

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: IPR2025-00436

U.S. Patent No. 10,313,024

**PETITION FOR *INTER PARTES* REVIEW UNDER 35 U.S.C. §§ 311–319
AND 37 C.F.R. § 42.104**

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Exhibit	Short Name	Description
Ex. 1001	'024 Patent	U.S. Patent No. 10,313,024
Ex. 1002	'024 Patent File History	File History of U.S. Patent No. 10,313,024
Ex. 1003	Kirk Declaration	Expert Declaration of Dr. Andrew G. Kirk
Ex. 1004	Kirk CV	<i>Curriculum Vitae</i> of Dr. Andrew G. Kirk
Ex. 1005	Scheduling Order	Doc. No. 30, Scheduling Order, <i>Applied Optoelectronics, Inc. v. Cambridge Industries USA, Inc.</i> , No. 3:24-cv-01010-JD (N.D. Cal.)
Ex. 1006	Mizobuchi	U.S. Patent No. 9,568,694
Ex. 1007	Akashi	U.S. Patent App. Pub. No. 2014/0140665 A1
Ex. 1008	Hartzell	U.S. Patent App. Pub. No. 2005/0175350 A1
Ex. 1009	Claim Construction Statement	Joint Claim Construction Pre-hearing Statement, Dkt. 34, December 16, 2024, in <i>Applied Optoelectronics, Inc. v. Cambridge Industries USA, Inc.</i> , No. 3:24-cv-01010-JD (N.D. Cal.)
Ex. 1010	Excerpt from Infringement Claim Charts	Excerpt from Patent Owner's L.R. 3-1 & 3-2 Disclosures, June 6, 2024, in <i>Applied Optoelectronics, Inc. v. Cambridge Industries USA, Inc.</i> , No. 3:24-cv-01010-JD (N.D. Cal.)

Cambridge Industries USA, Inc. (“Petitioner” or “CIG USA”) petitions for *Inter Partes* Review (“IPR”) under 35 U.S.C. §§ 311–319 and 37 C.F.R. § 42 of Claims 1–17 (“the Challenged Claims”) of U.S. Patent No. 10,313,024 (the “’024 Patent”). Petitioner requests cancellation of the Challenged Claims.

I. STANDING UNDER 37 C.F.R. § 42.104(a)

Petitioner certifies that the ’024 Patent is available for IPR, and that Petitioner is not barred or estopped from requesting IPR.

II. PAYMENT OF FEES

Petitioner authorizes Account No. 19-5029 to be charged for any fees.

III. OVERVIEW OF CHALLENGES AND RELIEF REQUESTED

Pursuant to § 42.22(a)(1) and § 42.104(b)(1)–(2), Petitioner requests cancellation of the Challenged Claims pursuant to the grounds below.

Ground 1: Claims 1-17 are unpatentable under 35 U.S.C. § 102 as anticipated by Mizobuchi.

Ground 2: Claims 1-17 are unpatentable under 35 U.S.C. § 102 as anticipated by Akashi.

IV. BACKGROUND

A. Overview of the ’024 Patent

Prior to the filing of the ’024 Patent, transmitter optical subassembly (“TOSA”) modules were well-known to persons of ordinary skill in the art

(“POSITAs”) of optical data communications. Ex. 1003, ¶¶ 39-46. Such modules typically comprised a hermetically sealed cavity that contain lasers (also referred to as “laser packages”) driven by light engine driving circuits, and a circuit board containing other module components. The contents of the hermetically sealed cavity are electrically coupled to the module components outside the cavity by a “feedthrough device,” i.e., a secondary circuit board that extends through the hermetic boundary. *Id.*, p. 41.

Circuitry arrangements designed to reduce electrical interference between power and radio frequency (“RF”) signals, such as those provided by light engine driving circuits, also were well-known in the field. *Id.*, ¶¶ 42-45. A common strategy for reducing such interference was to separate the power and RF traces on different circuit boards or on opposite sides of the same circuit board. *Id.*, ¶¶ 43, 47; Ex. 1008, ¶¶ [0028]-[0033]. The ’024 Patent simply combines standard TOSA module designs with well-known arrangements for reducing electrical interference between power and RF signals of circuitry and components used in such modules. Ex. 1003, ¶ 47. The ’024 Patent utterly lacks novelty.

Specifically, the ’024 Patent describes and claims a TOSA module that has its power and RF traces on both its main board and feedthrough device in “opposing arrangement.” *See* Ex. 1001. The ’024 Patent describes “a [TOSA] having a hermetically sealed cavity with a feedthrough device that electrically isolates RF and

power traces.” *Id.*, Abstract. The ’024 Patent discloses that driving circuitry of the TOSA is located on a substrate having a first end electrically connected to transmit connecting circuitry and a second end connected to a hermetically sealed cavity. *Id.* One or more laser packages for emitting associated channel wavelengths are contained within the hermetically sealed cavity. *Id.* The hermetically sealed cavity has a feedthrough device that provides power and RF traces electrically connected to the circuitry of the substrate, as well as an optical coupling port for connecting the TOSA to an external optical fiber or other connection. *Id.*

As demonstrated by the prior art discussed this Petition, the ’024 Patent describes a standard optical communication module that employs a well-known circuit board design for reducing electrical interference between power and RF signals. Ex. 1003, ¶ 47. The Board should thus institute review because there is a strong likelihood that Petitioner will prevail on at least one Challenged Claim.

B. Technical Background

A transmitting optical subassembly (“TOSA”) is an optical data communication module that generally is used to transmit an optical signal in various high speed optical data communications applications (e.g., high-speed internet and broadband television). *See* Ex. 1001, 1:16–37. A TOSA typically includes a hermetically sealed cavity that contains one or more lasers for emitting an optical signal of one or more channel wavelengths, and associated circuitry required to drive

the lasers. *Id.* Operation of the TOSA involves transmission of power and RF signals in such circuitry and across the feedthrough device that communicates with the contents of the hermetically sealed cavity. Ex. 1003, ¶ 39.

