

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CAMBRIDGE INDUSTRIES USA, INC.,

Petitioner, v.

APPLIED OPTOELECTRONICS, INC.,

Patent Owner.

Case IPR2025-00434
Patent No. 10,379,301

PATENT OWNER'S PRELIMINARY RESPONSE

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EXHIBITS

Exhibit No.	Description
2004	Declaration of Dr. Alan E. Willner

I. INTRODUCTION

Patent Owner Applied Optoelectronics, Inc. (“AOI”) submits this Preliminary Response to the Petition of Cambridge Industries USA, Inc. (“CIG USA”) challenging the patentability of Claims 1-7 (the “Challenged Claims”) of U.S. Patent No. 10,379,301 (the “301 Patent”) (Ex. 1001). The Board should deny institution because CIG USA has not established a reasonable likelihood that it will prevail on any claim in any Ground raised in the Petition.

CIG USA presents two grounds of invalidity against the Challenged Claims.

In ground 1, CIG USA challenges independent claims 1 and 7 and dependent claims 2-6 under an anticipation theory. Ground 1 is based on U.S. Patent Application Publication No. 2016/0349451 to Shen, et al. (the “Shen Patent Application Publication”), including the Shen provisional application no. 62/166015) (the “Shen Provisional”), (together referred to as “Shen”).

In ground 2, CIG USA challenges independent claims 1 and 7 and dependent claims 2-6 under an anticipation theory. Ground 2 is based on U.S. Patent No. 9,768,901 to Soldano (“Soldano”).

As set forth below, Petitioner fails to show that any of the prior art references disclose every feature of the Challenged Claims. Thus, CIG USA has

not established a reasonable likelihood that it will prevail on any claim on either Ground raised in the Petition. In addition, as further set forth below, the Board should exercise its discretion and deny institution.¹ Accordingly, AOI respectfully requests that the Board decline to institute *inter partes* review.

II. BACKGROUND

A. '301 Patent

The '301 Patent provides 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 '301 Patent (Exhibit 1001), Abstract; See also

¹ On April 28, 2025, pursuant to the Director's Memorandum of March 26 2025, AOI filed a Request to Director for Discretionary Denial of Petition for *Inter Partes* Review of U.S. Patent 10,379,301 (Paper No. 8). AOI includes similar arguments from the Request in this brief in support of AOI's position that the Board should exercise its discretion for the same reasons and deny institution of *inter partes* review.

Exhibit 2004 (Declaration of Dr. Alan E. Willner) at ¶¶ 48-52.

Figure 1 (reproduced below) shows an example 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 are disposed on a top surface of an end of the carrier 8, and the plurality of optoelectronic diodes 3 are 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 are 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 2004 at ¶¶ 48-52.

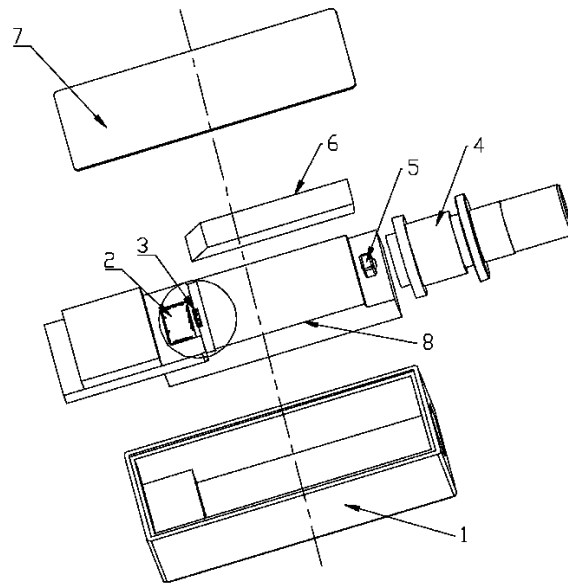


FIG. 1

Figure 3 (reproduced below) then 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 array. Exhibit 1001 at 3:13-3:22; Exhibit 2004 at ¶¶ 48-52.

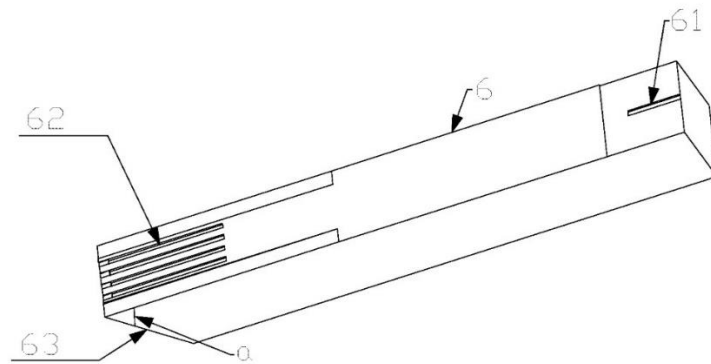


FIG. 3

Figure 4 (reproduced below) shows an embodiment of the '301 Patent in which first lens 5, for coupling the optical fiber, 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 2004 at ¶¶ 48-52.

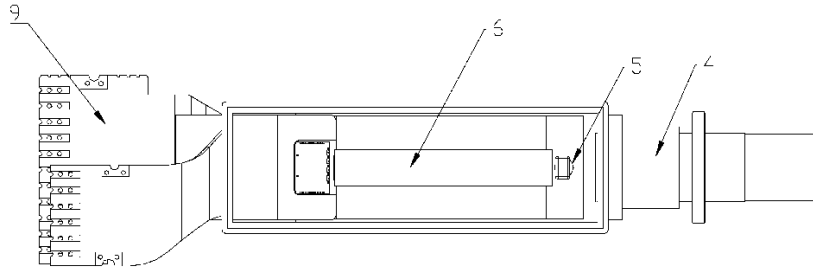


FIG. 4

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 2004 at ¶¶ 53-64.

On August 29, 2017, in a non-final Office Action, the PTO (“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 the Shen Patent Application Publication 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. In connection with the Office Action, the Examiner submitted a “Notice Of References Cited,” which listed U.S. Patent Application Publication No. 2016/0149662 to Soldano (the “Soldano Patent

Application Publication”).

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 March 1, 2018, AOI filed a filed an Information Disclosure Statement, citing the Soldano Patent Application Publication, among others.

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, including the Shen Patent Application Publication. The obviousness rejections relied on the Shen Patent Application Publication in three different combinations with three other references. This was the second Office Action that relied on the Shen Patent Application Publication. In the Office Action, the Examiner stated that all references in the Information Disclosure Statement “have been considered and made of record.” File History, Exhibit 1002, p. 169. The Office Action included AOI’s Information Disclosure Statement filed on March 1, 2018 which cited the Soldano Patent Application Publication, with the Examiner’s notation “All references considered except where lined through” and no references were lined through. *Id.* at p. 195.

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, including the Shen Patent Application Publication. The obviousness rejections (four of which were directed to independent claims 1 or 8) relied on the Shen Patent Application Publication in six different combinations with four other references. This was the third Office Action that relied on the Shen Patent Application Publication.

