

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ACCELIGHT TECHNOLOGIES, INC.,

Petitioner,

v.

APPLIED OPTOELECTRONICS, INC.,

Patent Owner.

Case IPR2025-01567
Patent No. 10,379,301

**PATENT OWNER RESPONSE TO PETITION FOR *INTER PARTES REVIEW*
OF U.S. PATENT 10,389,301**

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I. INTRODUCTION

Patent Owner Applied Optoelectronics, Inc. (“AOI”) submits this Patent Owner Response to the petition (“Petition”) of Accelight Technologies, Inc. (“Accelight” or “Petitioner”) for an *inter partes review* (“IPR”) of U.S. Patent No. 10,379,301 (the “’301 Patent”, Ex. 1001) entitled “Multi-Channel Parallel Optical Receiving Device.” The Petition challenges the patentability of Claims 1–4 (the “Challenged Claims”).

On March 17, 2026, the Board granted institution of the IPR. The ’301 patent has two independent claims: claims 1 and 7. Only independent claim 1 and claims 2–4, which depend from claim 1, are challenged in the IPR.

Accelight presents two grounds of invalidity against the Challenged Claims. *See* Petition at p. 4.

In Ground 1, Accelight challenges independent claim 1 and dependent claims 2–4 under an obviousness theory. Accelight contends that claims 1–4 are obvious over Kim (U.S. Patent Application Publication No. 2014/0169389, Ex. 1004). *Id.*

In Ground 2, Accelight challenges independent claim 1 and dependent claims 2–4 under an obviousness theory. Accelight contends that claims 1–4 are

obvious over Ho (U.S. Patent Application Publication No. 2014/0341578, Ex. 1005) in view of Lee (U.S. Patent Application Publication No. 2014/0183344, Ex. 1006). *Id.*

As discussed herein, none of the prior art references, individually or in combination, discloses all limitations of the Challenged Claims.

II. BACKGROUND

A. '301 Patent

The '301 Patent, entitled “Multi-Channel Parallel Optical Receiving Device,” issued on August 13, 2019. The '301 Patent claims priority to U.S. Patent Application No. 15/432,242, filed February 14, 2017, which claims priority to an earlier filed China patent application, CN App. No. 2016 1 03460078, filed May 23, 2016. *See* '301 Patent (Exhibit 1001); *see also* Exhibit 2011 (January 7, 2026 Declaration of Dr. Alan E. Willner) at ¶¶ 56–60.

The '301 Patent discloses a multi-channel parallel optical receiving device, including a carrier, a light receiving chip, a plurality of optoelectronic diodes disposed on a top surface of an end of the carrier, an optical fiber connector disposed in another end of the carrier, and an arrayed waveguide grating disposed on the top surface of the carrier. *See id.*

Figure 1 (reproduced below) shows an example embodiment of the multi-channel parallel optical receiving device disclosed in the '301 Patent which includes a carrier 8 and a light receiving chip 2. A plurality of optoelectronic diodes 3 may be disposed on a top surface of an end of the carrier 8, and the plurality of optoelectronic diodes 3 may be electrically connected to the light receiving chip 2. The light receiving chip 2 may be a trans-impedance amplifier (TIA) chip, and the optoelectronic diodes 3 and the trans-impedance amplifier (TIA) chip may be connected by bonding wires. An optical fiber connector 4 may be disposed at another end of the carrier 8, and an arrayed waveguide grating 6 may be further disposed on the top surface of the carrier 8. Exhibit 1001 at Col. 2:66–3:13; Exhibit 2011 at ¶ 58.

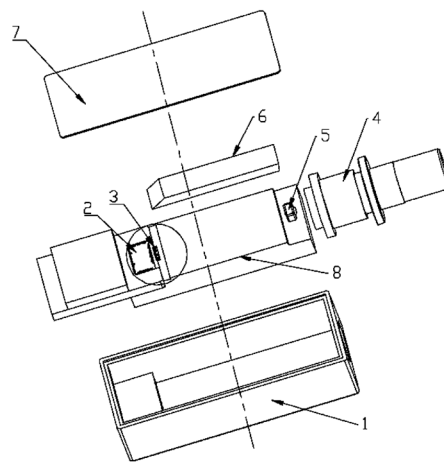


FIG. 1

Figure 3 (reproduced below) shows an input end 61 of the arrayed waveguide grating 6 may be connected to the optical fiber connector 4 for receiving an optical signal from the optical fiber. The optical signals may be divided into multi-channel optical signals in parallel by the arrayed waveguide grating 6 based on their wavelengths. The top surface 63 of an output end 62 of the arrayed waveguide grating 6 may be designed to be at a predetermined angle, allowing for the multi-channel optical signals to be reflected by the top surface 63 to the photosensitive surfaces of the plurality of optoelectronic diodes 3 arranged in an array. Exhibit 1001 at Col. 3:13–3:22; Exhibit 2011 at ¶ 59.

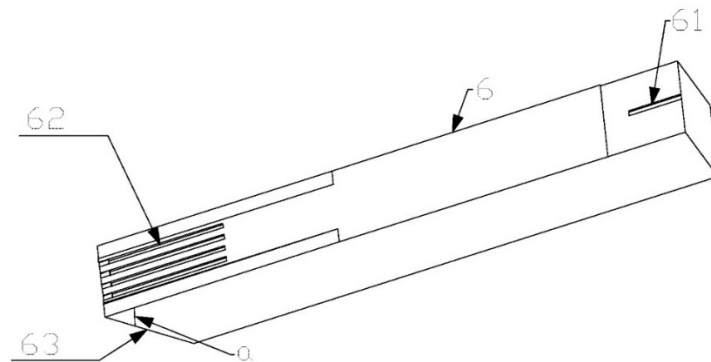


FIG. 3

Figure 4 (reproduced below) shows an embodiment of the '301 Patent in which first lens 5 may be disposed between the input end 61 of the arrayed waveguide grating 6 and the optical fiber connector 4. In this embodiment, the first lens 5 disposed on the carrier 8 may be located on the optical path of the optical fiber connector 4 and the arrayed waveguide grating 6, for the optical coupling to be realized. Exhibit 1001 at Col. 4:21–28; Exhibit 2011 at ¶ 60.

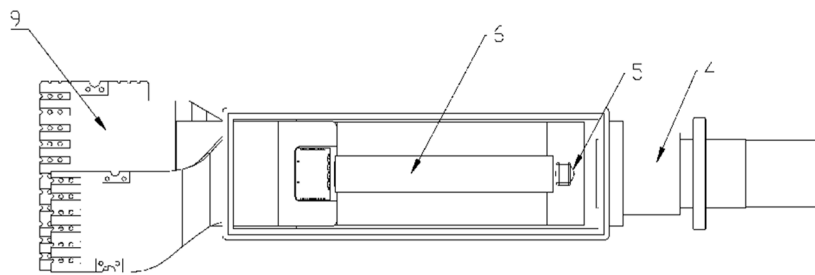


FIG. 4

B. Relevant File History

The application for the '301 Patent was filed on February 14, 2017 as application no. 145/432,242 with seven claims, including one independent claim. *See* “File History”, Exhibit 1002; *see also* Exhibit 2011 at ¶¶ 61–71.