As discussed, *supra*, TOSAs and associated circuitry of optical transceivers provide power and RF signals to driving the lasers within the sealed cavity. *Id.* As understood by every POSITA, when the power and RF traces are arranged in too close proximity, electrical interference may result, which may cause signal corruption or loss. *Id.*, ¶¶ 42-44. Consequently, to reduce electrical interference between power and RF signals, it was well known at the time the application for the '024 Patent was filed to provide adequate electrical isolation between the power and RF traces. *Id.*, ¶ 45.

POSITAs understood in April 2018, and indeed decades before then, that electrical isolation can be achieved by physically separating power and RF signals, e.g., by placing the power and RF traces on different circuit boards or different sides of a single circuit board. *Id.*, ¶ 42-44. POSITAs also understood that such basic circuit design techniques may be applied to feedthrough devices used with sealed packages to obtain the expected result of reduced interference. *Id.*, ¶ 45.

C. '024 Patent Prosecution History

Patent Owner filed Application No. 15/963,246 (the "'246 Application") on April 26, 2018, which issued as the '024 Patent on June 4, 2019. Exhibit 1002, p. 1;

Ex. 1003, ¶ 51.

In a Non-final Office action mailed November 19, 2018, the Patent Examiner rejected application claims 1, 5, 7, 8, 14 and 15 as obvious over Hartzell (US 2005/0175350) [Ex. 1008] in view of Grebenkemper (US 2005/0225955) and further in view of Daiber (US 2015/0162990). Specifically, the Examiner stated that the TOSA in Hartzell included a substrate with RF and power traces in opposing arrangement, but “doesn’t clearly state that the traces for power and rf signals are placed in separate layers opposing each other” and moreover “Hartzell doesn’t explicitly state that the TOSA comprises a hermetically sealed light engine.” Exhibit 1002, p. 41. Grebenkemper also was cited as teaching isolation of the power from RF traces. Exhibit 1002, p. 41; Ex. 1003, ¶ 52.

The November 19, 2018, Office action included the following additional rejections over the foregoing collection of references further in view of additional references:

- Application claim 6 was rejected further in view of Romas (US 2014/0152373);
- Application claims 9 and 10 were rejected further in view of Edwards (US 2012/0301152);
- Application claim 16 was rejected further in view of Jack (US 2016/0139477); and

- Application claim 17 was rejected further in view of Firth (US 2013/0114629). Exhibit 1002, pp. 45-48; Ex. 1003, ¶ 53.

Claims 2-4 and 11-13 were indicated to contain allowable subject matter if rewritten in independent form including all limitations of the base claim and any intervening claims. Exhibit 1002, p. 39; Ex. 1003, ¶ 54.

Patent Owner filed a Response on February 19, 2019, in which independent application claim 1 was amended to include the limitations of application claims 9 and 11, independent application claim 14 was amended to include the limitations of dependent application claim 2, and new independent claim 18 was added. Ex. 1002, pp. 29-33. The Amendments generally were directed to specifying that the feedthrough device had its RF and power traces disposed in opposing arrangement. *Id.*; Ex. 1003, ¶ 55.

A Notice of Allowance was mailed on March 26, 2019, and included a Notice of Allowability. Exhibit 1002, pp. 7-11. The Notice of Allowability referred to the February 19, 2019, Response, but did not include any Examiner's Amendment or Comment explaining the reasons for allowance. *Id.*, p. 11. The Issue Fee was submitted on April 18, 2019, and the '024 Patent issued on June 4, 2019. *Id.*, pp. 1-2; Ex. 1003, ¶ 56.

D. Priority Date

The '024 Patent does not claim the benefit of any prior-filed application. Accordingly, the earliest effective filing date of the '024 Patent is April 26, 2018. The references relied upon in this Petition constitute prior art to the '024 Patent under at least 35 U.S.C. §102(a). All references herein to 35 U.S.C. §§ 102–103 are made with respect to the AIA versions thereof, which apply to the Challenged Claims.

E. Prior Decisions by District Courts or the Board

The '024 Patent is currently asserted in two pending district court cases in the Northern District of California: *Applied Optoelectronics, Inc. v. Cambridge Industries USA, Inc.*, No. 3:24-cv-01010-JD (N.D. Cal.) and *Applied Optoelectronics, Inc. v. Accelight Technologies, Inc.*, No. 3:24-cv-09041 (N.D. Cal.), filed December 16, 2024. No dispositive judgment or claim construction orders have been issued. A claim construction hearing in Patent Owner's litigation against Petitioner is currently set for April 10, 2025. Ex. 1005, p. 2. The dispositive motion deadline is currently set for January 28, 2026. *Id.* Jury trial is scheduled to begin on June 8, 2026. *Id.*

F. Claim Construction (37 C.F.R. § 42.100(b))

The claims are construed herein “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) (Nov. 13, 2018). Unless otherwise specified, the terms should

receive their respective plain and ordinary meanings as understood by a person of ordinary skill in the art under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005).

In deciding this Petition, the Board may find it necessary to construe the terms “feedthrough device,” “interconnect device,” and “opposing arrangement” as used in the claims of the ’024 Patent. Ex. 1003, ¶ 58.

As described in the ’024 Patent, the feedthrough device (also referred to in the claims as an “interconnect device”) is formed by “patterns/traces that propagate signals from external circuitry to components within the hermetic sealed package.” Ex. 1001, 2:7-12. By comparison, Patent Owner contends in the District Court litigation that a plain and ordinary meaning of “a device designed to transmit electrical signals or power from one region to another region” should be applied. Ex. 1009, p. 2. Patent Owner’s proposed construction is so expansive it completely omits reference to the hermetically sealed package and thus cannot be correct. Ex. 1003, ¶ 59.

Similarly, the term “opposing arrangement” is used interchangeably with the phrase “first and second surfaces disposed opposite each other.” Ex. 1001, 2:18-24 (with respect to “feedthrough device” this “electrically isolates RF traces from power-related traces (e.g., DC traces, ground traces) by disposing power and RF traces on opposite sides. This configuration of power and RF traces may also be referred to as an opposing arrangement”); *id.*, 2:39-47 (“A first side of the

feedthrough device may include traces configured to propagate power signals, e.g., DC signals, from circuitry of the substrate to components within the hermetically-sealed cavity. On the other hand, a second side of the feedthrough device, opposite the first side, may include traces configured to propagate RF signals from circuitry of the substrate to components within the hermetically-sealed cavity”); *id.*, 2:48-52: (“Therefore, the RF and power signal traces of the feedthrough device may be electrically isolated from each other based on the distance therebetween, e.g., provided by the width of the feedthrough device, and/or the material properties of the feedthrough device.”). All of the above citations identify the only described embodiment on the ’024 Patent, which is directed to a single circuit board that has power traces on a top surface of the board and RF traces on the bottom surface of the *single* circuit board. Ex. 1003, ¶ 60.