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 under as indefinite or lacking antecedent basis under 35 U.S.C. § 112(b), but withdrawing 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 “the Examiner is unable to make a prima facie case for obviousness” *Id.*

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

C. The Litigation Between AOI and Petitioner

On February 20, 2024, AOI filed a lawsuit against Petitioner for patent infringement entitled *Applied Optoelectronics, Inc. v. Cambridge Industries, Inc.*, case no. 3:24-cv-01010-JD (N.D. CA) (the “Litigation”). The complaint alleges that Petitioner infringes eight of AOI’s patents, including the ’301 Patent. AOI filed a First Amended Complaint on April 25, 2024.

On May 16, 2024, the parties exchanged initial disclosures. On June 6, 2024, AOI served its infringement contentions, stating that Petitioner infringes claims 1-4 and 7 of the ’301 patent. On October 15, 2024, Petitioner served its amended invalidity contentions. Petitioner’s contentions state that claims 1-4 and 7 are invalid under either § 102 or § 103 on five grounds based on five different references, the following grounds of which are relevant here: (1) anticipated by or obvious over the Shen Patent Application Publication, and (2) anticipated by or

obvious over U.S. Patent No. 9,768,901 to Soldano². See “Petitioner’s Invalidity Contentions”, Exhibit 2002.

On August 8, 2024, the District Court entered its scheduling order setting the following pre-trial dates: a claim construction hearing on April 10, 2025, fact discovery cut-off on September 29, 2025, expert discovery cut-off on December 29, 2025, dispositive motion cut-off on January 28, 2026, and pre-trial conference on May 21, 2026. The court set a jury trial for June 8, 2026. See Scheduling Order, Exhibit 1010.

On November 7, 2024, Petitioner filed its answer and counterclaims against AOI. In its counterclaims, Petitioner alleges that each of the eight patents-in-suit is invalid. On November 15, 2024, AOI filed its answer to the counterclaims.

Pursuant to the District Court’s Scheduling Order, between October 2024 and March 2025, AOI and Petitioner exchanged proposed terms for claim construction, exchanged preliminary claim constructions and extrinsic evidence,

² U.S. Patent No. 9,768,901 to Soldano is the patent that issued from U.S. Patent Application Publication No. 2016/0149662. The publication is referred to herein as the “Soldano Patent Application Publication,” while the issued patent is referred to as “Soldano.”

filed a Joint Claim Construction Statement and Prehearing Statement, exchanged damage contentions, and filed opening, responsive, and reply claim construction briefs.

On March 19, 2025, AOI and Petitioner jointly filed a Notice to Court of Filing of Petitions for *Inter Partes* Review, informing the District Court that Petitioner had filed petitions for IPR of five of the eight patents-in-suit. On April 4, 2025, the District Court issued an order staying the case pending further order, vacating the claim construction hearing set for April 10, 2025, and requiring the parties to file joint status reports on the status of the PTAB proceedings every 90 days beginning on July 7, 2025.

D. The Additional Litigation Involving the '301 Patent

In addition to the Litigation against Petitioner, AOI has filed another patent infringement suit against another defendant, Accelight Technologies, Inc. (“Accelight”), entitled *Applied Optoelectronics, Inc. v. Accelight Technologies, Inc.*, case no. 4:24-cv-09041-HSG (N.D. CA) (the “Additional Litigation”). The complaint, filed on December 13, 2024, alleges infringement of six AOI patents, including the '301 Patent. Four of the other patents-in-suit are also the subject of the Litigation and are the subject of separate petitions for IPR that Petitioner filed on January 17, 2025, the same day that Petitioner filed the Petition that is the

subject of this Preliminary Response. Thus, the Litigation with Petitioner and Additional Litigation share five patents-in-suit, all of which are the subject of separate petitions for IPR that Petitioner filed in January 2025.

On March 28, 2025, AOI and defendant Accelight jointly filed a Notice to Court of Filing of Petitions for *Inter Partes* Review, informing the District Court that Petitioner had filed petitions for IPR of five of the six patents-in-suit. In the Joint Case Management Statement, defendant Accelight stated that one of the issues in the case was whether the asserted claims of the patents-in-suit were invalid. At the case management conference held on April 22, 2025, the court indicated that the case would move forward, and stated that it would set claim construction deadlines.

On April 23, 2025, the court entered a Scheduling Order which set the following dates: invalidity contentions and documents on May 30, 2025; exchange of proposed terms for claim construction on June 13, 2025; exchange of preliminary constructions and extrinsic evidence on July 7, 2025; damages contentions on July 22, 2025; a Joint Claim Construction Statement and Prehearing Statement to be filed on July 30, 2025; claim construction discovery cut-off on August 29, 2025; opening, responsive, and reply claim construction briefs to be filed on September 16, 2025, September 30, 2025, and October 7, 2025,

respectively; a technical tutorial on October 17, 2025; and a claim construction hearing on October 31, 2025. *See* Exhibit 2003.

E. The Petition for *Inter Partes* Review

On January 17, 2025, 11 months after AOI filed its complaint in the Litigation and seven months after AOI served its infringement contentions in the Litigation, Petitioner filed its Petition for IPR of the '301 Patent, PTAB Case IPR2025-00434. On the same date, Petitioner also filed petitions for IPR of four of the other AOI patents in the Litigation: U.S. Patent Nos. 9,523,826; 10,313,024; 10,788,690; and 10,042,116.

In the Petition for IPR of the '301 patent, Petitioner challenges claims 1-7. Petitioner asserts two grounds of invalidity: (1) anticipated by Shen; and (2) anticipated by Soldano.

The Petition relies on the 53-page declaration of Petitioner's expert, Dr. Andrew G. Kirk. *See* Exhibit 1003. Petitioner's other four petitions for IPR of the other four patents also rely on a declaration of Dr. Kirk.

On February 28, 2025, the PTAB issued its Notice of Filing Date Accorded to Petition and Time for Filing Patent Owner Preliminary Response (Paper 3).

On April 28, 2025, AOI timely filed a Request to the Director for Discretionary Denial of each of Petitioner's five Petitions for IPR.

Pursuant to the PTAB's "Consolidated Trial Practice Guide – November 2019," the PTAB will determine whether to institute an IPR within three months of the date the Patent Owner's Preliminary Response was filed or was due, by about August 28, 2025. Pursuant to 35 U.S.C. § 316(a)(11), the PTAB will set the trial date for the IPR within one year of the notice of institution, no later than about August 28, 2026.

F. Alleged Prior Art References

1. Shen (Exhibits 1007 (U.S. Patent App. Pub. No. US 2016/0349451) and 1008 (U.S. Provisional Patent App. 62/166,015))

The Shen Patent Application Publication, including the Shen Provisional (Exhibits 1007 (U.S. Patent App. Pub. No. US 2016/0349451) and 1008 (U.S. Provisional Patent App. 62/166,015)) is directed to an optical connection module that includes a substrate, an arrayed waveguide grating structure, an optical detector, and an oblique surface. The arrayed waveguide grating structure is disposed on the substrate and the arrayed waveguide grating structure is configured to transmit light. The optical detector is disposed on the substrate, and the optical detector is configured to detect the light propagating through the arrayed waveguide grating structure. The oblique surface is configured to redirect the light from the arrayed waveguide grating structure to the optical detector. Exhibit 1007,

Abstract; Exhibit 2004 at ¶¶ 70-72.

