# EXHIBIT 2003

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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CAMBRIDGE INDUSTRIES USA, INC.,
Petitioner,

v.

APPLIED OPTOELECTRONICS, INC.,
Patent Owner.

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IPR2025-00434
Patent 10,379,301

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Before MITCHELL G. WEATHERLY, MONICA S. ULLAGADDI, and IFTIKHAR AHMED, *Administrative Patent Judges.*

ULLAGADDI, *Administrative Patent Judge*.

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

# I. INTRODUCTION

Cambridge Industries USA, Inc. ("Petitioner") filed a Petition (Paper 2, "Petition" or "Pet.") requesting an *inter partes* review of claims 1–7 ("the challenged claims") of U.S. Patent No. 10,379,301 (Ex. 1001, "the '301 patent") pursuant to 35 U.S.C. §§ 311–319, accompanied by the supporting Declaration of Dr. Andrew G. Kirk (Ex. 1003). Applied Optoelectronics, Inc. ("Patent Owner") filed a Preliminary Response (Paper 10, "Preliminary Response" or "Prelim. Resp."), accompanied by the supporting Declaration of Dr. Alan E. Willner (Ex. 2004).

The standard for institution is set forth in 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted unless the information presented in the Petition and the Preliminary Response shows that "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314 (2019); *see also* 37 C.F.R § 42.4(a) (2019) ("The Board institutes the trial on behalf of the Director.").

Upon consideration of the parties' contentions and the evidence of record, we conclude that Petitioner has not established a reasonable likelihood of prevailing in demonstrating the unpatentability of at least one challenged claim of the '301 patent. Accordingly, we deny Petitioner's request and do not institute an *inter partes* review.



**IPR2025-01567, Exhibit 2003**

*A. Real Parties-in-Interest*

In addition to itself, Petitioner identifies the following entity as a real party-in-interest: CIG Shanghai, Co. Ltd. Pet. 33. Patent Owner identifies itself as the real party-in-interest. Paper 6, 2.

*B. Related Matters*

The parties identify as related matters the following lawsuits involving the '301 patent: *Applied Optoelectronics, Inc. v. Cambridge Industries USA, Inc.*, 5:24-cv-01010 (N.D. Cal.) and *Applied Optoelectronics, Inc. v. Accelight Technologies, Inc.*, 4:24-cv-09041 (N.D. Cal.). Pet. 34; Paper 6, 2.

*C. The '301 patent*

The '301 patent is titled "Multi-Channel Parallel Optical Receiving Device." Ex. 1001, code (54). More particularly, the '301 patent describes "a multi-channel parallel optical receiving device, including a carrier, a light receiving chip, a plurality of optoelectronic diodes . . . an optical fiber connector . . . and an arrayed waveguide grating disposed on the top surface of the carrier." *Id.* at code (57). "The optical signals are divided into multi-channel optical signals in parallel" and "[t]he top surface of an output end of the arrayed waveguide grating is at a predetermined angle, causing the multi-channel optical signals to be reflected by the top surface and to photosensitive surfaces of the optoelectronic diodes arranged in parallel." *Id.*

According to the '301 patent, "transmitting speed of a single channel of [optical communication] product and the number of the channels must increase in order to improve the overall performance of the datacenter whose limited physical space puts restraint on density of the products," requiring "multi-channel paralleling lights . . . to be enabled in the optical module" and "optical modules . . . to be implemented by connecting the optical

modules," which "are connected by a jumper, resulting in higher cost." *Id.* at 1:17–27.

The '301 patent purports to resolve these problems by designing "the top surface of the arrayed waveguide grating . . . to allow for the optical signals emitting from the arrayed waveguide grating to be reflected by the top surface to the photosensitive surfaces of the optoelectronic diodes," such that "only a placement groove or a guiding structure for the arrayed waveguide grating is needed on the carrier to guide the arrayed waveguide grating to be in the position aligning with the optoelectronic diodes," allowing "the arrayed waveguide grating [to] be installed without too much difficulty" and "simplifying the design of the structure and reducing the length of the bonding wire to enhance the integrity of the entire structure and lower the manufacturing cost of the same." *Id.* at 1:56–2:7.

Figure 1, reproduced below, is an exploded view of a structure of the '301 patent. *Id.* at 2:43–44.

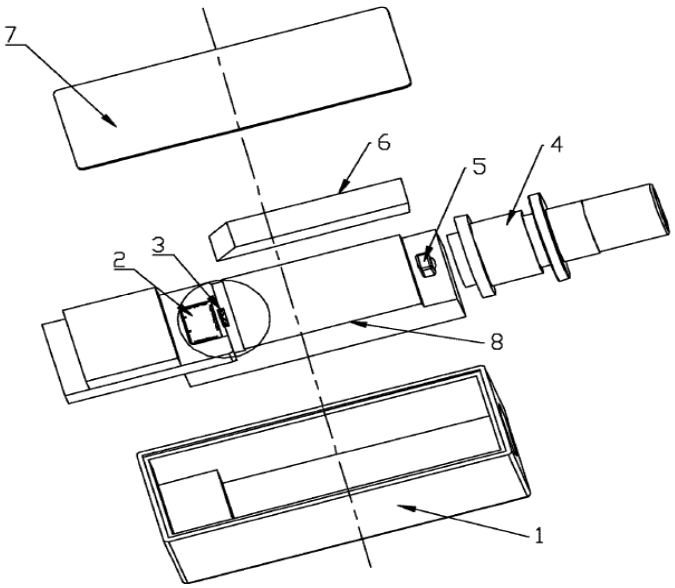


Figure 1 above shows carrier 8 and optoelectronic diodes 3 that may be disposed on a top surface of an end of carrier 8 and electrically connected to light receiving chip 2. *Id.* at 3:1–5. Optical fiber connector 4 may be disposed at another end of carrier 8, and arrayed waveguide grating 6 may be disposed on the top surface of carrier 8. *Id.* at 3:9–12. "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," and "[t]he optical signals may be divided into multi-channel optical signals in parallel by the arrayed waveguide grating 6 based on their wavelengths." *Id.* at 3:12–17.