Patent Owner contends in the pending litigation that its “plain and ordinary meaning” of “arranged on top and bottom sides of the substrate” applies not just to a single substrate but is infringed under the doctrine of equivalents by an embodiment in which RF and power traces are located on separate main and daughter circuit boards which are disposed adjacent to one another. Ex. 1009, p. 1, Ex. 1010, pp. 2, 4-5, 10, 13-14. Such an arrangement cannot validly fall within the scope of the claimed “opposing arrangement.” Ex. 1003, ¶ 61.

However, because a claim term should have the same meaning for purposes of invalidity as for infringement, Petitioner and its expert adopt, for purposes of the unpatentability analyses herein, the plain and ordinary meaning for the term “opposing arrangement” urged by the Patent Owner in its district court litigation against the Petitioner. Ex. 1003, ¶ 62.

V. PRIOR ART REFERENCES

A. U.S. Patent No. 9,568,694 (“Mizobuchi”), Ex. 1006

Mizobuchi was filed on March 18, 2016, and issued on February 14, 2017. Mizobuchi qualifies as prior art under at least AIA 35 U.S.C. § 102(a)(1). Mizobuchi was neither cited nor considered during prosecution of the ’024 Patent. Ex. 1003, ¶ 63.

Mizobuchi teaches an optical module, including “a first circuit board, an optical sub-assembly, a first flexible printed circuit and a second flexible printed circuit,” wherein “[a] high-speed electrical signal . . . is transmitted between both the circuit boards through the first flexible printed circuit, and a power source signal and a low-speed electrical signal . . . are transmitted between both the circuit boards through the second flexible printed circuit.” Ex. 1006, Abstract; Ex. 1003, ¶ 64.

Specifically, as further discussed in Section VII(A), *infra*, Mizobuchi discloses an optical transceiver including a transmitter optical subassembly (“TOSA”). *See* Ex. 1006, FIGS. 1A, 1B, 3A, 1:26-43, 12:42-58. The TOSA

includes a hermetically sealed light engine. *Id.*, FIG. 3A, 5:43-50, 7:15-21, 12:46-48. A first circuit board has first and second surfaces located opposite each other and defines a substrate. *Id.*, FIGS. 2, 3A, 4:22-5:34, 6:32-60. The first circuit board is connected to a second circuit board. *Id.* The substrate defined by the first circuit board includes regions configured to electrically couple with a transmit connecting circuit and with the hermetically sealed light engine via the second circuit board. *Id.*; Ex. 1003, ¶ 65.

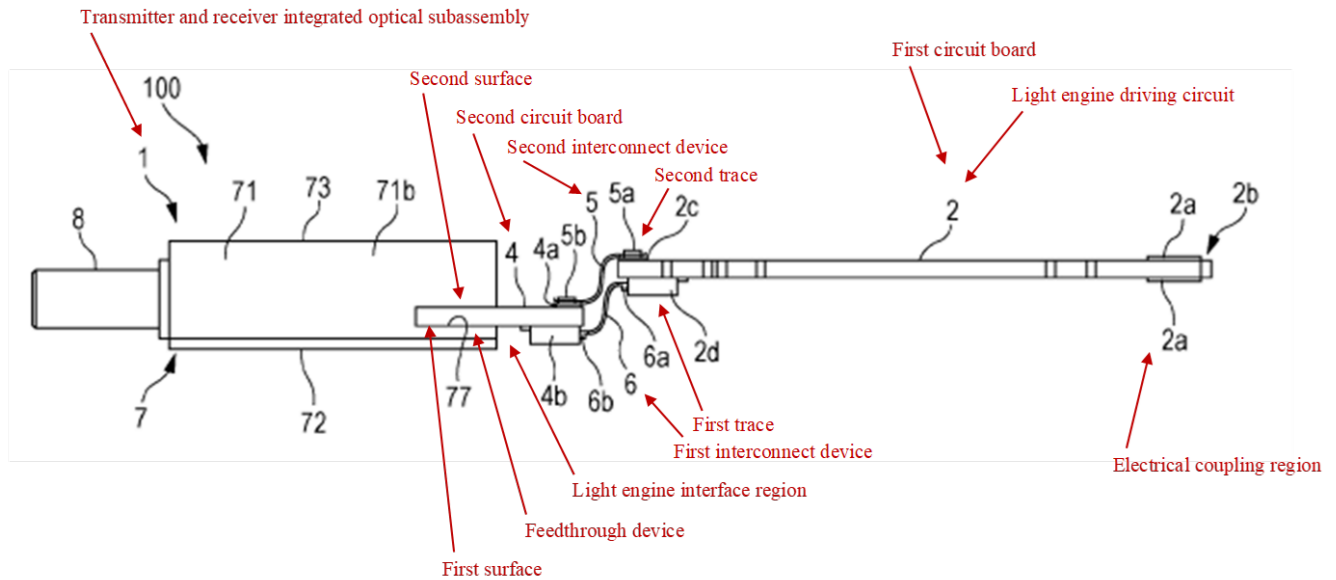


FIG. 2 (Mizobuchi)

A light engine driving circuit, located on the substrate, provides RF and power signals to drive the hermetically sealed light engine to output one or more channel wavelengths. Ex. 1006, FIGS. 2, 3A, 3:57-64, 12:27-41. The substrate includes first and second traces (located, respectively, on the substrate's first and second surfaces) for providing the power and RF signals, respectively. *Id.*, FIG. 2, 4:22-5:34, 6:48-