Figure 1 of the Shen Patent Application Publication shows a cross-section view of an optical connection module 10 in accordance with the Shen Patent Application Publication:

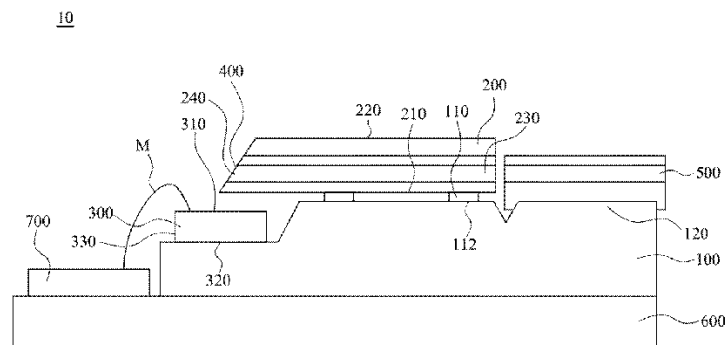


Fig. 1

As shown in Figure 1, an optical connection module 10 may include a substrate 100, an arrayed wavelength grating (AWG) structure 200 disposed on the substrate 100, an optical detector 300 disposed on the substrate 100, and an oblique surface 400. Exhibit 1007. at ¶33. According to Shen, the optical connection module 10 may further include a circuit board 600 and a driver 700, and the substrate 100 is disposed on the circuit board 600. The driver 700 is disposed on the circuit board 600, and the driver 700 is configured to drive the optical detector 300 or provide the optical detector 300 with an electric signal. The driver 700 and

the optical detector 300 may be connected electrically by the wire M. Exhibit 1007 at ¶44; Exhibit 2004 at ¶¶ 70-72.

2. Soldano (Exhibit 1009)

Soldano (Exhibit 1009) is directed to an assembly of waveguide wavelength multiplexers and demultiplexers, together with continuous wave (CW) laser transmitters that interface to grating couplers on a silicon photonics chip, providing CW sources, multiplexed output and optionally multiplexed input, all using a single photonic lightwave circuit (PLC). Exhibit 1009, Abstract; Exhibit 2004 at ¶¶ 81-85.

In short, Soldano provides a method of coupling light in and out of silicon photonics chips using a PLC as an intermediate material. *Id.* at 2:64-66. As explained, “by fabricating waveguide multiplexers and demultiplexers in glass PLCs, multi-wavelength fibers are broken down to individual wavelengths before entering or exiting the silicon and so each grating coupler in the silicon can be used only at a single wavelength, compensating for the limited optical bandwidth of the silicon grating coupler.” Exhibit 1009 at 2:66-3:5; Exhibit 2004 at ¶¶ 81-85.

FIG. 3 of Soldano shows the overall structure in accordance with aspects of the invention as follows:

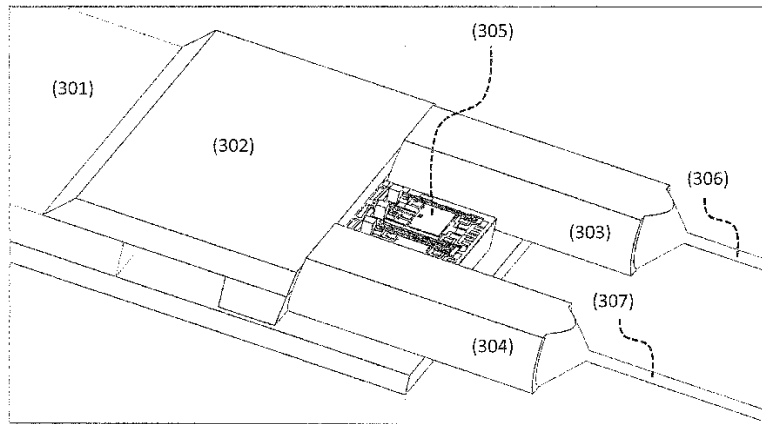


Fig 3

As explained in Soldano, multi-wavelength light enters through fiber 306. This fiber is glued into a capillary 303 that is aligned to the PLC 302. This light is then demultiplexed into four individual channels in the PLC 302. The other end of the PLC includes a structure for directing, or deflecting, this light down into the silicon photonics chip 301. A MEMS coupling structure 305 couples light from lasers into the PLC. Exhibit 1009 at 7:62-8:31; Exhibit 2004 at ¶¶ 81-85.

FIG. 5 of Soldano shows a detail of the side polish of the PLC and the grating coupler:

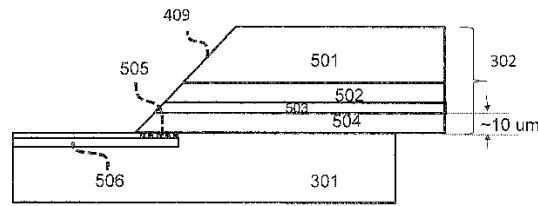


Fig 5

As explained in Soldano, the PLC wafer 302 includes a silicon substrate 501 on which various layers of glass are formed. The wafer is polished at an angle and then attached upside down to the silicon photonics chip 301. The PLC waveguides have two outer cladding regions 502 and 504, and a higher index core region 503. When the wafer is placed on the silicon photonics chip 301, the angle polish 409 causes the beam to reflect against the polished surface, diffract through the roughly 10 um of top cladding 504 and impinge on the grating coupler 505. Exhibit 1009 at 9:52-63; Exhibit 2004 at ¶¶ 81-85.

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

For the purposes of this Preliminary Response only, AOI applies CIG USA'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 at least (1) an undergraduate degree in electrical engineering, computer engineering, networking, or a comparable field of study and (2) at least two years of experience with optical data communications or a comparable field of work. Exhibit 1003, ¶¶ 22–23. Individuals with different education and additional experience also could be of ordinary skill in the art if that experience compensates for a deficit in their educational training as mentioned above. *Id.* Additional education might substitute for some experience, and vice versa. *Id.*; *see also* Exhibit 2004 at ¶¶ 28-32.

AOI reserves the right to further address CIG USA's formulation of a POSITA if trial is instituted.

IV. CLAIM CONSTRUCTION

CIG USA identifies a dispute over the terms “carrier” and “the same top surface” based on claim construction positions taken by the parties in the Litigation. Petition at pp. 9-11. CIG USA argues that “carrier” should be “construed as **“a ceramic or silicon substrate,”** i.e., a ceramic or similar rigid substrate having high thermal conductivity and designed to carry an integrated chip, as that term is (and was) understood by POSITAs.” *Id.* CIG USA further argues “that the phrase ‘the same top surface of the end of the carrier’ (claims 1

and 7) should be construed to mean ‘the topmost surface of the carrier,’ without respect to whether that surface has a single or multiple elevations.” *Id.*; *see also* Exhibit 2004 at ¶¶ 66-69. AOI asserted in district court that both terms should be given its plain and ordinary meaning.

But the Board need not construe these terms because claim construction is not necessary to resolve the controversy presented by CIG USA’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)). CIG USA has not demonstrated a reasonable likelihood of prevailing on any Challenged Claim whether using “plain and ordinary meaning” or CIG USA’s proposed claim constructions. *See* Exhibit 2004 at ¶¶ 66-69.