Figure 3, reproduced below, is a perspective view of structure shown in Figure 1 of the '301 patent. *Id.* at 2:46–47.

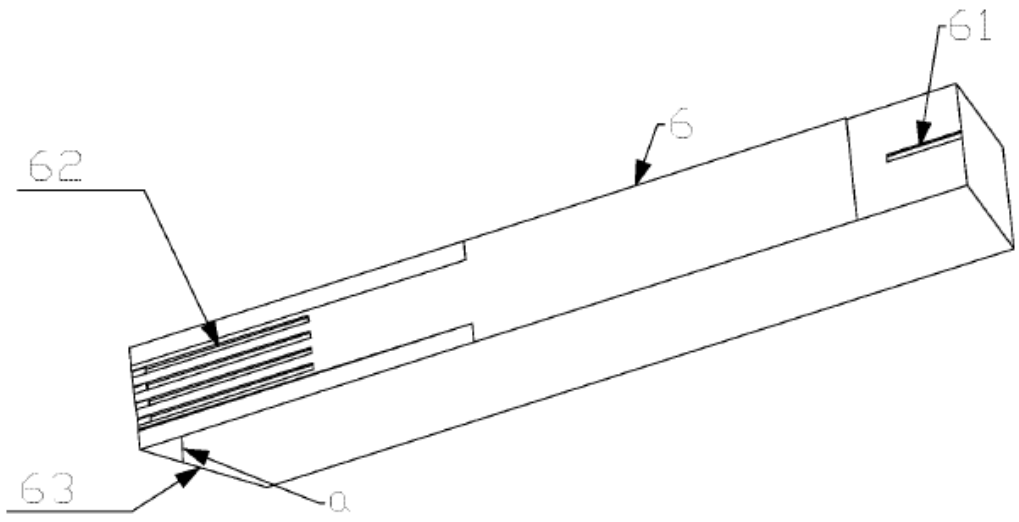



Figure 3 above shows top surface 63 of an output end 62 of the arrayed waveguide grating 6. *Id.* at 3:17–18. The top surface 63 "may be designed to be at a predetermined angle, allowing for the multi-channel optical signals to be reflected by the top surface 63 to the photo-sensitive surfaces of the plurality of optoelectronic diodes 3 arranged in array." *Id.* at 3:17–22.

### *D. Challenged Claims*

Of challenged claims 1–7 of the '301 patent, claims 1 and 7 are independent. Claim 1 is illustrative of the subject matter of the challenged claims and is reproduced below.

> 1. [**1a**] A multi-channel parallel optical receiving device, comprising:
>
> [**1b**] a carrier;
>
> [**1c**] a light receiving chip disposed on a top surface of an end of the carrier;
>
> [**1d**] 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;
>
> [**1e**] an optical fiber connector disposed in an end of the carrier;
>
> [**1f**] an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier, the arrayed waveguide grating having a first end, a middle, and a second end disposed opposite the first end, and an input end of the arrayed waveguide grating connected to the optical fiber connector for receiving an optical signal from the optical fiber wherein the top surface of the carrier underlies the middle of the arrayed waveguide grating; and
>
> [**1g**] 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 multichannel 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.

Ex. 1001, 4:51–5:19 (bracketing added for reference).

### *E. Asserted Grounds of Unpatentability*

Petitioner asserts that claims 1–7 would have been unpatentable on the following grounds:

| Claim(s) Challenged | 35 U.S.C. §[1] | Reference(s)/Basis |
|---|---|---|
| 1–7 | 102 | Shen[2] |
| 1–7 | 102 | Soldano[3] |

Pet. 2. As set forth above, Petitioner relies on the Declaration of Dr. Kirk (Ex. 1003).

## II. ANALYSIS

### *A. Legal Principles*

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3)). "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). We analyze

[1] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112–29, 125 Stat. 284, 285–88 (2011), revised 35 U.S.C. §§ 102, 103 effective March 16, 2013. The earliest possible priority date for the '301 patent claims is May 23, 2016. Ex. 1001, code (30). As that date falls after the effective date of the applicable AIA amendments, we apply the AIA version of 35 U.S.C. § 102 here.
[2] U.S. Patent Pub. 2016/0349451 A1 to Shen et al., published Dec. 1, 2016 (Ex. 1007, "Shen").
[3] U.S. Patent No. 9,768,901 B2 to Soldano et al., issued Sept. 19, 2017 (Ex. 1009, "Soldano").

the challenges presented in the Petition in accordance with the above-stated principles.

### *B. Level of Ordinary Skill in the Art*

Petitioner contends that a person of ordinary skill in the art ("POSA" or "POSITA") "would have had at least (1) an undergraduate degree in electrical engineering, computer engineering, computer science, or a comparable field of study and (2) at least two years of experience with optical data communications and networks or a comparable field of work." Pet. 15–16 (citing Ex. 1003 ¶ 22). According to Petitioner, a POSITA could have "different education and additional experience . . . if that experience compensates for a deficit in their education," and "[a]dditional education might substitute for some experience, and vice versa." *Id.* at 16.

Patent Owner applies Petitioner's proposed level of skill in the art. Prelim. Resp. 18–19.

As Petitioner's description of a POSITA appears consistent with the subject matter of the '301 patent and with the prior art of record, we apply it for purposes of this Decision. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

### *C. Claim Construction*

We interpret a claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b). Under this standard, we construe the claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.*



**IPR2025-01567, Exhibit 2003**

In a first, alternative claim construction theory, Petitioner argues that "the term a '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." Pet. 10 (citing Ex. 1005, 7–9; Ex. 1003 ¶ 62) (emphasis omitted). Petitioner also asserts that "[a] carrier is distinguished from a printed circuit board, which typically comprises fiberglass or plastic. *Id.* (citing Ex. 1007, 7–9; Ex. 1006, 76–83, 173–78, 515–17; Ex. 1003 ¶ 62). Petitioner asserts that "[t]he foregoing distinction is recognized in the '301 Patent." *Id.* (citing Ex. 1001, 4:6–11; Ex. 1003 ¶ 63).