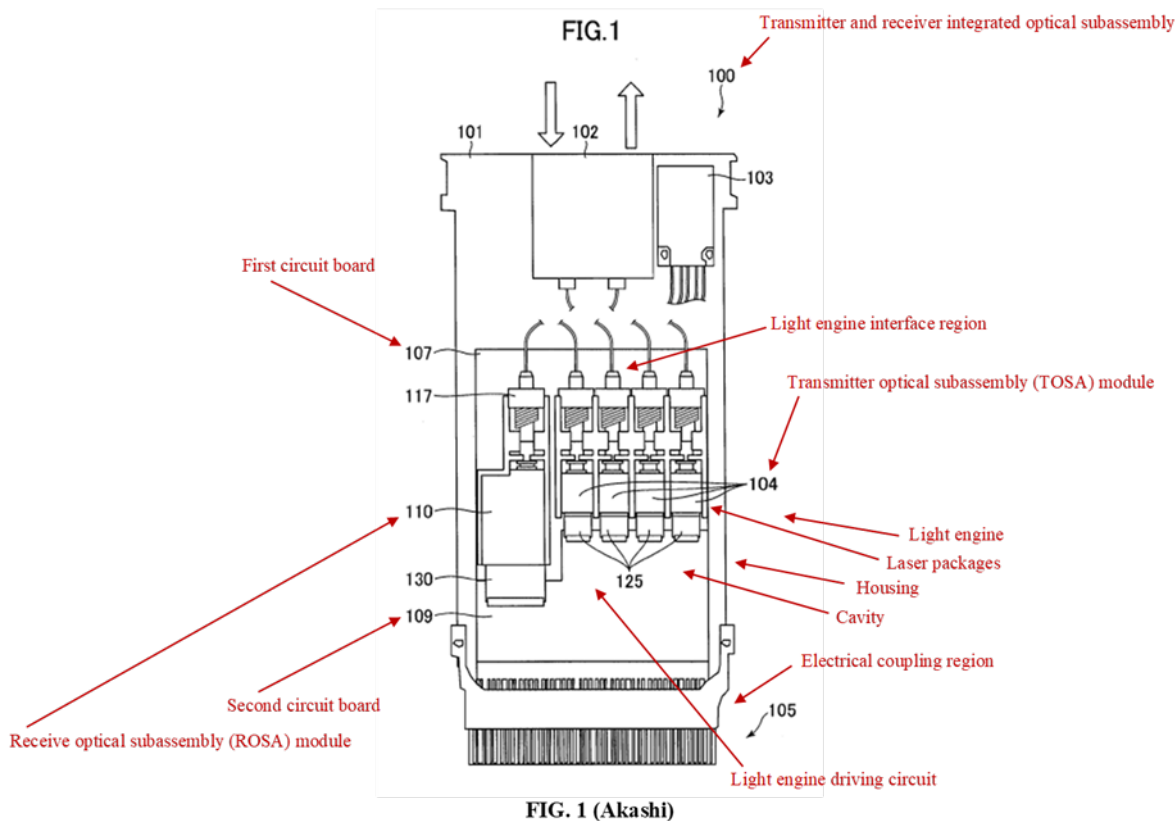
60. The first and second traces are disposed in an opposing arrangement to provide electrical isolation and thereby reduce electrical interference between the power and RF signals. *Id.* Mizobuchi discloses a feedthrough device consisting of flexible printed circuits that couple to a second circuit board that extends into the hermetic cavity. The flexible printed circuits (and second circuit board) have first and second surfaces that are located opposite each other and are substantially parallel with the first and second surfaces of the substrate that electrically couple laser packages of the TOSA to the light engine driving circuit. *Id.*, FIGS. 2, 3A, 6:32–7:64; Ex. 1003, ¶¶ 66-67.

B. U.S. Patent App. Pub. No. 2014/0140665 A1 (“Akashi”)

Akashi was filed on November 4, 2013, claiming priority to a Japanese application, JP 2012-251987, filed November 16, 2012. Akashi published on May 22, 2014, and qualifies as prior art under at least AIA 35 U.S.C. § 102(a)(1). Akashi was not cited or considered during prosecution of the '024 Patent. Ex. 1003, ¶ 68.

67. Akashi teaches an optical module including a main body that includes “an optical connector to which a communication cable transferring optical signal is connected, and a terminal portion on which a plurality of terminal pads for transmitting and receiving an electrical signal for communication using the optical signal are arranged,” a lead array electrically connected to the terminal pads, and a flexible printed circuit with “wires electrically connected to the metal leads” of the

lead array. Ex. 1007, Abstract; Ex. 1003, ¶ 69.



68. Akashi discloses a transmitter and receiver integrated optical subassembly that includes for transmitter optical subassemblies (TOSA) 104. Ex. 1007, FIG. 1, ¶¶ [0025]-[0026]. Each TOSA includes a hermetically sealed light engine, as was routine for such devices. *Id.*, FIG. 1, ¶¶ [0010], [0026], [0027]. The channel wavelength optical signals output by the TOSAs are combined into a single outgoing multiwavelength optical signal. *Id.*, FIG. 1, ¶ [0025]. A first circuit board (107) has first and second surfaces located opposite each other and defines a substrate. *Id.*, FIG. 1, ¶ [0026]. The first circuit board is connected to a second circuit board that carries a transmit connecting circuit. *Id.* The substrate of the first

circuit board is electrically coupled to the light engine. *Id.*; Ex. 1003, ¶ 70.