On August 29, 2017, in a non-final Office Action, the United States Patent and Trademark Office (“PTO” or “Office”) rejected claims 1–4 and 6 as anticipated by U.S. Patent Application Publication No. 2017/0168252 to Pezeshki

et al. and as obvious over U.S. Patent Application Publication No 2016/0349451 to Shen et al in view of Pezeshki. The Office also rejected claims 5 and 7 as obvious over Pezeshki in view of U.S. Patent Application Publication No. 2003/0174964A1 to Gao, et al.

On February 28, 2018, AOI filed an amendment, amending claim 1 to include the subject matter of claim 4, cancelling claim 4, and adding new independent claim 8 which included the subject matter of claims 1 and 5.

On April 13, 2018, the Office mailed a final Office Action, rejecting all of the claims as either anticipated or obvious over various combinations of six different references.

On August 13, 2018, AOI filed an amendment and RCE.

On September 13, 2018, the Office mailed a non-final Office Action repeating several of the prior obviousness rejections and asserting new obviousness rejections based on various combinations of the six previously cited references.

On December 12, 2018, AOI conducted an interview with the Office, and, on December 13, 2018, filed a reply.

The Office mailed a non-final Office Action on January 28, 2019 in which all of the claims were rejected as indefinite or lacking antecedent basis under 35 U.S.C. § 112(b), but the Office withdrew the obviousness rejections.

On April 29, 2019, AOI filed an amendment, amending independent claims 1 and 8 and several dependent claims to address the § 112 rejections.

On May 13, 2019, the Office mailed a Notice of Allowance, which included a Notice of Allowability stating that “the closest prior art of record does not expressly teach or reasonably suggest, in combination, each claim limitation as embodied by amended independent claims 1 and/or 8.” File History, Exhibit 1002, pp. 36–37. The Notice of Allowability further stated that “[t]he Examiner is unable to make a prima facie case for obviousness for such combination, most particularly in which the ‘light receiving chip’ (2) and the ‘optoelectronic diodes’ (3) are disposed *directly* on the same surface of the end of the carrier (left end/side in Fig. 1 same surface).” *Id.* (emphasis in original).

The ’301 Patent issued on August 13, 2019 with seven claims, including two independent claims.

C. Alleged Prior Art References

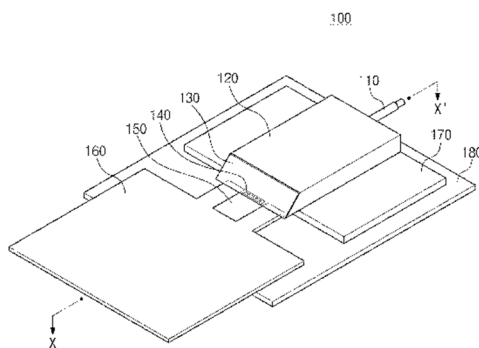
1. Kim, U.S. Patent App. Pub. No. U.S. 2014/0169389 (Exhibit 1004)

Kim discloses an optical receiver module that includes a demultiplexer, an optical device including a right-angled mirror reflecting individual optical signals transmitted from the demultiplexer and a plurality of lenses receiving the reflected

optical signals, and a plurality of photodetectors spaced apart from the plurality of lenses by a predetermined distance. The plurality of photodetectors converts the individual optical signals into electrical signals. The optical device and the demultiplexer are formed into a united structure. A distance between the lenses is equal to a distance between the photodetectors. *See* Exhibit 1004 at Abstract; *see also* Exhibit 2011 at ¶¶ 78–80.

As shown in Figure 1, the optical receiver module 100 includes an optical connector 110, a demultiplexer 120, an optical device 130, a photodetector 140, a pre-amplifier 150, a printed circuit board 160, a first supporting part 170, and a second supporting part 180. *See* Exhibit 1004 at ¶ 22.

Fig. 1



Figures 3 and 4 (Figure 4 is an enlarged view of a portion of Figure 3) illustrates that one channel optical signal divided by the demultiplexer 120 is optically coupled to the photodetector 140 through the lens 132. *Id.* at ¶ 38.

Fig. 3

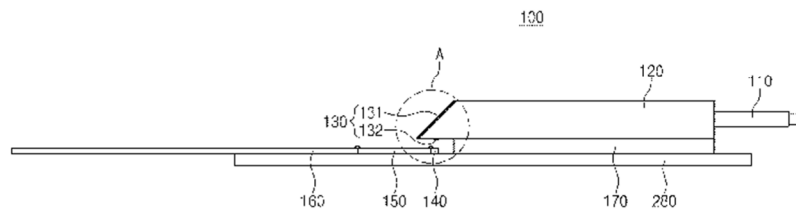
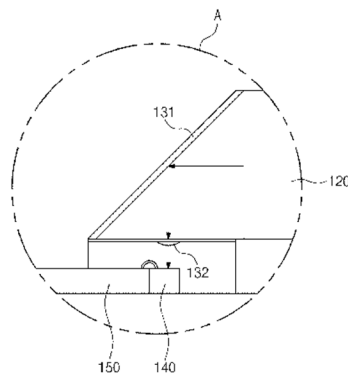


Fig. 4



2. Ho, U.S. Patent App. Pub. No. U.S. 2014/0341578 (Exhibit 1005)

Ho discloses a multi-channel receiver optical subassembly (ROSA) such as an arrayed waveguide grating (AWG), with outputs directly optically coupled to respective photodetectors such as photodiodes. In one embodiment, an AWG may be configured such that optical components of the AWG do not interfere with direct optical coupling, and the wire bonding points on the photodiodes may also be configured such that wire bonding does not interfere with direct optical coupling. The photodetectors may also be mounted on a photodetector mounting bar with a pitch sufficiently spaced to allow connection to floating grounds. A passive alignment technique may be used to determine the mounting locations on the photodetector mounting bar such that the photodetectors are aligned with the optical outputs. *See* Exhibit 1005, Abstract; *see also* Exhibit 2011 at ¶ 92.

3. Lee, U.S. Patent App. Pub. No. U.S. 2014/0183344 (Exhibit 1006)

Lee discloses a hybrid optical coupling module and a manufacturing method thereof. The hybrid optical coupling module includes an optical unit configured to include an optical transmission means that transmits an optical signal, and an array lens that is bonded at a point where the optical signal of the optical transmission means is output and focuses the output optical signal, and an electrical unit

configured to receive the optical signal focused through the array lens and convert the received optical signal into an electrical signal. An alignment mark is formed on the optical transmission means and the array lens so that the array lens is bonded at the point where the optical signal of the optical transmission means is output. Exhibit 1006, Abstract; *see also* Exhibit 2011 at ¶ 93.