In its second, alternative claim construction theory, Petitioner contends that "[b]ecause the term 'carrier' should be construed consistently for invalidity as for infringement, Petitioner and its expert ha[ve] adopted for purposes of this Petition Patent Owner's construction for carrier as 'one or more components for supporting [Receiver/optical sub-assembly ("ROSA")] components such as an [arrayed waveguide grating ("AWG")].'" *Id.* at 11 (citing Ex. 1003 ¶ 66).

Petitioner also 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.* at 10 (emphasis omitted). According to Petitioner, "[a]s discussed with respect to prosecution of the '301 Patent, the 'same top surface' does not refer to a single plane, but rather the topmost surface of the three distinct adjacent surfaces." *Id.* at 11 (citing Ex. 1003 ¶ 64).

Patent Owner asserts that "the Board need not construe these terms because claim construction is not necessary to resolve the controversy presented" in the Petition. Prelim. Resp. 20.



**IPR2025-01567, Exhibit 2003**

We do not find it necessary to construe the claims at this stage of the proceeding. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are 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))); *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) ("[C]laim terms need only be construed 'to the extent necessary to resolve the controversy'").

### *D. Challenge Applying Shen*

Petitioner contends that independent claims 1 and 7 and dependent claims 2–6 would have been unpatentable as anticipated by Shen. Pet. 16–23.

#### *1. Overview of Shen (Ex. 1007)*

Shen is titled "Optical Connection Module." Ex. 1007, code (54). Shen's optical connection module has an arrayed wavelength grating structure and an optical detector, both disposed on a substrate, and the arrayed wavelength grating structure is configured to transmit a light while the optical detector is configured to detect the light propagating through the arrayed wavelength grating structure. *Id.* at code (57).

Figure 1, reproduced below, is a cross-sectional view of an optical connection module taught by Shen. *Id.* ¶ 24.



**IPR2025-01567, Exhibit 2003**

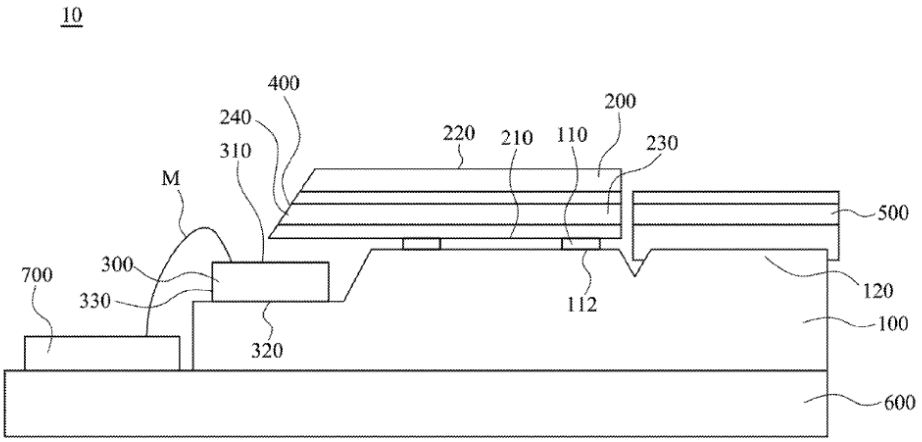



Figure 1 above shows optical connection module 10 including substrate 100, arrayed wavelength grating structure 200 disposed on substrate 100, optical detector 300 disposed on substrate 100, and oblique surface 400. *Id.* ¶ 33.

Oblique surface 400 is configured to redirect the light propagated through the arrayed wavelength grating to the optical detector. *Id.* Arrayed wavelength grating structure 200 may include first surface 210 and second surface 220 connected with oblique surface 400, and an acute angle is formed by oblique surface 400 and first surface 210. *Id.* ¶ 39.

*2. Petitioner's Contentions for Independent Claim 1*

For the reasons that follow, we are not persuaded that Petitioner sufficiently shows that it will prevail on its assertions that Shen would have anticipated independent claim 1, and in particular, that Shen discloses limitation [1d].

> ***[1a]*** *A multi-channel parallel optical receiving device, comprising:*

According to Petitioner, "Shen discloses a multi-channel parallel optical receiving device (10)."[4] Pet. 16 (citing Ex. 1007 ¶¶ 33, 43, Fig. 1; Ex. 1008[5], 6–8; Ex. 1003 ¶ 80).

> ***[1b]*** *a carrier;*

In a *first*, alternative argument, with regard to the claimed "carrier," Petitioner contends that, "[a]s construed by Patent Owner in its infringement contentions, Shen discloses **a carrier (substrate 100 and PCB [printed circuit board] 600)**." Pet. 16 (citing Ex. 1007 ¶¶ 33, 44; Ex. 1003 ¶ 81) (emphasis added).

In a *second*, alternative argument, Petitioner contends that "the Shen provisional application explains that the photodiodes and TIA IC [transimpedance amplifier integrated chip] (corresponding to the claimed 'light receiving circuit') **could both be located on the S[i]OB substrate (which is a carrier, not a PCB)** to minimize wire bonds." *Id.* at 17 (citing Ex. 1008, 6–8; Ex. 1003 ¶ 81) (emphasis added). Petitioner contends that "[a] POSITA would have understood that it was simply a matter of design

[4] Shen refers to element 10 as an "optical connection module." Petitioner's choice to use the '301 patent's claim term instead of Shen's own terminology in conjunction with Shen's element number is, at best, confusing, and at worst, misleading. *See*, *e.g.*, Pet. 17 (Petitioner referring to Shen's driver 700 as "light receiving chip (700)"), 19 (Petitioner referring to Shen's optical passive device 500 as "an optical fiber connector (500)"). We reproduce Petitioner's contentions as set forth in the Petition, but cite Shen's actual terms in our analysis of the parties' contentions. *Infra* § II.D.4.