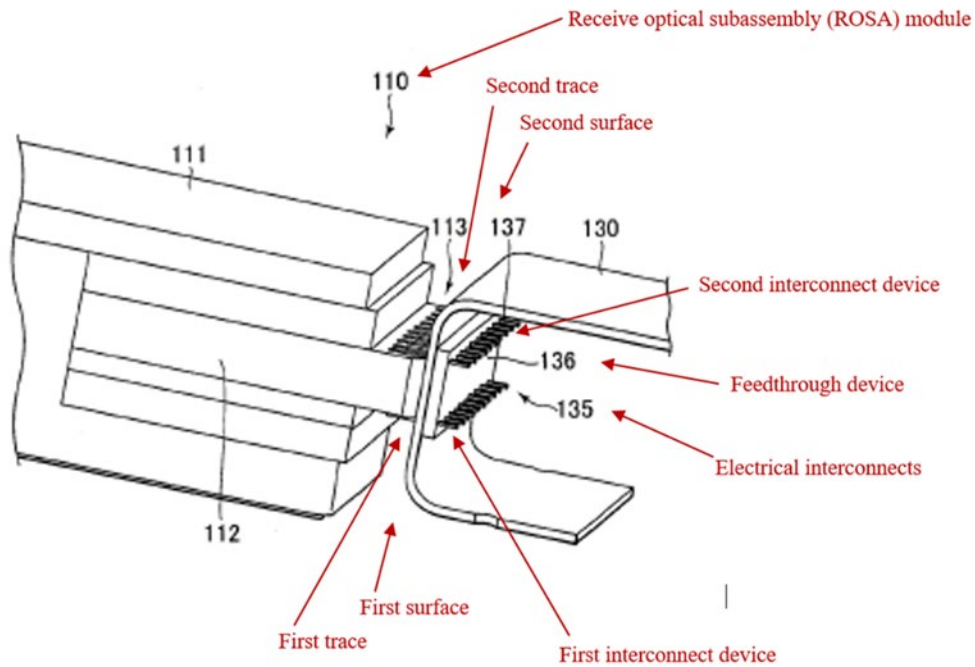


FIG. 2 (Akashi)

69. Akashi discloses a light engine driving circuit, located on the substrate, that provides RF and power signals to drive the hermetically sealed light engine to drive TOSAs 104. Ex. 1007, FIG. 1, ¶ [0026]. The substrate includes first and second traces for providing the power and RF signals, respectively. *Id.*, FIGS. 1, 2, 6, ¶¶ [0010], [0015], [0030], [0033], [0038]. Further, a POSITA would have understood, based on the configuration of the feedthrough device coupling the substrate to the TOSAs, discussed *infra*, that the first and second traces of the substrate in Akashi are located in an opposing arrangement to provide electrical isolation and thereby reduce interference between the power and RF signals. Ex. 1003, ¶ 71. A POSITA further would have understood that locating the RF and

power signals on opposite sides of the substrate was the preferred design for RF electronics, e.g., as taught by Hartzell, Ex. 1008, to reduce interference between the power and RF signals. *See* Ex. 1008, ¶¶ [0028], [0038]-[0041]; Ex. 1003, ¶ 71.

70. The feedthrough device disclosed in Akashi includes a flexible printed circuit and a portion of the receiver substrate, each having power and RF signal traces on their respective first and second surfaces that extend substantially parallel with the respective opposing surfaces of the substrate. Ex. 1007, FIGS. 1, 2, ¶ [0015]. The feedthrough device electrically couples the laser packages of the TOSAs to the light engine driving circuit on the first circuit (107). *Id.*, FIGS. 1, 2, ¶¶ [0010]-[0012], [0015], [0038]; Ex. 1003, ¶ 72.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A POSITA relevant to the field of the '024 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 and networks or a comparable field of work. Ex. 1003, ¶ 22. Individuals having different educational backgrounds and supplemental experience might still be of ordinary skill in the art if such experience compensates for any deficiencies in education relative to the criteria stated above. *Id.* In some cases, additional education might be an acceptable substitute for some experience, or vice versa. *Id.*

VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. **Ground 1: Claims 1-17 Are Unpatentable Under 35 U.S.C. § 102 as Anticipated by Mizobuchi**

Claim 1

[1a] Mizobuchi discloses a transmitter and receiver integrated optical subassembly that includes a TOSA. *See* Ex. 1006, FIGS. 1B, 3A, 3:26-43, 12:42-58; Ex. 1003, ¶ 73.

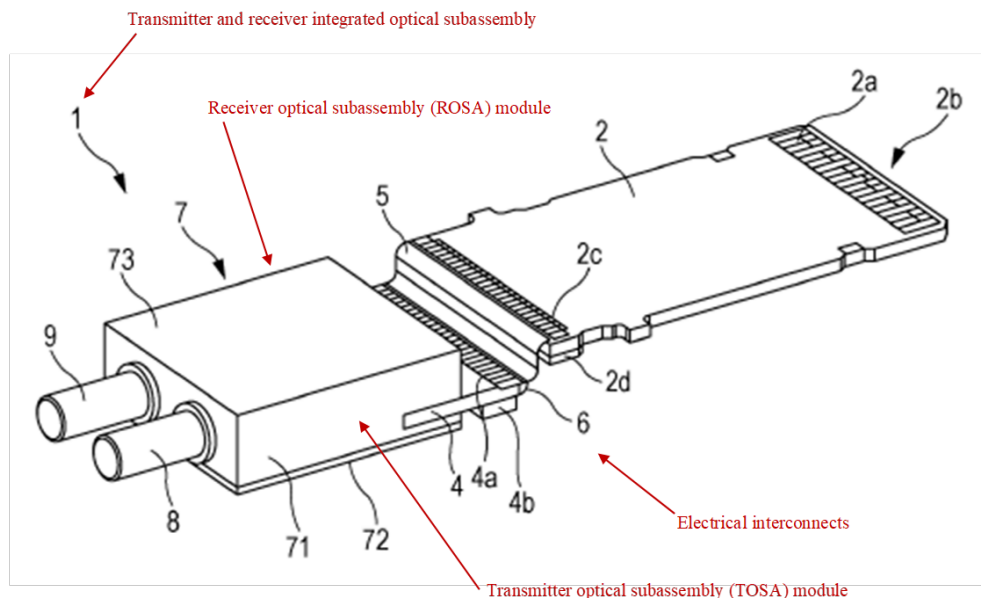


FIG. 1B (Mizobuchi)

[1b] Mizobuchi discloses that the TOSA includes a hermetically sealed light engine with a housing that defines a hermetic-sealed cavity with multiple laser packages disposed within the cavity. Each of the laser packages (“light emitting elements”) is configured to emit an associated channel wavelength optical signal. *See* Ex. 1006, FIG. 3A, 5:43-50, 7:15-21, 12:46-48; Ex. 1003, ¶ 74.