III. DEFINITION OF A PERSON OF ORDINARY SKILL IN THE ART

For the purposes of this Patent Owner Response, AOI applies Accelight's proposed level of skill in the art: A person of ordinary skill in the art ("POSITA") knowledgeable of the technical field of the '301 Patent would have had "(1) a Bachelor's degree in electrical or electronics engineering or an equivalent degree, and (2) two-four years of work experience in optoelectronics, optical networking, optical communications, or a closely-related field." Exhibit 1003 at ¶ 39; *see also* Exhibit 2011 at ¶¶ 36–40.

IV. CLAIM CONSTRUCTION

A. Carrier

Accelight identifies a dispute over the term "carrier" based on claim construction positions taken by the parties in related district court litigation. Petition at pp. 13–15. Accelight argues that "carrier" should be "construed as the supporting

structure that is contained within the multichannel parallel optical receiving device.” *Id.* However, the specification is clear that a “carrier” may be any supporting structure on which other claim elements could be disposed. *See, e.g., See ’301 Patent (Exhibit 1001) at Col. 1:38–43 (“A plurality of optoelectronic diodes may be disposed in an array on a top surface of an end of the carrier...[a]n optical fiber connector may be disposed in another end of the carrier. An arrayed waveguide grating may be further disposed on the top surface of the carrier....”).* Similarly, Claim 1 simply requires “[a] multi-channel parallel optical receiving device, comprising: a carrier; ...”. *Id.* at Claim 1; *See Exhibit 2011 at ¶¶ 73–77.*

However, Accelight’s proposed construction includes limitations that the specification never mentions. In this case, Accelight includes the extra limitation “that is contained within the multi-channel parallel optical receiving device.” But, neither the specification nor Claim 1 require that the carrier “*is contained within* the multi-channel parallel optical receiving device.” Claim 1 simply requires that the multi-channel parallel optical receiving device *comprises*, or includes, a carrier. *Id.*, Claim 1. Instead, it appears that Accelight wishes to improperly change and potentially narrow the meaning of the term “comprising” in the preamble through a construction of another claim limitation—in this case, through the term “carrier.” *See, e.g. MPEP §2111.03; Mars Inc. v. H.J. Heinz Co.*, 377 F.3d 1369, 1377 (Fed. Cir. 2004) (the transitional term “comprising” is

synonymous with and well understood as “including,” “containing,” or “characterized by,” and is inclusive or open-ended).

Accelight’s proposal conflicts with the plain meaning of this term in light of the claims and specification and improperly attempts to construe the preamble’s standard term “comprising” as part of the limitation “carrier.” Therefore, Accelight’s proposed construction for “carrier” should be rejected.

Regardless, the term “carrier” does not require construction because claim construction is not necessary to resolve the controversy presented by Accelight’s Petition. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms ... in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Accelight has not demonstrated a reasonable likelihood of prevailing on any Challenged Claim whether using “plain and ordinary meaning” or Accelight’s proposed claim constructions. *See* Exhibit 2011 at ¶ 77.

B. Accelight Improperly Asserts New Arguments Under the Guise of Claim Construction for the Terms “wire bonding,” “disposed in an end of the carrier,” and “disposed on.”

Notably, Accelight did not identify the terms “wire bonding,” “disposed in an end of the carrier,” or “disposed on” as requiring construction in either its

Petition for *inter partes* review or during the parties' extensive claim construction proceedings in the related District Court matter. *See* Petition at pp. 13–15; *see also* Exhibit 2012. To the extent Accelight attempts to save its inadequate Petition by asserting new arguments under the guise of “claim construction,” such attempts should be rejected because they are procedurally improper and do not remedy Accelight's initial failure to show that the prior art references render obvious or anticipate any of the Challenged Claims. *See* Board's Consolidated Trial Practice Guide, 73 (Nov. 21, 2019) (“Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g., to make out a *prima facie* case of unpatentability.”); *see also, e.g.*, Paper 14.

Regardless, as explained further below, these terms do not require construction because claim construction is not necessary to resolve the controversy presented by Accelight's Petition as the cited references fail to disclose these claims limitations under any claim construction.

V. GROUND 1: ACCELIGHT HAS NOT SHOWN THAT KIM RENDERS OBVIOUS CLAIMS 1–4

Accelight fails to show that Kim renders obvious any Challenged Claim in Ground 1. *See* Exhibit 2011 at ¶¶ 81–91.

A. Kim fails to disclose “a plurality of optoelectronic diodes disposed on the top surface of the end of the carrier, and the plurality of optoelectronic diodes electrically connected to the light receiving chip via bonding wire, wherein the optoelectronic diodes and the light receiving chip are disposed directly on the same top surface of the end of the carrier;”

Kim does not disclose “the plurality of optoelectronic diodes electrically connected to the light receiving chip via bonding wire.” For example, there is no mention or clear disclosure of a “bonding wire” in Kim. Petitioner points to a feature (a line) in Figure 4 of Kim as allegedly disclosing a bonding wire. *See* Petition at pp. 25–26. However, neither the figure nor any part of the specification identifies this line as a bonding wire. In fact, no reference or identification is made to it at all.

Next, Petitioner argues Kim discloses that “the pre-amplifier 150 is electrically connected to an end of the photodetector 140.” *See* Exhibit 1004 at ¶ 29. However, a POSITA would well know that there are numerous ways to electrically connect these elements besides using wire bonding. Indeed, by relying on an obvious argument related to a POSITA, Petitioner seems to recognize that Kim fails to explicitly disclose the “bonding wire” limitation as required by claim 1. *See, e.g.*, Petition at pp. 25–26 (arguing “wire bonding of components on a circuit board has been a routine and standard practice in the electronics and

optoelectronics industries long before the effective filing date of the '301 patent. It would thus have been obvious to a POSITA based on Kim's disclosure that photodetectors (optoelectronic diodes) 140 and pre-amplifier (light receiving chip) 150 of Kim are electrically interconnected through wire-bonding."); *see also* Exhibit 2011 at ¶ 82.

Indeed, the PTAB has already considered and rejected almost exactly this same argument with respect to the '301 patent. The PTAB found that a disclosure of an "electrical connection" without more does not disclose wire bonding. *See* Exhibit 2010 at p. 8.

Specifically, the PTAB did this analysis for a different piece of cited prior art (Soldano) in the context of a separate petition for *inter partes* review of the '301 patent that was filed by a different petitioner. *See id.* With respect to that separate petition for IPR, the PTAB denied institution. In denying a request for rehearing of that decision, a three-judge panel of the Board found that "[p]etitioner's original showing that Soldano [the cited art] described limitation 1d [requiring a wire bond] fatally failed to demonstrate that Soldano 'expressly or inherently' described an optical diode being electrically connected to a light receiving chip 'via wire bonding.'" *Id.*

In denying the request for rehearing, the Board further reasoned, “Dr. Kirk’s [petitioner’s expert’s] opinion that an ordinarily skilled artisan ‘would have understood’ that such a connection ‘could be accomplished via wire bonds’ is insufficient to establish that Soldano expressly or inherently discloses such a connection.” *Id.* The Board continued, stating, “[t]he cited portion of Soldano, Ex. 1009, 10:10–19, merely states that a ‘photodetector would be then *electrically connected* to the transimpedance amplifier’ without describing or even suggesting that such connection would be made ‘via wire bonding’ as recited in limitation 1d.” *Id.* (emphasis added). Thus, the Board concluded, “[w]e discern no error in our conclusion that Petitioner failed to demonstrate that Soldano described limitation 1d and thus failed to anticipate claim 1.” *Id.*; *see also* Exhibit 2011 at ¶ 83.