[5] U.S. Provisional Application No. 62/166,015 underlying the Shen reference (Ex. 1008, "the Shen Provisional").



**IPR2025-01567, Exhibit 2003**

choice whether to use a multi-level substrate 100 in lieu of substrate 100 and PCB 600." *Id.* at 16–17 (citing Ex. 1007 ¶¶ 33, 44; Ex. 1003 ¶ 81).

> ***[1c]*** *a light receiving chip disposed on a top surface of an end of the carrier;*

In Petitioner's *first*, alternative argument in which the combination of substrate 100 and PCB 600 is cited as teaching the claimed "carrier," Petitioner contends that "Shen discloses a light receiving chip (700) located on a top surface of an end of the carrier (substrate 100 + PCB 600)." Pet. 17 (citing Ex. 1007 ¶¶ 33–37, 44, Fig. 1).

We note that Petitioner's *first*, alternative argument runs afoul of Petitioner's *first*, alternative claim construction theory. As set forth above, Petitioner asserts that "the term . . . 'carrier' should be construed as 'a ceramic or silicon substrate,'" further asserts that "[a] **carrier is distinguished from a printed circuit**," and also points to the specification of the '301 patent to support its assertion that "[t]he **foregoing distinction is recognized in the '301 Patent**." *Id.* at 10 (citing Ex. 1005, 7–9; Ex. 1001, 4:6–11; Ex. 1003 ¶¶ 62, 63; Ex. 1006, 76–83, 173–78, 515–17) (emphasis omitted and added).

In Petitioner's *second*, alternative argument in which SiOB substrate *alone* is cited as teaching the claimed "carrier," Petitioner contends that "the Shen provisional application discloses that a POSITA would have understood that it was simply a matter of design choice whether to locate the light receiving chip on the carrier" "rather than a PCB." *Id.* at 17 (citing Ex. 1008, 6–8; Ex. 1003 ¶ 82).

We need not determine whether either of Petitioner's arguments comports with Petitioner's *second*, alternative claim construction theory for the reasons discussed below with respect to limitation [1d]. *Infra* § II.D.4.



**IPR2025-01567, Exhibit 2003**

> ***[1d]*** *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;*

Petitioner contends that "Shen discloses an optical detector (300) located on the top surface of the end of the carrier. The optical detector (300) includes a plurality of optoelectronic diodes one for each channel wavelength output by the arrayed wavelength grating (AWG)." Pet. 17–18 (citing Ex. 1007 ¶ 43, Fig. 3; Ex. 1008, 7). According to Petitioner, "[a] POSITA would have understood that because the output waveguides (278) are spaced apart, the optical detector necessarily includes a plurality of photodetectors to receive the multiple channel wavelength optical signals output by the AWG." *Id.* at 18 (citing Ex. 1003 ¶¶ 83–84).

With respect to Petitioner's *first* alternative argument, Petitioner explains "[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." *Id.* (citing Ex. 1007 ¶¶ 33–37, 44, Fig. 1; Ex. 1003 ¶ 84; Ex. 1008, 8).

Petitioner explains that the cited portion of the Shen Provisional states that "TIA IC [transimpedance amplifier integrated chip] may be located on the same substrate (S[i]OB) with PD [photodetector] or located on the PCB and connected to the PD on the S[i]OB through wire bonding." *Id.* (citing Ex. 1008, 8) (first and third alterations in original).

As set forth above, with respect to Petitioner's *second*, alternative argument, Petitioner states that "the Shen Provisional explain that the photodiodes and the TIA IC (corresponding to the claimed 'light receiving

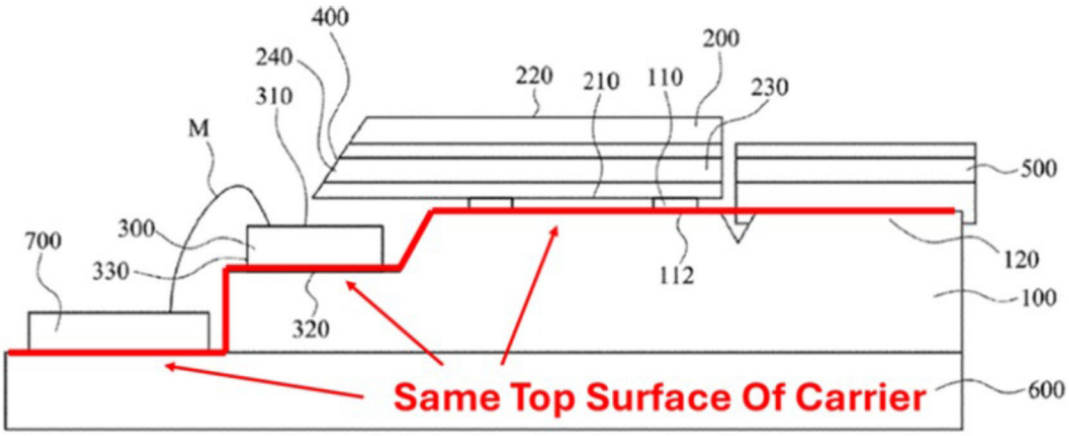
circuit') could both be located on the S[i]OB substrate (which is a carrier, not a PCB) to minimize wire bonds." *Id.* at 17 (citing Ex. 1008, 6–8, Ex. 1003 ¶ 81).

*3. Patent Owner's Contentions for Independent Claim 1*

Patent Owner disputes Petitioner's contentions with respect to limitation [1d]. In particular, Patent Owner contends that "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.'" Prelim. Resp. 24. Pointing to Petitioner's annotated version of Shen's Figure 1, Patent Owner quotes the portion of Shen that discloses that "[t]he **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." *Id.* (citing Ex. 1007 ¶ 44; Ex. 2004 ¶¶ 73–77) (emphasis added).