V. CIG USA HAS NOT ESTABLISHED A REASONABLE LIKELIHOOD OF PREVAILING FOR ANY CHALLENGED CLAIM

CIG USA bears the burden on institution of “demonstrating a reasonable likelihood that it will prevail in showing the unpatentability of at least one claim.” *SMIC, Ams. v. Innovative Foundry Techs., LLC*, IPR2020-00837, Paper 13, 13–14 (PTAB Oct. 9, 2020) (citing 35 U.S.C. §§ 314(a) and 312(a)(3)). In making this

showing, CIG USA’s Petition must identify “the evidence that supports the grounds for the challenge to each claim.” *Id.* CIG USA has not met that burden here.

CIG USA alleges that each of independent claims 1 and 7 and dependent claims 2-6 are invalid as anticipated under 35 U.S.C. § 102. Anticipation requires “that a single prior art reference discloses each and every element of a claimed invention.” *Silicon Graphics, Inc. v. ATI Techs., Inc.*, 607 F.3d 784, 796 (Fed. Cir. 2010). A reference must not only explicitly or inherently disclose every claimed element, but those elements must also be arranged within that reference as they are in the claim. *See Net MoneyIN, Inc. v. Verisign, Inc.*, 545 F.3d 1359, 1369–71 (Fed. Cir. 2008). Disclosures from multiple, distinct embodiments of a prior art reference cannot be combined to anticipate the challenged claim. *See id.*, 1371. And “differences between the prior art reference and a claimed invention, however slight, invoke the question of obviousness, not anticipation.” *Id.*

Here, CIG USA has not shown a reasonable likelihood of success for any challenged claim under either ground of unpatentability. The Board should thus deny institution.

**VI. GROUND 1: CIG USA HAS NOT SHOWN A REASONABLE
LIKELIHOOD THAT SHEN ANTICIPATES OR RENDERS
OBVIOUS CLAIMS 1–7**

A. Petitioner fails to show that Shen discloses all the limitations of any claim of the '301 Patent

Petitioner fails to show that discloses all the limitations of any claim of the '301 Patent. For example, Petitioner fails to show that Shen discloses “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;” as required by claims 1-7. *See* Exhibit 2004 at ¶¶ 73-74.

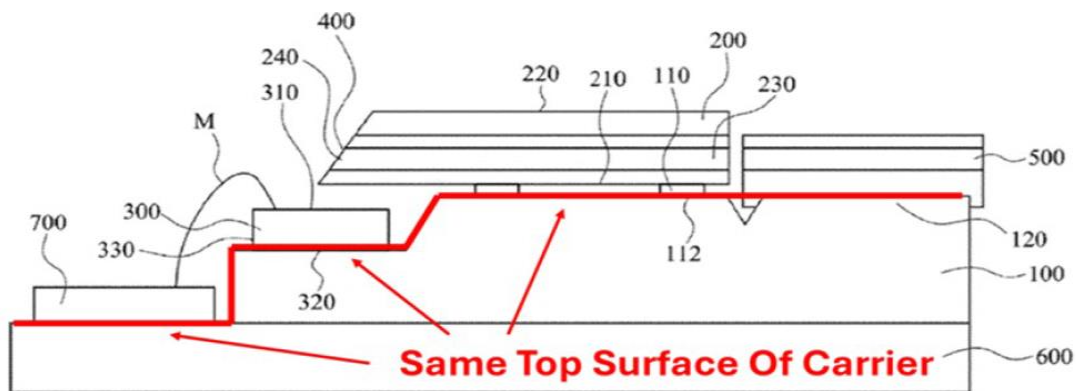
Specifically, Petitioner fails to show that Shen discloses “a plurality of optoelectronic diodes disposed on the top surface of the end of the carrier, and the plurality of optoelectronic diodes electrically connected to the light receiving chip via bonding wire, wherein the optoelectronic diodes and the light receiving chip are disposed directly on the same top surface of the end of the carrier” as required by independent claim 1. Claims 2-6 depend from claim 1 and thus also contain this limitation. Similarly, independent claim 7 also requires this limitation. And, thus, Petitioner fails to show that Shen discloses all limitations of any claim of the '301 Patent. *Id.* at ¶ 75.

- i. **Petitioner fails to show that Shen discloses “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;” as required by claims 1-7 of the ’301 Patent.**

Petitioner fails to show that Shen discloses “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” as required by independent claim 1. Claims 2-6 depend from claim 1 and thus also contain this limitation. Similarly, independent claim 7 also requires this limitation. And, thus, Petitioner fails to show that Shen discloses all limitations of any claim of the ’301 Patent. *Id.* at ¶ 76.

Petitioner and its expert argue Shen discloses that “[t]he optical detector (e.g., photodiodes) (300) and the light receiving chip (700) are located directly on the same top surface of the end of the carrier.”. Petition at p. 18; Exhibit 1003 at ¶84.

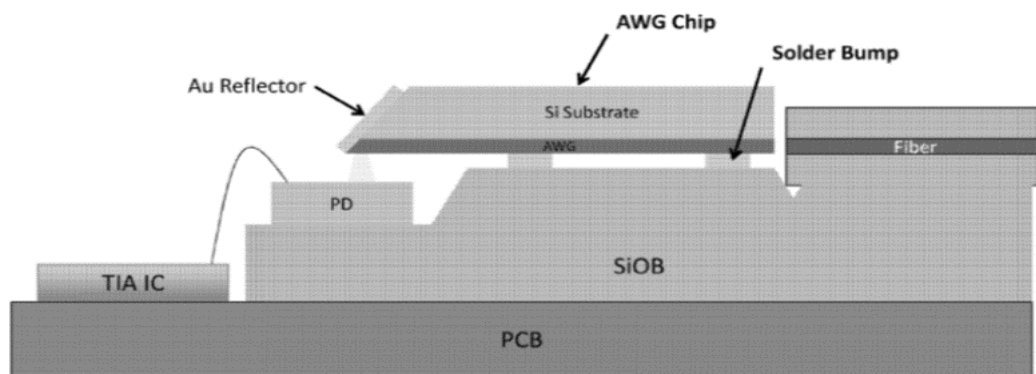
However, Petitioner fails to show that Shen teaches that the “optical detector (e.g., photodiodes) (300) and the light receiving chip (700)” “are disposed directly on the same top surface of the end of the carrier.” This is shown in Petitioner’s annotated version of Figure 1 of Shen as follows:



Indeed, as explained by Shen, “the optical connection module 10 may further include a circuit board 600 and a driver 700, and the substrate 100 is disposed on the circuit board 600. The driver 700 is disposed on the circuit board 600, and the driver 700 is configured to drive the optical detector 300 or provide the optical detector 300 with an electric signal.” Exhibit 1007 at ¶¶44; Exhibit 2004 at ¶¶ 73-77.