Furthermore, Petitioner may argue “bonding wire” should be construed as and/or given a plain and ordinary meaning of “an electrical wire interconnecting two components,” which is not a reasonable construction for bonding wire. *See, e.g.,* Paper 13 at p. 1. But, even under Petitioner’s proposed interpretation, there is still no mention or clear disclosure of a “bonding wire” or even “an electrical wire interconnecting two components” in Kim. Neither Figure 4 of Kim nor any part of the specification actually identifies a bonding wire or even a wire of any kind.

And, to the extent Petitioner argues Kim discloses components that are “electrically connected,” the PTAB has already considered and rejected substantially the same argument, finding that a POSITA would not understand a disclosure of an “electrical connection” to specifically disclose a wire bonding. *See* Exhibit 2010 at p. 8

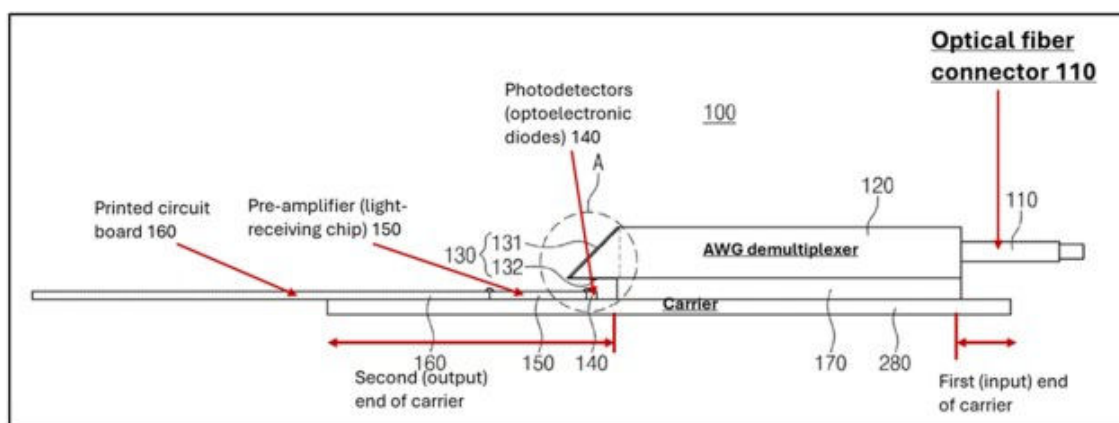
Finally, such an approach using “general knowledge”—a broad category encompassing AAPA, expert declarations, common sense, and other non-patent or non-printed publication evidence—*cannot be used* to supply a missing claim limitation in an IPR. *See* Exhibit 2008 at p. 1, July 31, 2025 Memorandum from Acting Director Stewart (emphasis added). Thus, as here, if a prior art reference admittedly lacks a specific element, petitioners can no longer argue that a person of ordinary skill in the art (POSITA) would inherently understand or fill that gap based on background knowledge, and the IPR should be denied. *See id.* (“As a practical matter, enforcement of Rule 104(b)(4) means that applicant admitted prior art (AAPA), expert testimony, common sense, and other evidence that is not ‘prior art consisting of patents or printed publications’ (collectively, ‘general knowledge’) may not be used to supply a missing claim limitation. Per 35 U.S.C. § 312(a)(4), the Board shall deny an IPR petition that fails to comply with Rule 104(b)(4).”).

In short, Petitioner has failed to show that Kim discloses “the plurality of optoelectronic diodes electrically connected to the light receiving chip via bonding wire” limitation as required by Claim 1 of the ’301 patent.

B. Kim fails to disclose “an optical fiber connector disposed in an end of the carrier;”

Kim also fails to disclose the limitation requiring an “optical fiber connector disposed in an end of the carrier.” Instead, optical connector 110 as disclosed in Kim is connected to the AWG 120 and is above the carrier 180/280. Thus, Kim does not disclose optical fiber connector 110 disposed *in an end of the carrier* 180/280, as required in the challenged claims of the ’301 patent. Furthermore, optical connector 110 in Kim is not in the “end of the carrier” 180/280. *See* Exhibit 2011 at ¶ 84.

This is shown in Petitioner’s annotated Figure 3 from Kim:



As can be seen from Petitioner's annotated Figure 3 from Kim, optical connector 110 in Kim is well above the carrier 280 and therefore is not in an end of the carrier 180/280.

Further, Petitioner admits that Kim does not directly disclose the limitation requiring an "optical fiber connector disposed in an end of the carrier." Instead, Petitioner argues a POSITA would inherently understand the limitation only required an optical connector disposed at an end region of the carrier. See Petition at p. 27 ("As shown in Figure 3 [of Kim] optical connector 110 is coupled to the input end of AWG demultiplexer 120, with optical connector 110 being disposed at the first (input) end of carrier 180/280. According to Petitioner, a POSITA would have understood that the claim element 'an optical fiber connector disposed in an end of the carrier' does not mean that the connector is coupled directly to the end of the carrier; rather, it means that the connector is *disposed at an end region of the carrier*.") (emphasis added). However, a POSITA would not have understood that the claim element "an optical fiber connector disposed in an end of the carrier" only requires that the connector is disposed at an end region of the carrier because it is a deviation from the plain language of claim 1, which clearly requires "an optical fiber connector disposed in an end of the carrier." See Exhibit 2011 at ¶ 86.

Next, Petitioner may argue for a construction of “optical fiber connector disposed in an end of the carrier” to mean “an optical connector disposed at an end region of the carrier.” See Paper 13 at p. 2. But this amounts to nothing more than an improper attempt to change a claim’s plain meaning to match the Petitioner’s reference. Kim discloses an optical connector 110 that is connected to the AWG 120 that is well above Petitioner’s identified carrier (180/280) from Kim, as shown in Petitioner’s annotated Figure 3 from Kim. Petitioner’s proposed construction and the disclosures in Kim is a clear deviation from the plain language of claim 1, which requires “an optical fiber connector disposed in an end of the carrier.”