*4. Analysis of the Parties' Contentions*

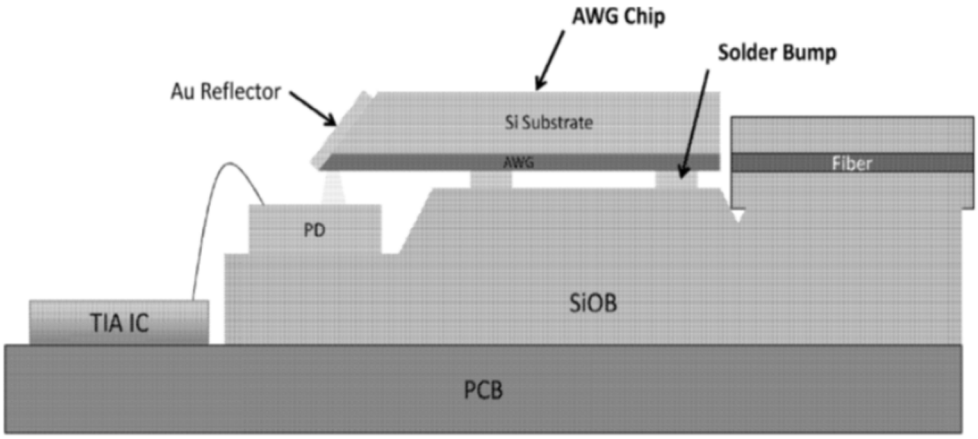
With respect to Petitioner's *first*, alternative argument, we find Patent Owner's arguments persuasive. Petitioner's annotated version of Shen's Figure 1, reproduced below, depicts various elevations of the top surface of the combination of circuit board 600 and substrate 100, which is cited as teaching the claimed carrier.




Petitioner's annotated version of Shen's Figure 1 depicts multiple elevations of a top surface. Pet. 19.

Even assuming, *arguendo*, we accept Petitioner's contention that all three elevations in Shen's Figure 1 constitute the claimed "the same top surface," driver 700, which Petitioner cites as teaching the claimed "light receiving chip," is depicted as disposed directly on *only* circuit board 600, whereas optical detector 300 is disposed on carrier 100, which is disposed on top of circuit board 600. Ex. 1007, Fig. 1. Stated differently, we determine that Petitioner's *first*, alternative argument is deficient because it does not show driver 700 on what Petitioner points to teaching the claimed "carrier"—that is, the *combination* of Shen's substrate 100 and circuit board 600—and thus does not sufficiently show that Shen discloses "the optoelectronic diodes and the light receiving chip are disposed directly on the same top surface of the end of the carrier," as recited in limitation [1d].

With respect to Petitioner's *second*, alternative argument, Patent Owner points to an unnumbered figure in the Shen Provisional, reproduced below, and persuasively argues that "if the substrate 100 (i.e., SiOB in the figure below) [alone] is the carrier, then the light receiving chip (700) (TIA IC in the figure below) is not on the carrier." Prelim. Resp. 25.




The unnumbered figure in the Shen Provisional depicts TIA IC on PCB and PD on SiOB. Ex. 1008, 6.

Patent Owner also persuasively contends that "if light receiving chip (700) is placed directly on the SiOB," then "the light receiving chip (700) would no longer be electrically connected via bonding wire as required by the claim." Prelim. Resp. 25–26 (citing-in-part Ex. 1008, 6–8). Not only does the Shen Provisional imply a distinction between situations in which a bonding wire is used—when the TIA IC is located on the PCB and PD is on the SiOB, and when no bonding wire is used—when "TIA IC may be located on the same substrate (S[i]OB) with PD," Petitioner acknowledges this distinction by asserting that "the photodiodes and TIA IC (corresponding to the claimed 'light receiving circuit') could both be located on the S[i]OB substrate (which is a carrier, not a PCB) **to minimize wire bonds**." *Id.*; Pet. 17 (citing Ex. 1008, 6–8; Ex. 1003 ¶ 81) (emphasis added).

In sum, Petitioner's *second*, alternative argument is deficient because it does not show that the Shen Provisional expressly or inherently discloses that when TIA IC and PD are directly disposed on what Petitioner cites as teaching the claimed "carrier"—*only* substrate SiOB—they are connected via a bonding wire. *See Verdegaal Bros.*, 814 F.2d at 631. That is,

Petitioner's *second*, alternative argument is deficient in that Shen (and the underlying Shen Provisional) does not disclose "the plurality of optoelectronic diodes electrically connected to the light receiving chip via bonding wire," as recited in limitation [1d].

*5. Summary*

In view of the foregoing, we are not persuaded that Petitioner demonstrates a reasonable likelihood of prevailing on its anticipation challenge to independent claim 1 applying Shen. Petitioner's arguments with respect to dependent claims 2–6 do not cure the deficiencies noted above with respect to independent claim 1. Pet. 21–23. As such, Petitioner does not demonstrate a reasonable likelihood of prevailing with respect to dependent claims 2–6.

Petitioner cites its argument for independent claim 1 and dependent claim 4 for independent claim 7. *Id.* at 23 (citing Ex. 1003 ¶¶ 106–107) ("Claim 7 combines the elements of claims 1 and 4 and is anticipated by Shen for the same reasons as described above for claims 1 and 4."). As such, we are not persuaded that Petitioner demonstrates a reasonable likelihood of prevailing with respect to its anticipation challenge to independent claim 7 applying Shen.

*E. Challenge Applying Soldano*

Petitioner contends that independent claims 1 and 7 and dependent claims 2–6 would have been unpatentable as anticipated by Soldano. Pet. 24–29.