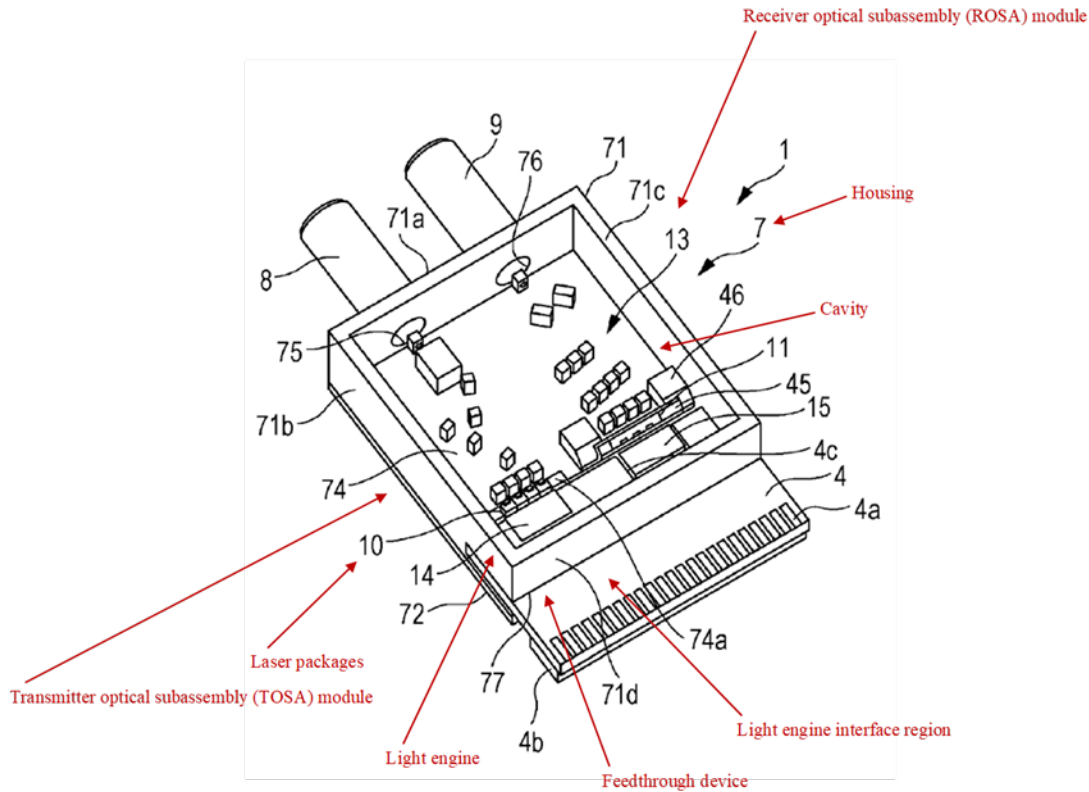


FIG. 3A (Mizobuchi)

[1c] Mizobuchi discloses a first circuit board that has first and second surfaces disposed opposite each other and defines a substrate. *See* Ex. 1006, FIGS. 2, 3A, 4:22-5:34, 6:32-60. The substrate defined by the first circuit board carries a light engine driving circuit and includes an electrical coupling region that connects to a transmit circuit, and a light engine interface region. *Id.*, FIG. 2, 3:44-55. The light interface region is configured to electrically couple with a second circuit board that extends into the hermetically sealed light engine. *Id.*, FIG. 2, 3:65-4:5; Ex. 1003, ¶ 75.

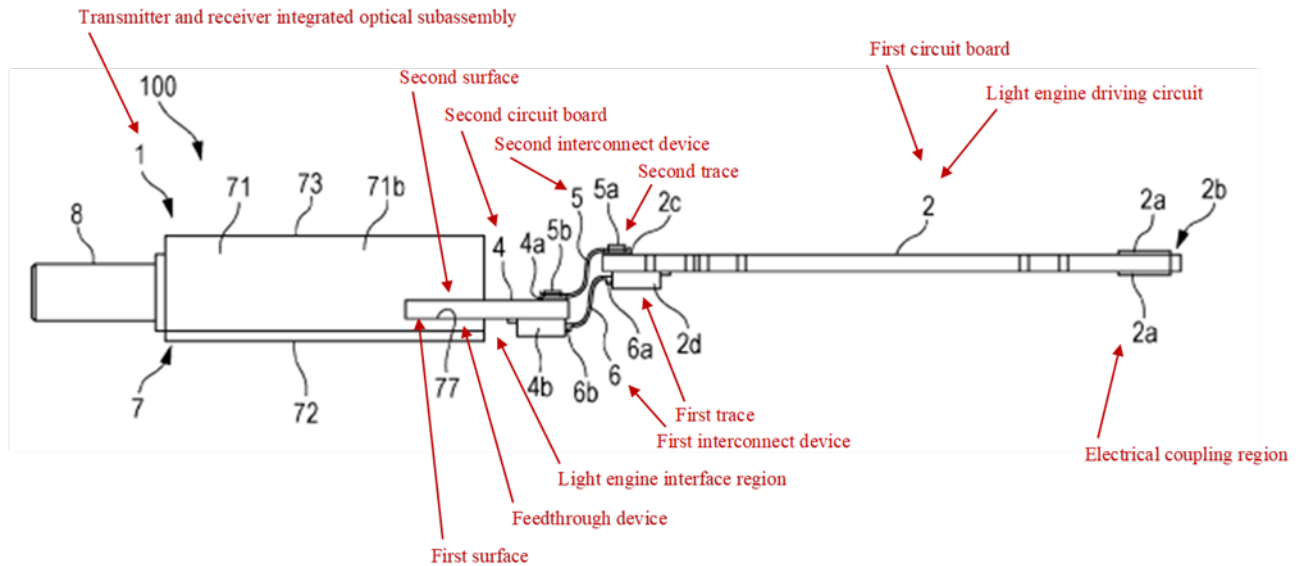


FIG. 2 (Mizobuchi)

[1d] Mizobuchi discloses a light engine driving circuit disposed on the substrate that includes a clock data recovery (“CDR”) circuit and a power supply circuit. *See* Ex. 1006, FIGS. 2, 3A, 3:57-64, 12:27-41. The light engine driving circuit is configured to provide an RF signal and a power signal to drive the hermetically sealed light engine to output one or more channel wavelengths. *Id.*, 3:65-4:18; Ex. 1003, ¶ 76.