Thus, in addition to failing to show “optical detector (e.g., photodiodes) (300) and the light receiving chip (700)” “are disposed directly on the same top surface of the end of the carrier,” Petitioner also improperly combines substrate

(100) and PCB (600) of Shen as a single carrier. Indeed, Petitioner argues Shen discloses “that the photodiodes and TIA IC (corresponding to the claimed “light receiving circuit”) could both be located on the SiOB substrate (which is a carrier, not a PCB) to minimize wire bonds.” See Petition at p. 17. Petitioner then reproduces the following figure from the Shen Provisional (Exhibit 1008):



However, if the substrate 100 (i.e. SiOB in the figure above) is the carrier, then the light receiving chip (700) (TIA IC in the figure above) is not on the carrier. But, if the PCB (600) in the figure above is the carrier, then optical detector (300) (PD in the figure above) is not on the carrier. Exhibit 2004 at ¶¶ 78-79.

Regardless, even if Petitioner can assert that Shen teaches that one can combine the PCB and substrate (SiOB) as the carrier, then optical detector (300) is not at the end of the carrier as required. Moreover, if light receiving chip (700) is placed directly on the SiOB, the teaching of the citation by the Petitioner and its expert would indicate that the light receiving chip (700) would no longer be

electrically connected via bonding wire as required by the claim. *Id.*; *see also* Exhibit 1008 at pp. 6-8 (“TIA IC may be located on the same substrate (SIOB) with PD, or located on the PCB and connected the PD on SIOB through wire bonding.”).

Thus, Petitioner fails to show that Shen discloses “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” as required by claim 1-7. Exhibit 2004 at ¶ 80.

Petitioner fails to show to a reasonable likelihood that Shen anticipates any challenged claim in Ground 1.

**VII. GROUND 2: CIG USA HAS NOT SHOWN A REASONABLE
LIKELIHOOD THAT SOLDANO ANTICIPATES OR RENDERS
OBVIOUS CLAIMS 1–7**

**A. Petitioner fails to show that Soldano discloses all the limitations of
any claim of the ’301 Patent**

Petitioner fails to show that Soldano (Exhibit 1009) discloses all the limitations of any claim of the ’301 Patent. For example, Petitioner fails to show

that Soldano discloses “wherein the optoelectronic diodes and the light receiving chip are disposed directly on the same top surface of the end of the carrier” and “an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier” as required by claim 1. Claims 2-6 depend from claim 1 and thus also contain this limitation. Similarly, independent claim 7 also requires this limitation. And, thus, Petitioner fails to show that Soldano discloses all limitations of any claim of the ’301 Patent. *Id.* at ¶¶ 86-87.

i. **Petitioner Fails to Show that Soldano Discloses “wherein the optoelectronic diodes and the light receiving chip are disposed directly on the same top surface of the end of the carrier”**

Petitioner fails to show that Soldano discloses “wherein the optoelectronic diodes and the light receiving chip are disposed directly on the same top surface of the end of the carrier” as required by independent claim 1. Claims 2-6 depend from claim 1 and thus also contain this limitation. Similarly, independent claim 7 also requires this limitation. And, thus, Petitioner fails to show that Soldano discloses all limitations of any claim of the ’301 Patent. *Id.* at ¶ 88.

Petitioner points to Figures 3 and 5 in Soldano as allegedly disclosing this limitation and argues the grating couplers 505 are the plurality of optoelectronic diodes. *See* Petition at p. 25. However, Figures 3 and 5 of Soldano depict the

photodetectors are not located at the “end of the carrier”. And, Petitioner specifically argues “[t]he silicon photonics chip [301] of Soldano corresponds to the claimed ‘carrier’ of the ’301 patent.” Petition at p. 25; Exhibit 2004 at 89.

This is shown in Petitioner’s annotated version of Figure 5 as follows:

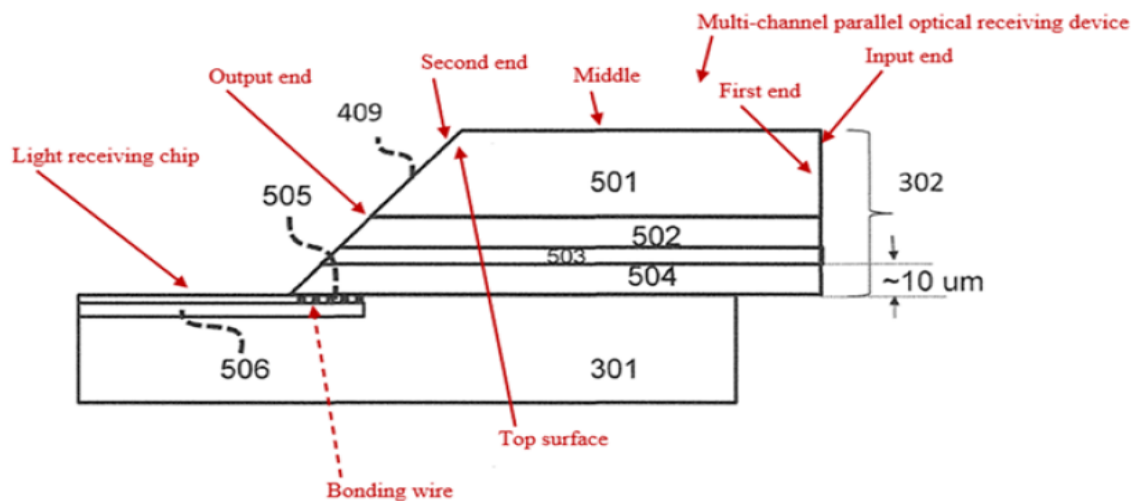
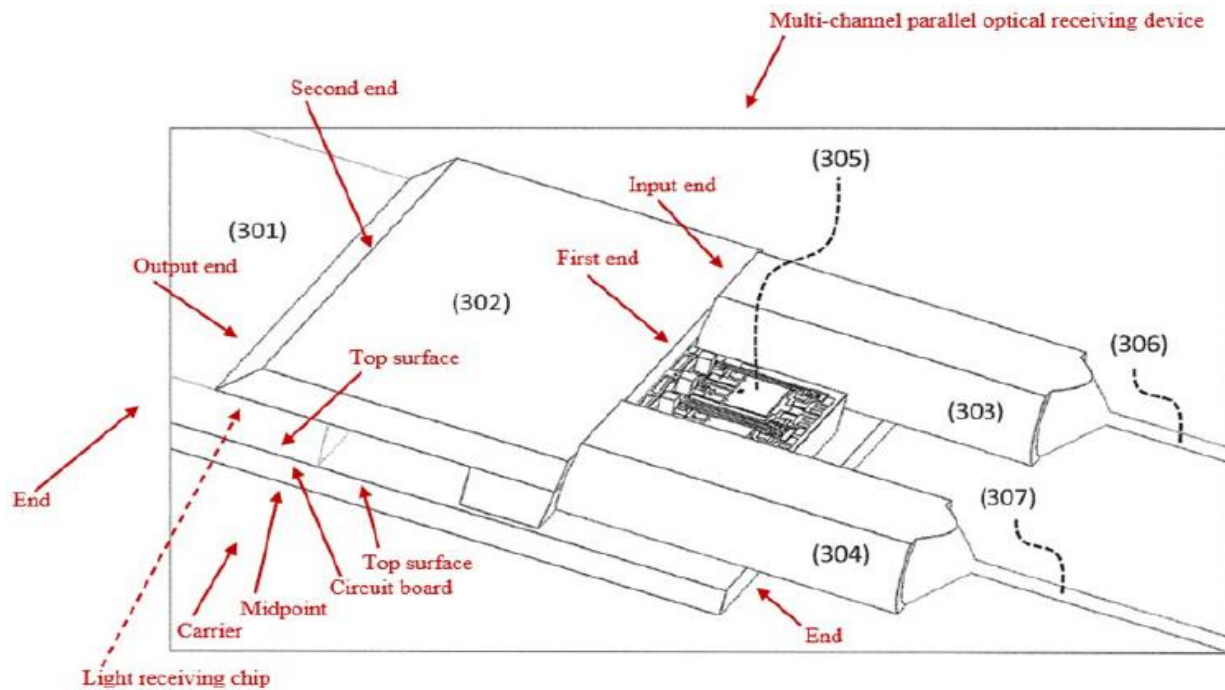