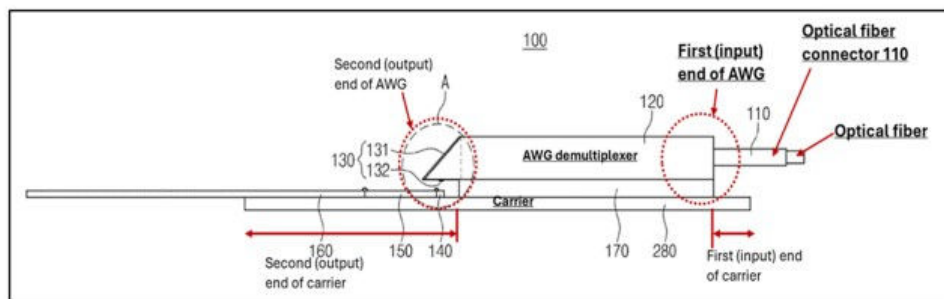
Finally, such general knowledge or understanding of a POSITA cannot be used to supply a missing claim limitation in an IPR. See Exhibit 2008 (if a prior art reference admittedly lacks a specific element, petitioners can no longer argue that a person of ordinary skill in the art (POSITA) would inherently understand or fill that gap based on background knowledge, and the IPR should be denied).

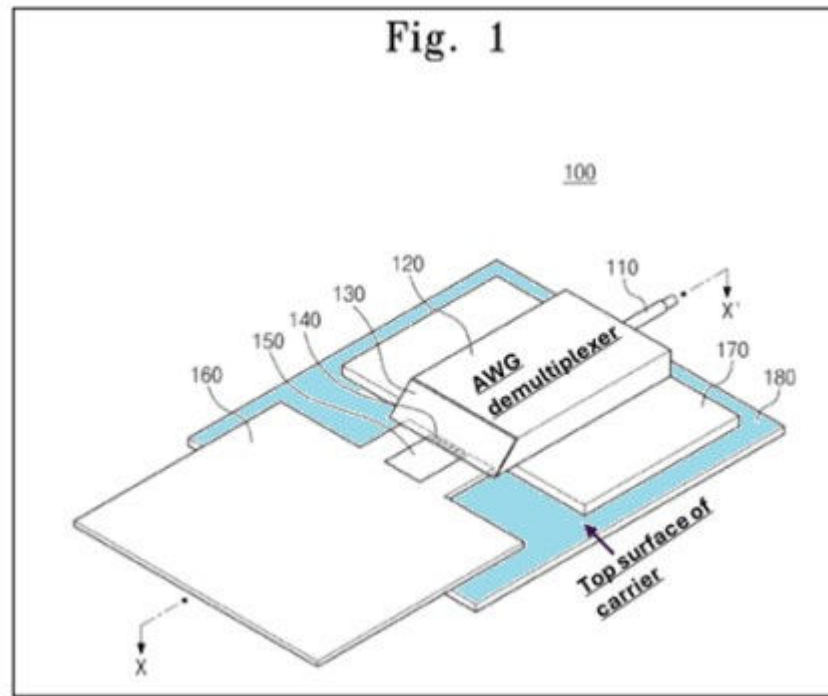
C. Kim fails to disclose “an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier;”

Kim also fails to disclose the limitation requiring “an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier.” Specifically, Kim discloses that what Petitioner has identified as the

AWG 120 is mounted on supporting part 170, and not what Petitioner has identified as carrier 180/280. Kim then specifically discloses that “the first supporting part 170 may be disposed under the multiplexer 120 [i.e. what Petitioner has identified as the ‘AWG’] to support the multiplexer [‘AWG’] 120.” *See* Exhibit 1004 at ¶31. In contrast, “[t]he second supporting part 180 [i.e. what Petitioner has identified as the ‘carrier’] may be disposed at the lowermost part of the optical receiver module 100 to entirely support the optical receiver module 100.” *Id.*; *see also* Exhibit 2011 at ¶ 87.

This distinction is clearly shown in Petitioner’s annotated Figures 1 and 3 from Kim, which show the AWG 120 is disposed on supporting part 170, and not on carrier 180/280:





Indeed, Petitioner admits that Kim only “discloses an arrayed waveguide grating (AWG) demultiplexer 120 mounted on a supporting part 170, which is [then] disposed on a top surface of carrier 180/280.” See, Petition at p. 28 (emphasis added). Instead, Petitioner again relies on an obviousness argument that relies on a POSITA to assert “[i]t would have been obvious to a POSITA that because AWG demultiplexer 120 is mounted on supporting part 170, which is then mounted on carrier 180/280, AWG demultiplexer 120 is disposed on a top surface of carrier 180/280.” See Petition at pp. 40–41. However, a POSITA would not have understood this because Petitioner’s argument is contrary to and deviates from the

teachings of Kim, which discloses “the first supporting part 170 may be disposed under the multiplexer 120 to support the multiplexer 120,” while “[t]he second supporting part 180 may be disposed at the lowermost part of the optical receiver module 100 to entirely support the optical receiver module 100.” *See* Exhibit 1004 at ¶31; *see also* Exhibit 2011 at ¶ 89.

Furthermore, as is also clear from Petitioner’s annotated Figures 1 and 3 from Kim, the identified “AWG” 120 does not define a midpoint of the identified “carrier” 180/280, as required by the claim. *See* Exhibit 2011 at ¶ 90.

Petitioner may argue the claim language requiring “an arrayed waveguide grating [AWG] further disposed on a top surface of the carrier that defines a midpoint of the carrier” should be construed to only require the AWG be indirectly disposed on the top surface of a carrier without defining a midpoint of the carrier. But, again, this is only because Kim discloses the AWG is disposed on “intervening elements” and not on the carrier, and therefore the AWG is “*disposed indirectly* on the top surface of carrier... beneath the AWG midpoint,” as even Petitioner acknowledges. *See* Paper 13 at p. 3.

Finally, as noted, such “general knowledge” cannot be used to supply a missing claim limitation in an IPR. *See* Exhibit 2008.

D. Kim fails to disclose Claims 2–4

Claims 2–4 of the '301 Patent depend from Claim 1. Because Petitioner has not shown that Kim renders obvious Claim 1, Petitioner also has not shown that Kim renders obvious Claims 2–4. *See* Exhibit 2011 at ¶ 91.

1. Claim 2

Kim also separately fails to disclose Claim 2, which requires “The multi-channel parallel optical receiving device according to claim 1, wherein the top surface of the end of the carrier is defined at least in part by a circuit board, and wherein the plurality of optoelectronic diodes and the light receiving chip are directly disposed on the circuit board.”

In Kim, the plurality of optoelectronic diodes and the light receiving chip are not directly disposed on the circuit board. *See* Exhibit 1004 at ¶¶ [0022], [0030], Figs. 1 and 3. Indeed, Petitioner even acknowledges in Kim the “plurality of photodetectors (optoelectronic diodes) 140 and pre-amplifier (light-receiving chip) 150 are disposed on carrier 180/280, *which is adjacent to and contiguous with printed circuit board carrier 160.*” *See* Petition at p. 34 (emphasis added).