[1e] A POSITA would have understood that RF and power signals are carried on opposite surfaces on the first and second circuit boards 2 and 4 of Mizobuchi to match to the arrangement of RF and power signal traces on the flexible printed circuits (FPCs) 5 and 6. Ex. 1006, 4:19-65; Ex. 1003, ¶ 77. Thus, a POSITA would have understood that Mizobuchi discloses that the substrate (circuit board 2) includes a first trace disposed on its first (lower) surface to provide the power signal

and a second trace disposed on its second (upper) surface to provide the RF signal. *Id.*, FIG. 2, 5:18-21 (“low-speed electrical signals of 1 MHz or lower including direct-current signals and power source signals are transmitted between both the circuit boards 2 and 4 through this second FPC 6.”); *id.*, 5:4-17 (“high-speed electrical signals of 1 GHz or higher is transmitted between both the circuit boards 2 and 4 through this first FPC 5. The first FPC5 is directly connected to both the circuit boards 2 and 4 by soldering and provided with the impedance lines for high-speed transmission”); Ex. 1003, ¶ 77.

A POSITA would have understood that Mizobuchi discloses first and second traces disposed on opposite sides of circuit boards 2 and 4 to provide electrical isolation and thus reduces electrical interference therebetween. This was fully consistent, e.g., with Hartzell, Ex. 1008, ¶¶ [0028]-[0033], which discusses a well-known electronics design technique of locating RF signal and power signals on separate planes in an optical communication module to reduce interference. Ex. 1003, ¶ 78.

[1f] Mizobuchi discloses a feedthrough device that electrically couples the laser packages to the light engine driving circuit. *See* Ex. 1006, FIGS. 2, 3A, 6:32-37, 6:61-7:64; Ex. 1003, ¶ 79.

[1g] Mizobuchi discloses the feedthrough device is defined, in part, by a first surface and a second surface of the second circuit board, such that the first surface

and the second surface of the feedthrough device extend substantially parallel with the respective opposing surfaces of the substrate. *See* Ex. 1006, FIG. 2, 6:32-60; Ex. 1003, ¶ 80.

Accordingly, Mizobuchi anticipates Claim 1. Ex. 1003, ¶ 81.

Claim 2

Mizobuchi discloses a first interconnect device of a first type is electrically coupled to the first trace and a corresponding trace of the housing of the hermetically sealed light engine to provide the power signal. Specifically, the power traces of FPC 6 in Mizobuchi are coupled to circuit boards 2 and 4 by an easily removable FPC connector. Ex. 1006, 5:23-27, 5:32-34, 12:27-41; Ex. 1003, ¶ 82.

Mizobuchi also discloses a second interconnect device of a second type that is electrically coupled to the second trace and a corresponding trace of the housing of the light engine to provide the RF signal. Specifically, the RF signal traces on circuit boards 2 and 4 are coupled by FPC 5, which is soldered to the respective electrode pads of circuit boards 2 and 4. Ex. 1006, 5:4-10, 5:29-31; Ex. 1003, ¶ 83. Accordingly, as required by Claim 2, the first type of the first interconnect device (which carries the power signal) is different than the second type of the second interconnect device (which carries the RF signal), and thus Mizobuchi anticipates Claim 2. Ex. 1006, 5:4-10, 5:29-31; Ex. 1003, ¶ 84.

Claim 3

A POSITA would have understood in April 2018 that a DC busbar was a well-known method of distributing power in a direct current voltage distribution system. Ex. 1003, ¶ 85. A POSITA further would have understood the advantages of using a DC busbar to power to multiple lasers, as the power requirements for driving laser packages would be similar, and use of a busbar would conserve space on the interconnect device for electrically coupling the power signal on the first (lower) surface of the Mizobuchi circuit boards 2 and 4. Accordingly, it would have been a simple design choice for a POSITA to use a DC busbar for the first type of interconnect for the power signals, as an alternative to the FPC connector suggested in Mizobuchi for FPC 6. *See* Ex. 1006, FIG. 2, 12:11-15, 12:35-41; Ex. 1003, ¶ 85.

Claim 4

A POSITA would have understood in April 2018 that wire bonds are especially suitable for interconnecting semiconductor chips to package leads for carrying RF signals. Ex. 1003, ¶ 87. A POSITA further would have understood that wire bonds provide a direct electrical and thermal path between the coupled semiconductor components that assists in dissipating heat generated by RF signals. *Id.* Accordingly, it would have been a simple design choice for a POSITA to use wire bonds as the second type of interconnect for coupling the RF signals, as an alternative to the soldered connections for FPC5 described in Mizobuchi.. *See* Ex.

1006, FIG. 2, 12:8-11, 12:27-34; Ex. 1003, ¶ 88.

Claim 5

As a matter of simply understanding RF electronics, a POSITA would have understood in April 2018 that providing a ground trace between adjacent traces carrying RF signals would provide isolation and reduce crosstalk between the RF signals. Ex. 1003, ¶ 90. A POSITA further would have understood the advantages of using a ground trace amongst the RF signal traces on the upper surface of circuit boards 2 and 4 of Mizobuchi to provide further isolation of the RF signals. *Id.* Indeed, Mizobuchi discloses that the at least one impedance line provided on the upper surface of circuit boards 2 and 4 (which carries the RF signals) may be a grounded co-planar line. Ex. 1006, 14:30-15:21; Ex. 1003, ¶ 90. Accordingly, in view of the emphasis in, and disclosure of, Mizobuchi on isolating the power and RF signals, a POSITA would have understood it to be a simple design choice to use in Mizobuchi a ground trace disposed on the second surface, adjacent to the second trace carrying RF signals, to reduce crosstalk between RF signals. *See* Ex. 1006, FIG. 2, 12:8-11, 12:27-34; Ex. 1003, ¶ 91.