FIG. 1009, FIG. 5

Further, Petitioner’s annotated version of Figure 3 (and Figure 5 above) show the photodetectors 505 (below the “Output end” in Petitioner’s annotated version of Figure 5 above) are not at the “end” of the alleged carrier (silicon photonics chip 301) as identified by Petitioner as follows:



Ex. 1009, FIG. 3

The photodetectors (grating couplers 505) (which the claim says should be at the “end” of the carrier 301) are not at the “end” of the carrier 301 as shown in Petitioner’s annotated Figures 3 and 5 reproduced above. Exhibit 2004 at ¶¶ 90-92.

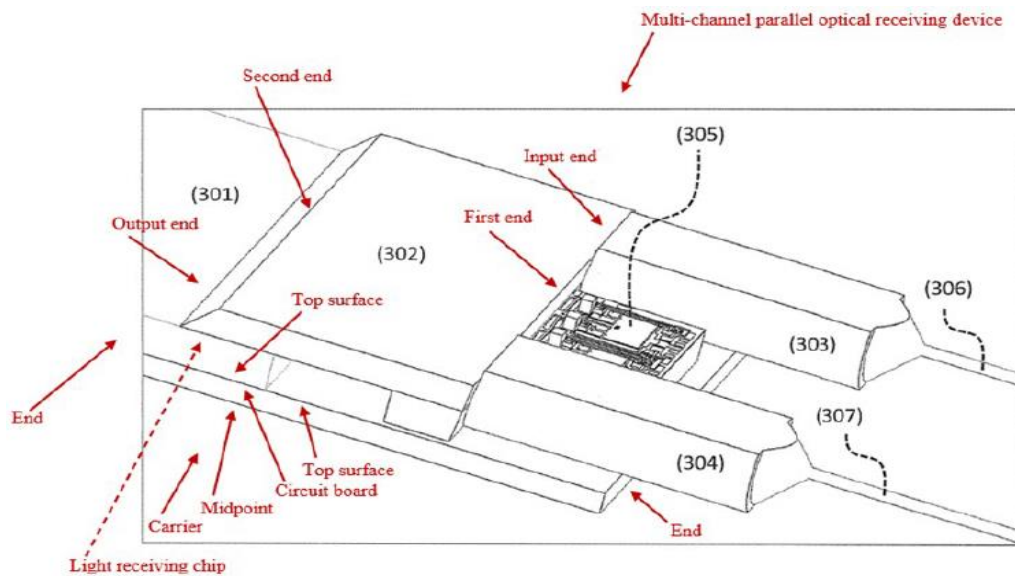
Therefore, Petitioner fails to show that Soldano discloses “a light receiving chip disposed on a top surface of an end of the carrier”. Exhibit 2004 at ¶ 93.

ii. **Petitioner Fails to Show that Soldano Discloses “an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier”.**

Petitioner fails to show that Soldano discloses “an arrayed waveguide

grating further disposed on a top surface of the carrier that defines a midpoint of the carrier” as required by independent claim 1. Claims 2-6 depend from claim 1 and thus also contain this limitation. Similarly, independent claim 7 also requires this limitation. And, thus, Petitioner fails to show that Soldano discloses all limitations of any claim of the ’301 Patent. *Id.* at ¶ 94.

Petitioner argues “Soldano discloses an arrayed waveguide grating (302) located on a top surface of the carrier that defines a midpoint of the carrier.” But, as shown again in Petitioner’s annotated version of Figure 3, arrayed waveguide grating (302) is not at the midpoint of the carrier - wherein Petitioner specifically argues “[t]he silicon photonics chip [301] of Soldano corresponds to the claimed ‘carrier’ of the ’301 patent.” Petition at p. 25. Rather, in both Petitioner’s annotated FIGS. 3 and 5, the arrayed waveguide grating (302) seems to be over the end of carrier 301 and another region beyond the end of the carrier. Exhibit 2004 at ¶ 95.



Ex. 1009, FIG. 3

Therefore, Petitioner fails to show that Soldano discloses “an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier”. Exhibit 2004 at ¶ 96.

Petitioner fails to show to a reasonable likelihood that Soldano anticipates any challenged claim in Ground 2.

VIII. THE BOARD SHOULD EXERCISE ITS DISCRETION TO DENY INSTITUTION.

The Board should exercise its discretion and deny institution of IPR on the '301 Patent. The following factors support a discretionary denial:

- Art relied upon in the Petition was also relied upon by the Office in rejecting claims during prosecution.

- There is significant overlap between the issues in the Petition and in the Litigation. Many of the same claims are challenged, and some of the grounds, the key art, and the arguments are substantially the same in the Petition as in the Litigation. All of the art relied upon in the Petition is also relied upon by Petitioner in the Litigation.
- There has been significant investment in the Litigation in that substantive issues have already been addressed by the parties.
- There are settled expectations in the enforcement of the '301 Patent in that the patent has been in force for almost six years.
- Petitioner's arguments on unpatentability are weak.
- The Petition relies heavily on the declaration of an expert.
- Petitioner and the defendant are the same party.
- The '301 Patent is one of the patents-in-suit in the Additional Litigation between AOI and defendant Accelight, and claim construction and the validity of the '301 Patent may well be adjudicated before the PTAB's decision in an IPR would be due.
- There are no relevant changes in the law that affect patentability.
- Four of the other five patents asserted by AOI in the Litigation are

each the subject of an IPR filed by Petitioner on the same date as this
Petition.

Each of these factors is discussed separately below in sections A through
J.

A. The Petition is Based in Part on Art Presented to the Office.

The Board may consider whether the same or substantially the same prior art
or arguments were previously before the Office during prosecution. 35 U.S.C. §
325(d); *Advanced Bionics, LLC v. Med-El Elektromedizinische Gerate GMBH*,
IPR2019-01469, Paper 6, pp.7-8 (Feb. 13, 2020) (precedential); *General Plastic
Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19, p. 17
(Sept. 6, 2017) (precedential).

Pursuant to § 325(d), the Board uses a two-part test for this factor: (1)
whether the same or substantially the same art or arguments were previously
presented to the Office; and, if the first part is met, (2) whether the petitioner has
shown that the Office erred in a material way with respect to patentability.
(*Advanced Bionics, supra*, at p. 8.) If the first part is met, and the petitioner does
not demonstrate material error by the Office, “the Director generally will exercise
discretion not to institute IPR.” *Id.* at p. 9.