Instead, Petitioner again argues “[i]t would have been obvious to a POSITA that instead of positioning photodetectors 140 and pre-amplifier 150 directly on the top surface of carrier 180/280, they could have been positioned directly on printed

circuit board 160 to save space on carrier 180/280.” *Id.* However, if as here, a prior art reference admittedly lacks a specific element, petitioners can no longer argue that a person of ordinary skill in the art (POSITA) would inherently understand or fill that gap based on background knowledge, and the IPR should be denied. *See* Exhibit 2008 (“As a practical matter, enforcement of Rule 104(b)(4) means that applicant admitted prior art (AAPA), expert testimony, common sense, and other evidence that is not ‘prior art consisting of patents or printed publications’ (collectively, ‘general knowledge’) may not be used to supply a missing claim limitation. Per 35 U.S.C. § 312(a)(4), the Board shall deny an IPR petition that fails to comply with Rule 104(b)(4).”).

Petitioner admittedly has failed to show Kim discloses “[t]he multi-channel parallel optical receiving device according to claim 1, wherein the top surface of the end of the carrier is defined at least in part by a circuit board, and wherein the plurality of optoelectronic diodes and the light receiving chip are directly disposed on the circuit board” as required by claim 2.

2. Claim 4

Kim also separately fails to disclose Claim 4, which requires, “The multi-channel parallel optical receiving device according to claim 1, wherein the

predetermined angle of the top surface of the output end of the arrayed waveguide grating is 42 degrees.”

Kim fails to disclose “the top surface of the output end of the arrayed waveguide grating is 42 degrees.” *See* Exhibit 1004 at ¶¶ [0033]–[0034]. Instead, Petitioner admits Kim only discloses “the top surface of the output end of AWG demultiplexer 120 is inclined and is cut at a predetermined angle of 45 degrees (to the horizontal) to directly optically couple the demultiplexed light reflected by the inclined surface with corresponding photodetectors 140.” *See* Petition at p. 38 (agreeing “Kim does not explicitly disclose that the predetermined angle of the top surface is 42 degrees.”).

Petitioner again fails in their attempts by arguing “a POSITA would have known that a 42-degree interior angle of the inclined top surface of the output end of the AWG is an obvious design choice and obvious-to-try based on multiple considerations.” *See id.* at pp. 38–39. But, again, such “general knowledge” cannot be used to supply a missing claim limitation in an IPR. *See* Exhibit 2008.

Petitioners has admittedly failed to show Kim discloses “[t]he multi-channel parallel optical receiving device according to claim 1, wherein the predetermined angle of the top surface of the output end of the arrayed waveguide grating is 42 degrees” as required by claim 4.

VI. GROUND 2: ACCELIGHT HAS NOT SHOWN THAT HO IN VIEW OF LEE RENDERS OBVIOUS CLAIMS 1–4

Accelight fails to show that Ho in view of Lee renders obvious any
Challenged Claim in Ground 2.

A. The Ho-Lee Combination fails to disclose the limitation requiring “an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier.”

The Ho-Lee Combination fails to disclose the limitation of claim 1 requiring “an arrayed waveguide grating [AWG] further disposed on a top surface of the carrier that defines a midpoint of the carrier.” *See* Exhibit 2011 at ¶ 95.

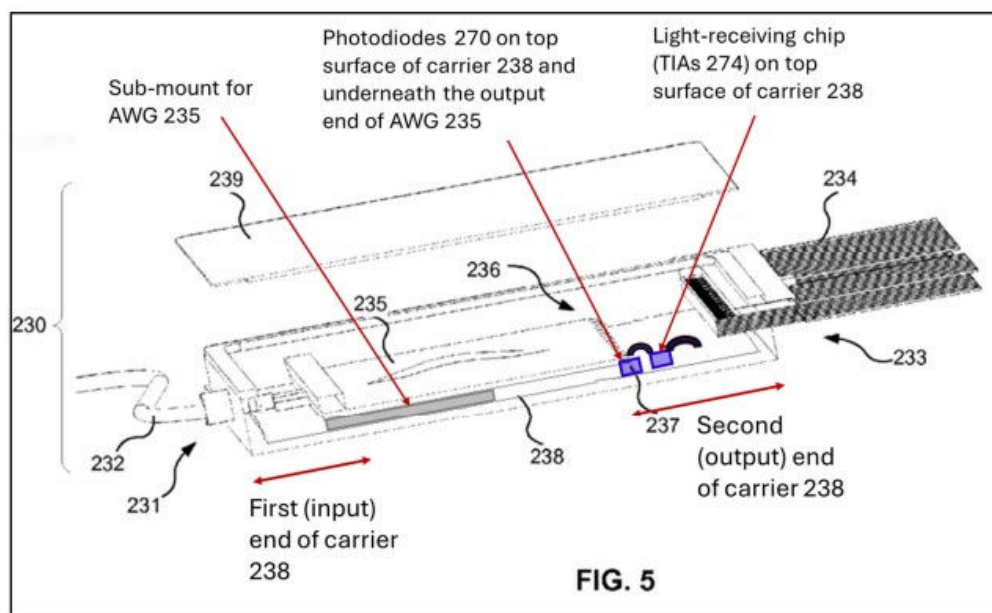
First, PLC 110 in Lee is not an AWG chip. PLC 110 is a generic planar lightwave circuit that can take many different forms, including specifically a fiber array as disclosed in Lee, and none of the embodiments show an AWG as an example. *See* Ex. 1006 at ¶ 34 (stating “[a]s a parallel transmission method is increasingly used along with an increase in the speed of optical communication, an optical fiber array using a planar lightwave circuit (PLC) in which an optical output is established in the form of multi-core process or a V-groove of a silicon optical bench (SiOB) is widely used in the ROSA module.”) (emphasis added). Furthermore, PLC 110 in Lee is not disposed on what Petitioner has identified as

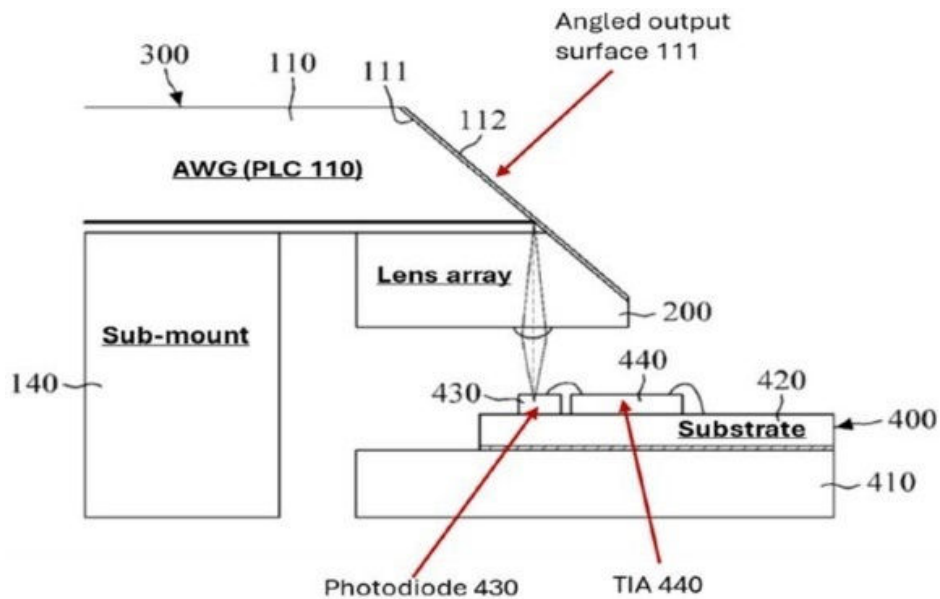
substrate 400 (as required by Claim 1 of the '301 Patent), but instead on sub-mount 140 and lens array 200. *See, e.g., id.* at Fig. 2; *see also* Exhibit 2011 at ¶ 96.