*1. Overview of Soldano (Ex. 1009)*

Soldano is titled "Planar Lightwave Circuit Active Connector." Ex. 1009, code (54). Soldano discloses "[a]n assembly of waveguide wavelength multiplexers and demultiplexers, together with continuous wave



**IPR2025-01567, Exhibit 2003**

(CW) laser transmitters that interface to grating couplers on a silicon photonics chip." *Id.* at code (57). Figure 3, reproduced below, is a view of the planar lightwave circuit (PLC) and silicon, silicon photonics chip, and fiber of Soldano. *Id.* at 7:62–8:10

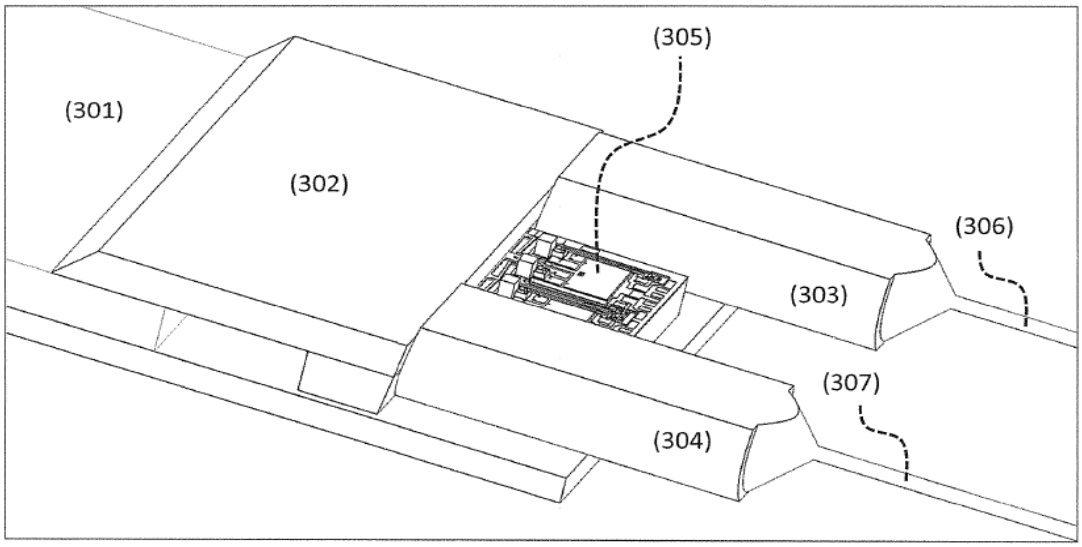



Figure 3 above shows multi-wavelength light that is demultiplexed into four individual channels in the PLC 302, e.g., "using a conventional wavelength sensitive structure such as an AWG." *Id.*

An "angle polished side on the PLC directs the light down into grating couplers on the silicon photonics chip." *Id.* at 7:35–37.

*2. Petitioner's Contentions for Independent Claim 1*

For the reasons that follow, we are not persuaded that Petitioner sufficiently shows that it will prevail on its assertions that Soldano would have anticipated independent claim 1, and in particular, that Soldano discloses limitations [1d] and [1f].

***[1a]*** *A multi-channel parallel optical receiving device, comprising:*

Petitioner contends that "Soldano discloses a multi-channel parallel optical receiving device." Pet. 24 (citing Ex. 1009, Figs. 3, 5, 7:28, 8:28; Ex. 1003 ¶ 108).

***[1b]*** *a carrier;*

With respect to the claimed "carrier," Petitioner contends that "Soldano disclose[s] a silicon photonics chip [301] coupled to an arrayed waveguide grating ('AWG') that includes a demultiplexer for an incoming multiwavelength optical signal and multiplexer for outgoing optical signals." Pet. 24 (citing Ex. 1009, 9:5–12). Petitioner explains that "[t]he silicon photonics chip [301] of Soldano corresponds to the claimed 'carrier' of the '301 patent." *Id.* at 25 (citing Ex. 1003 ¶ 109).

***[1c]*** *a light receiving chip disposed on a top surface of an end of the carrier;*

Petitioner contends that "Soldano discloses a light receiving chip located on a top surface of an end of the carrier." Pet. 25 (citing Ex. 1009, Figs. 3, 5, 8:8–10, 8:14–20, 9:15–20; Ex. 1003 ¶ 110).[6]

[6] It is not clear which element in Soldano Petitioner is citing as teaching the "light receiving chip." In Petitioner's annotated version of Soldano's Figure 9, an unlabeled part with no element number is annotated with the words "light receiving chip." Pet. 24; *see also id.* at 24–25 (Petitioner's showing for limitations [1a] and [1b]).



**IPR2025-01567, Exhibit 2003**

> ***[1d]*** *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;*

Petitioner contends that "Soldano discloses in an alternative embodiment a plurality of optoelectronic diodes (505)[7] located on the top surface of the end of the carrier." Pet. 25 (citing Ex. 1009, Figs. 3, 5, 8:14–20). According to Petitioner, Soldano discloses that "[t]he plurality of optoelectronic diodes (505) are electrically connected to the light receiving chip, **which a POSITA would have understood could be accomplished via wire bonds**." *Id.* (citing Ex. 1009, 10:10–19; Ex. 1003 ¶ 111) (emphasis added). Petitioner further contends that "[t]he optoelectronic diodes (505) and the light receiving chip are located directly on the same top surface of the end of the carrier." *Id.* (citing Ex. 1009, Figs. 3, 5, 8:4–8, 8:14–28, 10:10–25; Ex. 1003 ¶ 111).

> ***[1e]*** *an optical fiber connector disposed in an end of the carrier;*

According to Petitioner, "Soldano discloses an optical fiber connector (303) located in an end of the carrier." Pet. 25 (citing Ex. 1009, Fig. 3, 7:24–32, 7:52–65; Ex. 1003 ¶ 112).

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[7] Soldano refers to element 505 as a grating coupler. Petitioner's choice to use the '301 patent's claim term instead of Soldano's own terminology in conjunction with the Soldano's element number is, at best, confusing, and at worst, misleading. *See*, *e.g.*, Pet. 25 (Petitioner referring to Soldano's capillary 303 as "optical fiber connector (303)"). We reproduce Petitioner's contentions as set forth in the Petition, but cite Soldano's actual terms in our analysis of the parties' contentions. *Infra* § II.E.4.