“If reasonable minds can disagree regarding the purported treatment of the art or arguments, it cannot be said that the Office erred in a manner material to patentability. At bottom, this framework reflects a commitment to defer to previous Office evaluations of the evidence of record unless material error is shown.” *Id.*

The Board may use the *Becton, Dickinson* factors (*Becton, Dickinson and Company v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8, pp. 17-18 (December 15, 2017) (precedential section)) to apply the two-part *Advanced Bionics* test. *Advanced Bionics, supra*, at p. 9. These factors are non-exclusive and are to be “read broadly” (*id.* at p. 10): (a) the similarities and differences between the asserted art and the prior art involved during examination; (b) the cumulative nature of the asserted art and the prior art evaluated during examination; (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection; (d) the extent of the overlap between the arguments made during examination and the manner in which the petitioner relies on the prior art; (e) whether the petitioner has pointed out sufficiently how the examiner erred in their evaluation of the asserted prior art; and (f) the extent to which additional evidence and facts presented in the petition justifies reconsideration of the prior art or arguments.

According to *Advanced Bionics*, factors (a), (b), and (d) are used to

determine if the same or substantially the same art or arguments were previously presented to the Office. Factors (c), (e), and (f) are then applied to determine if the petitioner has shown that the Office made a material error. *Id.*

Here, Petitioner makes two arguments for invalidity of claims 1-7: (1) anticipated by Shen; and (2) anticipated by Soldano.

With respect to Petitioner's argument as to Shen, the first part of the *Advanced Bionics* test is met because the same art and similar argument was previously presented to the Office. *See, e.g.*, Exhibit 2004 at ¶¶ 53-64. During prosecution, the Shen Patent Application Publication was a key reference. *See, e.g., id.* The Shen Patent Application Publication was relied upon by the Office in rejecting claims as obvious in three separate Office Actions (on August 29, 2017, April 13, 2018, and September 13, 2018). *Id.* at ¶ 59. In these three Office Actions, the Shen Patent Application Publication was relied upon in rejecting claims in at least six different combinations with up to four other references. *Id.* The Shen Patent Application Publication was the primary reference in many of the rejections. Thus, the Shen Patent Application Publication was not only clearly considered, but relied upon repeatedly and in a variety of combinations with several other references by the Office in rejection the claims. Petitioner relies on the Shen Provisional which Petitioner states was not cited or considered by the

Office. However, the subject matter of the Shen Patent Application Publication and the Shen Provisional application are similar and the Shen Patent Application Publication was the subject of extensive evaluation by the Office. *See, e.g.*, Exhibit 2004 at ¶¶ 70-72; *see also* Exhibit 2004 at ¶¶ 53-64

The second part of the *Advanced Bionics* test as to Shen is also met. Factor (c) is present because the Office evaluated the Shen Patent Application Publication in that it relied on the Shen Patent Application Publication consistently and multiple times in multiple ways to reject claims. *See, e.g. id.* at ¶ 59. Factor (e) is not present or satisfied by Petitioner because Petitioner has not shown that the Office made a material error in evaluating the Shen Patent Application Publication. Petitioner relies on its expert, who states: “in my opinion, a POSITA would have understood the Shen provisional application as explaining that it was simply a matter of design choice whether to locate the light receiving chip on the carrier rather than a PCB.” *See* Exhibit 1003, Declaration of Andrew G. Kirk in Support of Petition, p. 34, ¶ 82 (emphasis added). However, Petitioner has failed to show how the Office erred in not finding the claims anticipated as Petitioner’s expert opines. Given that Petitioner’s argument is based on an opinion about a design choice, then “reasonable minds can disagree regarding the purported treatment of the art [and] it cannot be said that the Office erred in a manner material to

patentability.” See *Advanced Bionics, supra*, at p. 9. Factor (f) is not present or satisfied by Petitioner because Petitioner offers no other evidence to justify reconsideration of the prior art or arguments.

With respect to Petitioner’s argument as to Soldano, the first part of the *Advanced Bionics* test is met because the same art was previously presented to the Office. See Exhibit 2004 at ¶ 54. The Soldano Patent Application Publication (which is essentially the same as Soldano) was cited by the Office, listed in an Information Disclosure Statement, and considered by the Office, although not relied upon by the Office in rejecting claims. *Id.*; see also Exhibit 2004 at ¶¶ 81-85.

The second part of the *Advanced Bionics* test as to Soldano is also met. Factor (c) is present because the Office evaluated the Soldano Patent Application Publication. Factor (e) is not present or satisfied by Petitioner because Petitioner has not shown that the Office made a material error in its consideration of Soldano. Factor (f) is not present or satisfied by Petitioner because Petitioner offers no other evidence to justify reconsideration of the prior art or arguments.

Therefore, pursuant to *Advanced Bionics*, the Board should exercise its discretion and deny institution of IPR based on this factor.

B. The Issues in the Petition Have Significant Overlap with the

Issues in the Litigation.

The Board may consider whether there is significant overlap between the issues raised in the Petition and in the Litigation. See *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11, p. 6 (March 20, 2020) (precedential). “[I]f the petition includes the same or substantially the same claims, grounds, arguments, and evidence as presented in the parallel proceeding, this fact has favored denial.”

Here, there is significant overlap in the issues raised in the Petition and in the Litigation.

First, many of the same claims are challenged in the Petition (claims 1-7) as are challenged in the Litigation (claims 1-4, 7).

Second, all of the art relied upon in the Petition (Shen and Soldano) is relied upon in the Litigation. The art at issue in the Petition is a subset of the art at issue in the Litigation.

Third, the two grounds for invalidity in the Petition are the same or substantially the same as two of the several grounds asserted in the Litigation. In the Petition, Petitioner argues that claims 1-7 are anticipated by Shen; in the Litigation, Petitioner argues that claims 1-4 and 7 are anticipated by or obvious over Shen. In the Petition, Petitioner argues that claims 1-7 are anticipated by

Soldano; in the Litigation, Petitioner argues that claims 1-4 and 7 are anticipated by or obvious over Soldano.

Fourth, the arguments in the Petition are substantially the same as the arguments in the Litigation. Petitioner's arguments as to where the claim limitations are found in the prior art, on a limitation-by-limitation basis, are essentially the same in both proceedings. This is demonstrated by a comparison of the Declaration of Andrew G. Kirk in Support of Petition (Exhibit 1003 at pp. 32-43 as to Shen and pp. 44-52 as to Soldano) filed in the PTAB with Petitioner's Amended Invalidity Contentions and claim charts filed in the Litigation (Exhibit 2002, Ex. G-1 as to Shen and Ex. G-5 as to Soldano).

Thus, there is significant overlap in the challenged claims, the grounds, the art, and the arguments. Moreover, the Litigation involves three other references and three additional grounds not asserted in the Petition. And the Litigation also involves seven other patents. Thus, the issues in the Petition are essentially a subset of the issues in the Litigation; meaning that the Litigation will need to go forward regardless of whether IPR is instituted. The fact that the Litigation involves additional challenges to the '301 Patent weighs in favor of a denial. See *Next Caller Inc. v. Trustid, Inc.*, IPR 2019-00963, Paper 8, p. 12 (October 28, 2019) (informative).