Petitioner even admits that what Petitioner purports to allegedly be AWG in Lee is not disposed on the top surface of the carrier. *See* Petition at p. 62 (“It would have been obvious to a POSITA that because AWG 235 is mounted on a submount, which is then mounted on carrier 238, AWG 235 is *indirectly* disposed on the top surface of carrier 235.”) (emphasis added).

Further, as shown in the figures included below, neither Ho nor Lee discloses the AWG defining a midpoint of the carrier. *See* Exhibit 2011 at ¶ 97.

This is shown in Petitioner’s annotated Figure 5 of Ho and Figure 2 of Lee:





Furthermore, there would have been no meaningful motivation to modify Ho in view of Lee in order to incorporate Ho's AWG 235 that is disposed on a sub-mount and then disposed on a top surface of carrier 238, nor to do so in a way that defines a midpoint of the carrier at the output end of Ho's AWG 235.

Petitioner argues that "[i]n Ho modified in view of Lee, AWG 235 would have been mounted on a sub-mount disposed on a top surface of carrier 238 that defines a midpoint of the carrier." Petition at pp. 61–62. Petitioner and Dr. Lebby further state that a POSITA would directly mount AWG 236 and TIA 274 on carrier 238 in order to reduce the number of sub-mounts or substrates on Ho's carrier 238 and thus reduce manufacturing complexities and costs. See Exhibit 1003 at ¶100; *see also* Exhibit 2011 at ¶ 99.

However, if a mount is provided on the carrier 238 in Ho to elevate AWG 235, the mount will be an additional submount/substrate on Ho's carrier 238. A motivation to reduce the number of submounts/substrates (the objective asserted by the Petitioner) would find the elevation of Ho's AWG 235 undesirable because it adds an additional submount element. Thus, Petitioner's combination or modification is contradictory. Similarly, if the PD 270 and TIA 274 are mounted on a circuit board instead of directly on the carrier 238, this circuit board will also be an additional submount/substrate on Ho's carrier 238. *See* Ex. 1003 at ¶116. The intended purpose as stated in Ho is to minimize the size and complexity of the connections. *See, e.g.*, 1005 at ¶¶ 5–6 (“To provide the coupling efficiency needed for a desired receiver sensitivity, these optical couplings are often made using a fiber array and/or lenses. The limited space within a smaller sized ROSA housing, however, may not be sufficient to accommodate fiber arrays and lenses used for such optical couplings.”). Thus, in short, the proposed modification of Ho in view of Lee as proposed by Petitioner renders Ho inconsistent for Ho's intended purpose. *See* Exhibit 2011 at ¶ 100; *see also* MPEP §2143.01 (“if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification,” and the obviousness argument fails).

The Ho-Lee Combination fails to disclose the limitation of claim 1 requiring “an arrayed waveguide grating [AWG] further disposed on a top surface of the carrier that defines a midpoint of the carrier.”

B. The Ho-Lee Combination also fails to disclose the limitation requiring “an optical fiber connector disposed in an end of the carrier.”

The Ho-Lee Combination also fails to disclose the limitation requiring “an optical fiber connector disposed in an end of the carrier.” Again, as already discussed *supra*, Petitioner incorrectly argues a POSITA would understand that the limitation only required an optical connector disposed at an end *region* of the carrier. See Petition at p. 60 (“A POSITA would have understood that the claim element ‘an optical fiber connector disposed in an end of the carrier’ does not mean that the connector is coupled directly to the end of the carrier; rather, it means that the connector is disposed at an end region of the carrier.”); *see also* Exhibit 2011 at ¶ 101.

However, a POSITA would not have understood that the claim limitation “an optical fiber connector disposed in an end of the carrier” only requires that the connector is disposed at an end region of the carrier because the plain language of claim 1 clearly requires “an optical fiber connector disposed in an end of the

carrier.” *See id.* at ¶ 102. Regardless, as noted, such “general knowledge cannot be used to supply a missing claim limitation in an IPR. *See* Exhibit 2008.

The Ho-Lee Combination also fails to disclose the limitation requiring “an optical fiber connector disposed in an end of the carrier.”

- C. The Ho-Lee Combination also fails to disclose the limitation requiring “wherein the optical signal is divided into multi-channel optical signals in parallel by the arrayed waveguide grating based on their wavelengths, a top surface defined by an output end of the arrayed waveguide grating is at a predetermined angle, causing the multi-channel optical signals reflected by the top surface defined by the output end of the arrayed waveguide grating to be reflected to a photosensitive surface of the plurality of optoelectronic diodes arranged in parallel, wherein the predetermined angle of the top surface defined by the output end of the arrayed waveguide grating is in a range of 41 to 46 degrees such that the top surface provides the reflection.”**

A POSITA would not have been motivated to modify Ho in view of Lee to provide “the multi-channel optical signals reflected by the top surface defined by the output end of the arrayed waveguide grating to be reflected to a photosensitive surface of the plurality of optoelectronic diodes arranged in parallel, wherein the predetermined angle of the top surface defined by the output end of the arrayed waveguide grating is in a range of 41 to 46 degrees such that the top surface provides the reflection.” *See* Exhibit 2011 at ¶ 103.

Petitioner and Dr. Lebby argue that “in Ho modified in view of Lee, the output end of Ho’s AWG 235 would have been modified to have an inclined surface cut at a 45-degree angle, such as surface 111 of Lee, to vertically reflect the demultiplexed outputs 237 to the photosensitive surfaces of photodiodes 270 provided below the angled surface...[because] a POSITA would have been motivated to modify Ho in view of Lee to use the more efficient and reliable direct coupling technique disclosed in Lee.” Petition at p. 65; *see also* Exhibit 2011 at ¶ 104.

However, there would have been no meaningful motivation to modify the output end of Ho’s AWG 235 in view of Lee to have an inclined surface cut at a 45-degree angle to vertically reflect the demultiplexed outputs 237 to the photosensitive surfaces of photodiodes 270 given that Ho already discloses an effective and efficient way to couple the AWG 235 to the photodetectors 236. *See* Exhibit 1005 at ¶¶43–44. Indeed, if Ho is modified by using the coupling technique of Lee, the lens will be bonded to Ho’s AWG 235. This would result in Petitioner's combination or modification changing the principal operation of Ho and render it unsatisfactory for its intended purpose, which is direct coupling without any intermediate optical components such as lenses or fiber arrays. *See* Exhibit 2011 at ¶ 105; *see also* MPEP §2143.01 (“if the proposed modification ...

would change the principle of operation of the prior art invention being modified, then the teachings of the reference are not sufficient to render the claims *prima facie* obvious.”).