**IPR2025-01567, Exhibit 2003**

> ***[1f]*** *an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier, the arrayed waveguide grating having a first end, a middle, and a second end disposed opposite the first end, and an input end of the arrayed waveguide grating connected to the optical fiber connector for receiving an optical signal from the optical fiber wherein the top surface of the carrier underlies the middle of the arrayed waveguide grating*

Petitioner contends that "Soldano discloses an arrayed waveguide grating (302) located on a top surface of the carrier that defines a midpoint of the carrier." Pet. 25 (citing Ex. 1009, 7:65–8:1; Fig. 3). According to Petitioner, "[t]he arrayed waveguide grating has a first end, a middle, and a second end located opposite the first end." *Id.* (citing Ex. 1009, 7:65). Petitioner explains that "[a]n input end of the arrayed waveguide grating (302) is connected to the optical fiber connector (303) for receiving an optical signal from the optical fiber (306)." *Id.* at 25–26 (citing Ex. 1009, 7:24–8:10, Fig. 3). Petitioner further contends that "[t]he top surface of the carrier underlies the middle of the arrayed waveguide grating (302)." *Id.* at 26 (citing Ex. 1009, 7:24–8:10, Figs. 3, 5; Ex. 1003 ¶ 113).

*3. Patent Owner's Contentions for Independent Claim 1*

*First*, Patent Owner argues that grating couplers 505, which Petitioner has cited as teaching the claimed "plurality of optoelectronic diodes," "are not located at the 'end of the carrier'" as required by independent claim 1. Prelim. Resp. 27–28 (citing Pet. 25; Ex. 1009, Figs. 3, 5).

*Second*, Patent Owner argues that Petitioner's argument is deficient because Soldano does not disclose "an arrayed waveguide grating [is] further disposed on a top surface of the carrier that defines a midpoint of the carrier" as required by independent claim 1. *Id.* at 29–30. According to



**IPR2025-01567, Exhibit 2003**

Patent Owner, "Petitioner argues 'Soldano discloses an arrayed waveguide grating (302) located on a top surface of the carrier that defines a midpoint of the carrier.'" *Id.* at 30. "Rather," Patent Owner contends, "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." *Id.* (citing Ex. 2004 ¶ 95).

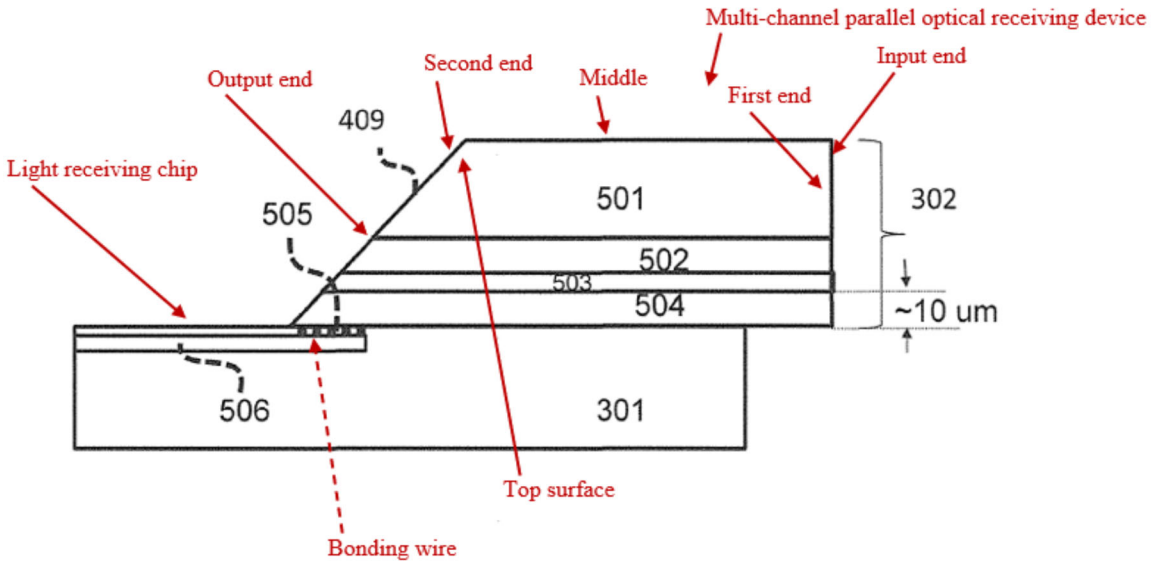
*4. Analysis of the Parties' Contentions*

We note that, with respect to at least limitation [1d], Petitioner applies the wrong legal standard. In an anticipation challenge, it is not dispositive whether "a POSITA would have understood" a connection between grating coupler 505, cited as teaching the claimed "optoelectronic diodes" and whatever element is cited as teaching the claimed "light receiving chip" "**could** be accomplished via wire bonds." Pet. 25 (citing Ex. 1009, 10:10–19; Ex. 1003 ¶ 111) (emphasis added); *see* n.6 *supra* (determining a lack of clarity with respect to "which element in Soldano Petitioner is citing as teaching the 'light receiving chip'"). Rather, the dispositive inquiry is whether the reference, Soldano, discloses that the connection method between grating couplers 505 and light receiving chip is employs a bonding wire. Petitioner does not contend that Soldano inherently discloses limitation [1d]. Pet. 25.

In Petitioner's annotated version of Soldano's Figure 5, reproduced below, Soldano does not depict or disclose a bonding wire between grating coupler 505, cited as teaching the claimed "optoelectronic diodes" and whatever element is cited as teaching the claimed "light receiving chip." *See generally* Ex. 1009; *see also id.* at 10:10–19 (cited by Petitioner as teaching connection via bonding wire).