Accordingly, this factor favors denial of institution.

C. The Parties Have Invested in the Litigation by Addressing Substantive Issues.

Pursuant to the District Court's Scheduling Order, between October 2024 and March 2025, AOI and Petitioner exchanged proposed terms for claim construction, exchanged preliminary claim constructions and extrinsic evidence, filed a joint claim construction statement and pre-hearing statement, exchanged damage contentions, and filed opening, responsive, and reply claim construction briefs.

Thus, the parties have spent significant time and effort in conducting discovery, in the claim construction process, and in briefing claim construction.

This factor weighs in favor of denial of institution.

D. There Are Settled Expectations in the '301 Patent.

The '301 Patent was issued on August 13, 2019. The patent has been in force for almost six years. Thus, there are settled expectations of the parties that the '301 Patent is valid and enforceable.

This factor weighs in favor of denial of institution.

E. Petitioner's Arguments on Unpatentability are Weak.

The Board may consider the strength of the petitioner's unpatentability

challenge in determining whether to discretionarily deny institution of IPR. *Apple Inc. v. Fintiv, Inc.*, *supra*, pp. 14-15. If the merits are a “close call,” that fact weighs in favor of denying institution if other factors favoring denial are present. *Id.* at p. 15.

Here, as already discussed above, Petitioner is unlikely to succeed on the merits because Petitioner fails to show that the cited references disclose all the limitations of the '301 Patent.

F. The Petition Relies Almost Exclusively on the Declaration of an Expert.

An over-reliance on expert testimony may weigh in favor of discretionary denial of an IPR. *See Next Caller Inc.*, *supra*, p. 14 (informative); *see also* Director’s Memorandum Interim Processes for PTAB Workload Management” dated March 26, 2025 (the “Memorandum”), Exhibit 2001, at p. 2.

The Petition is based almost exclusively on the 53-page Declaration of Andrew Kirk, Petitioner’s expert (Exhibit 1003). As can be seen from the Petition, every limitation of every challenged claim cites to Exhibit 1003 (*see*, Petition, pp. 16-23 for Shen and pp. 44-52 for Soldano), and the Declaration of Dr. Kirk discusses every limitation of every claim (*see*, Exhibit 1003, pp. 32-43 for Shen and pp. 44-52 for Soldano).

Accordingly, this factor weighs in favor of denial.

G. Petitioner and the Defendant Are the Same Party.

Here, the fact that Petitioner and the defendant in the Litigation are the same party weighs in favor of denial of institution. *See Apple Inc. v. Fintiv, Inc., supra*, pp. 13-14.

H. The Validity of the '301 Patent May Be Adjudicated by a District Court Before the PTAB's Decision Is Due if IPR is Instituted.

The Board may consider whether another forum has already adjudicated the validity of the challenged claims in determining whether to discretionarily deny institution of IPR. Memorandum, Exhibit 2001, at p. 2.

Here, the '301 Patent is one of the patents-in-suit in the Additional Litigation between AOI and defendant Accelight, filed on December 13, 2024. As noted above, five of the six patents-in-suit in the Additional Litigation are also in suit in the Litigation with Petitioner and are the subject of petitions for IPR filed by Petitioner.

In the Additional Litigation, the District Court has ordered the case to move forward, despite the parties' notifying the court that five of the six patents-in-suit are the subject of petitions for IPR filed by Petitioner. On April 23, 2025, the court entered a Scheduling Order which set all of the dates pertaining to claim

construction between June 2025 and October 2025 (exchange of proposed terms, exchange of preliminary constructions and extrinsic evidence, damages contentions, a Joint Claim Construction Statement and Prehearing Statement, claim construction discovery cut-off, opening, responsive, and reply claim construction briefs, and a technical tutorial), and set a claim construction hearing on October 31, 2025. *See* Exhibit 2003.

Defendant Accelight has stated that the validity of the asserted claims of the patents-in-suit is in issue and that it will be taking discovery on invalidity. The court has set invalidity contentions and documents due on May 30, 2025. *Id.*

Thus, the validity of the '301 Patent may well be adjudicated in the Additional Litigation before the PTAB's decision in an IPR, which would be due on or about August 28, 2026 if IPR is instituted. Accordingly, this factor weighs in favor of denial.

I. There Are No Relevant Changes in the Law that Affect Patentability.

There have been no changes in the law or judicial precedent regarding patentability since the '301 Patent issued. Accordingly, this factor weighs in favor of denial of institution. *See* Memorandum, Exhibit 2001, p. 2.

J. Petitioner Filed Petitions for IPR for Four of the Other Patents

Asserted by AOI in the Litigation on the Same Date as this Petition.

The Board may consider all relevant circumstances in determining whether to discretionarily deny institution of IPR. *See* Memorandum, Exhibit 2001, p. 3; *Apple Inc. v. Fintiv, Inc., supra*, p. 14.

The Litigation involves eight AOI patents, five of which are the subject of petitions for IPR filed by Petitioner, including the '301 Patent. These facts indicate that Litigation will need to go forward regardless of the petitions for IPR. Therefore, it would be more efficient for the validity of the '301 Patent to be resolved in the Litigation, and the PTAB could conserve its resources by denying institution. *See, Next Caller Inc., supra*, p. 14, fn. 13, with similar facts (informative). Therefore, this factor weighs in favor of denial.

IX. RESERVATION OF RIGHTS

Should the Board decide to institute an *inter partes* review, Applied Optoelectronics, Inc. reserves all rights to make additional arguments in, and present claim constructions and evidence with, its Patent Owner Response. Applied Optoelectronic's silence on any particular claim or limitation at this time is not a concession that the Petition's discussion of that claim or limitation is properly based. Applied Optoelectronics, Inc. also reserves the right to dispute the

level of ordinary skill in the art if the Board decides to institute *inter partes* review. Accordingly, Applied Optoelectronics, Inc. reserves the right to submit additional or alternative arguments of patentability, and nothing in this Preliminary Response acts or should be construed to act as an admission, acquiescence, or estoppel on the merits of the Petition.

X. CONCLUSION

For the reasons set forth above, Applied Optoelectronics, Inc., respectfully requests that the Board deny institution of the Petition for all Challenged Claims of the '301 Patent.

Dated: May 28, 2025

/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's Preliminary Response, excluding the table of contents, table of authorities, certificate of word count, appendix and certificate of service, totals 8,271 words, which is less than the 14,000 words allowed under 37 C.F.R. § 42.24(b)(1).

Dated: May 28, 2025

/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'S PRELIMINARY RESPONSE**, which was served on May 28, 2025 to the following Counsel for Petitioner via e-mail:

Nicola A. Pisano
Eversheds Sutherland LLP
12255 Camino Real, Suite 100
San Diego, CA 92130-2071
nicolapisano@eversheds-sutherland.com

Regis Worley
Eversheds Sutherland LLP
12255 Camino Real, Suite 100
San Diego, CA 92130-2071
regisworley@eversheds-sutherland.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