033 ¶ 87.

Dr. Goossen further explains why an ordinarily skilled artisan would not have wanted to place the EDFA preamplifier after the demultiplexer in the reception path. Dr. Goossen testifies that an ordinarily skilled artisan would have recognized that adding an optical amplifier (such as an EDFA preamplifier) after demultiplexing would be inefficient. Ex. 2033 ¶ 87. In particular, such an addition would require multiple optical preamplifiers—one per LRC—each performing amplification, rather than one preamplifier that, like in DeSalvo, could be used before demultiplexing, creating needless duplication. *Id.*

This testimony by Dr. Goossen stands unrebutted. Petitioner has not provided any persuasive argument or evidence showing why an ordinarily skilled artisan would have wanted the needless duplication of placing numerous EDFA preamplifiers after the demultiplexer—as Petitioner proposes, rather than using one preamplifier before the demultiplexer in the reception path. Petitioner's expert, Dr. MacFarlane, does not address the issue of duplication in either his original declaration or in his supplemental declaration, even though in the latter he responds to testimony by Dr. Goossen. Ex. 1226 ¶ 6. In its Reply, Petitioner also does not explain why an ordinarily skilled artisan would have desired such duplication. *See* Pet. Reply 19–22.

Indeed, Petitioner does not address Dr. Goossen's testimony that an ordinarily skilled artisan would have added any EDFA amplifier to the receiving node of Choy before Choy's demultiplexer. Pet. 20–21; Ex. 2033 ¶ 87. Instead, Petitioner ignores that testimony and implies that Patent Owner merely argues that it would be better to use an EDFA repeater along the fiber. Pet. Reply 21. Petitioner then argues that DeSalvo teaches that an EDFA preamplifier is preferable to the mere use of an EDFA repeater along the fiber line. *Id.* at 20 (citing Pet. 13–14 and Ex. 1202 ¶¶ 88, 93–94). Petitioner's argument, however, misses the point. Dr. Goossen's actual testimony cannot be disregarded. Dr. Goossen testified that an ordinarily skilled artisan would have added an EDFA amplifier to the receiving node of Choy before Choy's demultiplexer. Ex. 2033 ¶ 87. Petitioner has offered no persuasive evidence to rebut that testimony. Pet. Reply 19–22. Moreover, Petitioner relies on its discussion of DeSalvo to argue that the mere use of an EDFA repeater along the fiber would not be as useful as an EDFA amplifier. Pet. Reply 21 (citing Pet. 13–14, which discusses DeSalvo). But then Petitioner disregards DeSalvo's teaching that such an amplifier should be added before a demultiplexer while Petitioner proposes adding it after Choy's demultiplexer. *Id.*; Ex. 1202 ¶ 222; Ex. 1211, Fig. 6.

We find Petitioner has not proven by a preponderance of the evidence that an ordinarily skilled artisan would have added an EDFA preamplifier to

Choy's LRC card and, therefore, has not proven that an ordinarily skilled artisan would have made Petitioner's proposed combination of Choy, DeSalvo, and Takahashi.[19] Accordingly, we determine that Petitioner has not proven that the combination of Choy, DeSalvo, and Takahashi would have rendered claims 1 and 14 obvious.

5. Claims 2–13 and 15–24

Dependent claims 2–13 and 15–24 each depend directly or indirectly from either independent claim 1 or 14. The additional arguments and evidence presented in the Petition for these dependent claims are directed only to the limitations added by those claims, and do not remedy the deficiencies in Petitioner's showing regarding the obviousness of claims 1 and 14. Pet. 58–73. Accordingly, we determine that Petitioner: has not proven that the combination of Choy, DeSalvo, and Takahashi would have rendered any of claims 5–9, 11, 12, 15 and 19–24 obvious; has not proven that the combination of Choy, DeSalvo, Takahashi, and Reiner would have

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[19] Petitioner has not argued or presented any persuasive evidence that placing the EDFA preamplifier before Choy's grating would satisfy the limitations of claims 1 or 14. Among other things, claims 1 and 14 recite a transceiver card comprising an energy level detector, and Petitioner maps the transceiver card to Choy's LRC card, which does not include Choy's grating. Pet. 15; Ex. 1210, Fig. 6. Also claims 1 and 14 recite that the energy level detector is optically connected between the receiver and the fiber input. Petitioner maps the recited receiver to the "receiver section" of the LRC (Pet. 15) and the recited fiber input to connector 54 on the LRC (*id.* at 50.) A placement of an EDFA preamplifier before demultiplexing in the signal path of Choy would place it before Choy's grating (24 and 25), which would mean Choy's grating would be between the preamplifier and connector 54 and, therefore, the preamplifier would not be optically coupled between connector 54 (the fiber input) and the receiver. Ex. 1210, Figs. 3 and 6.

rendered either claim 2 or 16 obvious; and has not proven that the combination of Choy, DeSalvo, Takahashi, and Fatehi would have rendered any of claims 3, 4, 10, 17, and 18 obvious.

III. CONCLUSION

For the foregoing reasons, we determine Petitioner has not demonstrated by a preponderance of the evidence that any challenged claim is unpatentable.

IV. ORDER

Accordingly, it is:

ORDERED that none of the challenged claims have been proven to be unpatentable;

FURTHER ORDERED that, because this is a Final Written Decision, the 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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