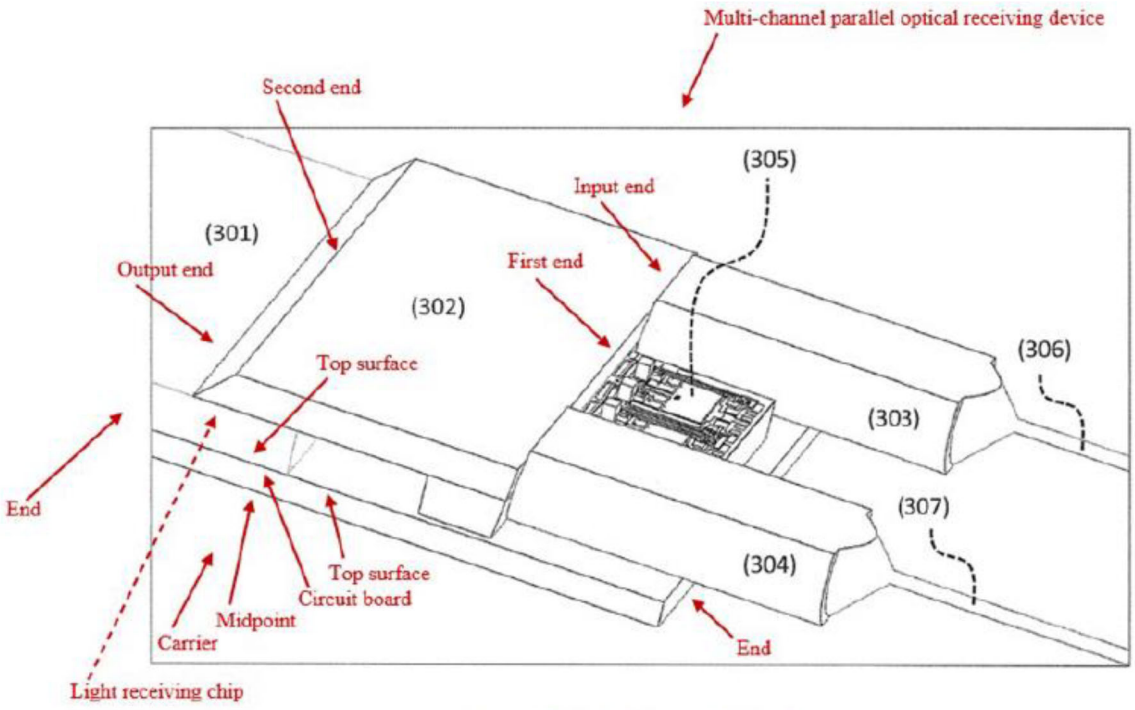
**IPR2025-01567, Exhibit 2003**




Petitioner's annotated version of Soldano's Figure 5 depicts, *inter alia*, grating coupler 505, waveguide 506, silicon photonics chip 301, and dots without a reference number.

It is only Petitioner's own annotation to Soldano's Figure 5, referring to unlabeled, unreferenced dots as the claimed "bonding wire" that is the "evidence" relied upon. Pet. 24. Accordingly, we are not persuaded Soldano discloses limitation [1d]. Dr. Kirk's Declaration substantially mirrors Petitioner's assertion that "[t]he plurality of optoelectronic diodes (505) are electrically connected to the light receiving chip, which a POSITA would have understood **could** be accomplished via wire bonds." Ex. 1003 ¶ 111 (citing Ex. 1009, 10:10–19) (emphasis added).

We find Patent Owner's second argument persuasive for another independent reason. In Petitioner's annotated version of Soldano's Figure 3, reproduced below, planar lightwave circuit 302, which Petitioner cites as teaching the claimed "arrayed waveguide grating," is not depicted as defining the midpoint of silicon photonics chip 301, which Petitioner cites as teaching the claimed "carrier."




Petitioner's annotated version of Soldano's Figure 3 depicts, *inter alia*, silicon photonics chip 301 underlying PLC 302.

As silicon photonics chip 301 is depicted as extending out of the frame of Figure 3, it is not possible to determine how long Si photonics chip 301 is, nor where its midpoint is. Pet. 15.

The cited portions in columns 7 and 8 of Soldano describe the components and structure of Figure 3. *See* Ex. 1009, 7:24–8:10. The cited portions do not expressly or inherently disclose the positioning of planar lightwave circuit 302 relative to silicon photonics chip 301. *Id.* In view of the foregoing, Soldano does not disclose "an arrayed waveguide grating further disposed on a top surface of the carrier that defines a midpoint of the carrier" and that "the top surface of the carrier underlies the middle of the arrayed waveguide grating," as recited in limitation [1f].

*5. Summary*

In view of the foregoing, we are not persuaded that Petitioner demonstrates a reasonable likelihood of prevailing on its anticipation challenge to independent claim 1 applying Soldano. Petitioner's argument with respect to dependent claims 2–6 do not cure the deficiencies noted above with respect to independent claim 1. Pet. 26–29. As such, Petitioner does not demonstrate a reasonable likelihood of prevailing with respect to dependent claims 2–6. Petitioner cites its argument for independent claim 1 and dependent claim 4 for independent claim 7. *Id.* at 29 (citing Ex. 1003 ¶¶ 128–129) ("Soldano discloses all of the elements of Claim 7, and therefore anticipates Claim 7, for the same reasons as described above with respect to Claims 1 and 4."). As such, we are not persuaded that Petitioner demonstrates a reasonable likelihood of prevailing with respect to its anticipation challenge to independent claim 7 applying Soldano.

## III. CONCLUSION

For the foregoing reasons, we conclude that the information presented in the Petition does not present a reasonable likelihood that Petitioner would prevail in argument that at least one of the claims of the '301 patent is unpatentable.

## IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), Petitioner's request for institution of an *inter partes* review of claims 1–7 of the '301 patent is *denied*.



**IPR2025-01567, Exhibit 2003**

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**IPR2025-01567, Exhibit 2003**