Indeed, Ho specifically teaches that “[t]he term ‘directly optically coupled’ refers to an optical coupling *without any intermediate optical components such as lenses or fiber arrays.*” *Id.* at ¶ 19 (emphasis added). And, Ho then teaches “the outputs of the demultiplexer 132 may be aligned with and *directly optically coupled* to the photodetectors 134 to provide a relatively high coupling efficiency.” *Id.* at ¶ 30 (emphasis added); Exhibit 2011 at ¶ 106.

As explained, the intended purpose of Ho is the direct optical coupling of vertical photodetectors 236 to the AWG 235. See *id.* at ¶¶ 18–19, 30. The optical unit 300 of Lee includes an array lens 200 for focusing an optical signal output from the optical transmission means, and the electrical unit 400 receives the optical signal focused through the array lens 200 and converts the received optical signal into an electrical signal. See, e.g., Exhibit 1006 at Fig. 2, ¶ 33. If the AWG 235 in Ho is modified in view of Lee’s PLC 110, such combination or modification would be a change in the basic principle under which Ho’s AWG 235 was designed to operate, which is its direct coupling. See Exhibit 2011 at ¶ 107.

In other words, the modification of Ho in view of the coupling technique described in Lee as argued by Petitioner and Dr. Leeb results in an unsatisfactory result for Ho's intended purpose and is contradictory to its teachings. *See* Exhibit 2011 at ¶ 108.

Therefore, the Ho-Lee combination fails to disclose the limitation requiring “the multi-channel optical signals reflected by the top surface defined by the output end of the arrayed waveguide grating to be reflected to a photosensitive surface of the plurality of optoelectronic diodes arranged in parallel, wherein the predetermined angle of the top surface defined by the output end of the arrayed waveguide grating is in a range of 41 to 46 degrees such that the top surface provides the reflection.”

D. The Ho-Lee Combination fails to disclose Claims 2–4

Claims 2–4 of the '301 Patent depend from Claim 1. Because Petitioner has not shown that the Ho-Lee Combination discloses Claim 1, Petitioner also has not shown that the Ho-Lee Combination discloses Claims 2–4. *See* Exhibit 2011 at ¶ 109.

1. Claim 2

The Ho-Lee combination also separately fails to disclose Claim 2, which requires “The multi-channel parallel optical receiving device according to claim 1,

wherein the top surface of the end of the carrier is defined at least in part by a circuit board, and wherein the plurality of optoelectronic diodes and the light receiving chip are directly disposed on the circuit board.”

Petitioner again admits the Ho-Lee combination does not directly disclose this limitation, and instead relies on the “general knowledge” of an expert, which is impermissible and cannot be used to supply a missing claim limitation in an IPR. *See* Exhibit 2008

Petitioners has failed to show that the Ho-Lee Combination disclosed claim 2.

2. Claim 4

The Ho-Lee combination also separately fails to disclose Claim 4, which requires “The multi-channel parallel optical receiving device according to claim 1, wherein the predetermined angle of the top surface of the output end of the arrayed waveguide grating is 42 degrees.”

Ho-Lee fails to disclose “the top surface of the output end of the arrayed waveguide grating is 42 degrees.” *See* Exhibit 1006 at ¶¶ [0012], [0051]. Instead, Petitioner admits “Lee discloses an AWG demultiplexer having an inclined surface 111 (i.e., the top surface of the output end of the AWG) that is cut at a predetermined angle of 45 degrees to directly couple the light reflected

orthogonally by inclined surface 111 with corresponding photodiodes 430.” *See* Petition at p. 68–69 (agreeing “Lee does not explicitly disclose that the predetermined angle of the top surface is 42 degrees.”).

Petitioner again argues “a POSITA would have known that a 42-degree interior angle of the inclined top surface of the output end of the AWG is an obvious design choice and obvious-to-try based on multiple considerations.” *See id.* But, again, such “general knowledge” cannot be used to supply a missing claim limitation in an IPR. *See* Exhibit 2008.

Petitioner admittedly has failed to show that the Ho-Lee Combination discloses “[t]he multi-channel parallel optical receiving device according to claim 1, wherein the predetermined angle of the top surface of the output end of the arrayed waveguide grating is 42 degrees” as required by claim 4.

VII. CONCLUSION

For the reasons set forth above, Applied Optoelectronics, Inc., respectfully requests that the Board deny Accelight’s request to cancel the Challenged Claims of the ’301 Patent.

Dated: June 8, 2026

/s/ Jo Dale Carothers

Jo Dale Carothers (Reg. No. 74,180)

Weintraub Tobin Law Corporation

400 Capitol Mall, 11th Floor

Sacramento, CA 95814

Phone: 858.436.8152

Fax: 916.446.1611

Email: jcarothers@weintraub.com

*Attorneys for Patent Owner Applied
Optoelectronics, Inc.*

CERTIFICATE OF WORD COUNT

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the Microsoft Office word count including all footnotes for the foregoing Patent Owner Response to Petition for *Inter Partes Review* of U.S. Patent No. 10,379,301, excluding the table of contents, table of authorities, certificate of word count, appendix and certificate of service, totals 7,340 words, which is less than the 14,000 words allowed under 37 C.F.R. § 42.24(b)(1).

Dated: June 8, 2026

/s/ Jo Dale Carothers
Jo Dale Carothers (Reg. No. 74,180)
Weintraub Tobin Law Corporation
400 Capitol Mall, 11th Floor
Sacramento, CA 95814
Phone: 858.436.8152
Fax: 916.446.1611
Email: jcarothers@weintraub.com

CERTIFICATE OF SERVICE

The undersigned hereby certifies service on the Petitioner, pursuant to 37 C.F.R. § 42.6(e) and by agreement of counsel, by electronic (e-mail) delivery of a true copy of the foregoing Patent Owner Response to Petition for *Inter Partes Review* of U.S. Patent No. 10,379,301, which was served on June 8, 2026 to the following Counsel for Petitioner via e-mail:

Arpita Bhattacharyya
Perkins Coie LLP
3150 Porter Drive
Palo Alto, CA 94304
Bhattacharyya-ptab@perkinscoie.com

Robert F. McCauley
Perkins Coie LLP
3150 Porter Drive
Palo Alto, CA 94304
rmccauley@perkinscoie.com

Aaron E. Schindler
Perkins Coie LLP
33 East Main Street, Suite 201
Madison, WI 53703
aschindler@perkinscoie.com

/Eric Caligiuri/
Eric Caligiuri (Reg. No. 58,121)
Weintraub Tobin Law Corporation
400 Capitol Mall, 11th Floor
Sacramento, CA 95814
Phone: 858.436.3140
Fax: 916.446.1611
Email: ecaligiuri@weintraub.com