Claim 6

As discussed for Claims 3-5 above, a POSITA in April 2018 would have been thoroughly familiar with use DC busbars, wire bonds and locating ground traces adjacent to RF signal traces, and moreover, would have considered the use of any or

all of these features to be simple design choices in implementing the optical transceiver of Mizobuchi. Ex. 1003, ¶ 93. Claim 6 simply combines these well-known and well-understood alternative design features. *Id.* Based on the disclosure of Mizobuchi and the knowledge possessed by those of skill in the art, a POSITA in April 2018 would have understood that Claim 6 is anticipated. *Id.*, ¶¶ 93-94.

Claim 7

A POSITA would have understood in April 2018 that varying the width of a substrate or varying the material properties of the substrate would improve electrical isolation of traces disposed in an opposing arrangement on the substrate. Ex. 1006, 4:26-29 (“The first circuit board 2 and the second circuit board 4 each include, for example, a ceramic multilayer board.”); *see also* Ex. 1008, ¶¶ [0028]-[0033]; Ex. 1003, ¶ 95. Accordingly, a POSITA would have understood that such techniques could be used to enhance isolation between the power signals and RF signals in Mizobuchi. *See* Ex. 1006, FIG. 2, 12:35-41; Ex. 1003, ¶¶ 95-96.

Claim 8

[8a] A POSITA in April 2018 would have understood that it often is necessary to mechanically strengthen physical interconnections between circuit boards to account, e.g., for differential thermal expansion of the boards caused by the electrical components located thereon or bending stresses. Ex. 1003, ¶ 97. A POSITA further would have understood that RF signal electronics and laser

packages often generate high heat loads that can exacerbate mechanical stresses imposed by thermal expansion. *Id.* A POSITA would have understood that in Mizobuchi, feedthrough device (circuit board 4) is secured by solder in the opening 77 plus the slots in either side wall 71b and 71c. Ex. 1006, FIG. 3A, 6:32-43. However, a POSITA would have understood that it would have been a simple matter of design choice further to use a plurality of electrical interconnects to brace the substrate in the housing of the light engine. Ex. 1003, ¶¶ 97-98.

Claim 9

A POSITA in April 2018 would have understood that adjacent circuit boards readily could be joined using end-to-end connectors. Ex. 1003, ¶ 99. Thus, a POSITA would have understood that it would have been a matter of design choice to use an end-to-end connector to couple the circuit board of the feedthrough device (circuit board 4) to the circuit board 2 of Mizobuchi. *Id.*, ¶¶ 99-100.

Claim 10

A POSITA in April 2018 would have understood that having adjacent connected circuit boards be coplanar would be a matter of design choice, based on the type of connector used and the desired length of the housing accommodating the optical module. For example, use of an end-to-end connector necessarily would result in the joined boards being coplanar. Ex. 1003, ¶ 101. In addition, the '024 Patent does not explain that any benefit arises from making the feedthrough device

coplanar with the substrate, and accordingly, a POSITA further would have understood that features as being a simple matter of design choice if space was available to do so. Ex. 1003, ¶¶ 102-103.

Claim 11

A POSITA would have understood that it was well-known in April 2018 that RF signals could be isolated from power signals to reduce interference by placing the signals on opposite sides of the circuit boards, or alternatively, by physically spacing apart the power and RF signal traces on the same side of a substrate. Ex. 1003, ¶ 104. A POSITA therefore would have understood that although less desirable, such a design readily could be used in the optical transceiver of Mizobuchi provided that the width of circuit boards 2 and 4 could accommodate a power trace on the upper surface of the boards, and that such a choice involved no inventive effort. *Id.*, ¶¶ 104-105.

Claim 12

Claim 12 combines the limitations of Claims 1 and 2 of the '024 Patent, except that Claim 12 requires at least first and second “interconnect devices” instead of a “feedthrough device” and further that the TOSA be located in the housing of an optical transceiver, and that the transceiver include a receive optical subassembly (ROSA) in the housing. Ex. 1002, pp. 32-33 (referring to application claim 14). Ex. 1003, ¶ 106. As discussed with respect Claim 1 in the discussion of the “feedthrough

device,” *supra*, Mizobuchi discloses first and second interconnect devices (FPC 5 and 6) that separately carry RF signals and power signals between corresponding traces of the substrate and hermetically sealed light engine. Ex. 1003, ¶ 107. Mizobuchi also discloses an optical transceiver that includes a TOSA within a hermetically sealed housing and a ROSA disposed within the housing. Ex. 1006, FIGS. 2, 3A, 3:26-31; Ex. 1003, ¶ 107. Mizobuchi discloses all of the limitations of Claim 12 for the reasons set forth *supra* for Claims 1 and 2. Ex. 1003, ¶¶ 108-109.

Claim 13

Claim 13 includes all of the limitations of Claims 12 and 3. Ex. 1003, ¶ 110. Accordingly, a POSITA would have understood that Mizobuchi, together with knowledge of skill in the art, discloses all of the limitations of Claim 13 for the reasons set forth *supra* for Claims 12 and 3. *Id.*, ¶¶ 110-111.

Claim 14

Claim 14 includes all of the limitations of Claims 12 and 4. Ex. 1003, ¶ 112. Accordingly, a POSITA would have understood that Mizobuchi, together with knowledge of skill in the art, discloses all of the limitations of Claim 14 for the reasons set forth *supra* for Claims 12 and 4. *Id.*, ¶¶ 112-113.

Claim 15

Claim 15 combines all of the limitations of Claims 1 and 2, except that Claim 15 requires at least first and second “interconnect devices” instead of a “feedthrough

device,. Ex. 1002, pp. 32-33 (referring to application claim 18); Ex. 1003, ¶ 114. Mizobuchi discloses first and second interconnect devices (FPC 5 and 6) that separately carry RF signals and power signals between corresponding traces of the substrate and hermetically sealed light engine. Ex. 1003, ¶ 115. Mizobuchi discloses all of the other limitations of Claim 15 for the reasons set forth *supra* for Claims 1 and 2. *Id.*, ¶¶ 115-116.

Claim 16

Claim 16 includes all of the limitations of Claims 15 and 3. Ex. 1003, ¶ 117. Accordingly, a POSITA would have understood that Mizobuchi, together with knowledge of skill in the art, discloses all of the limitations of Claim 16 for the reasons set forth *supra* for Claims 15 and 3. *Id.*, ¶¶ 117-118.

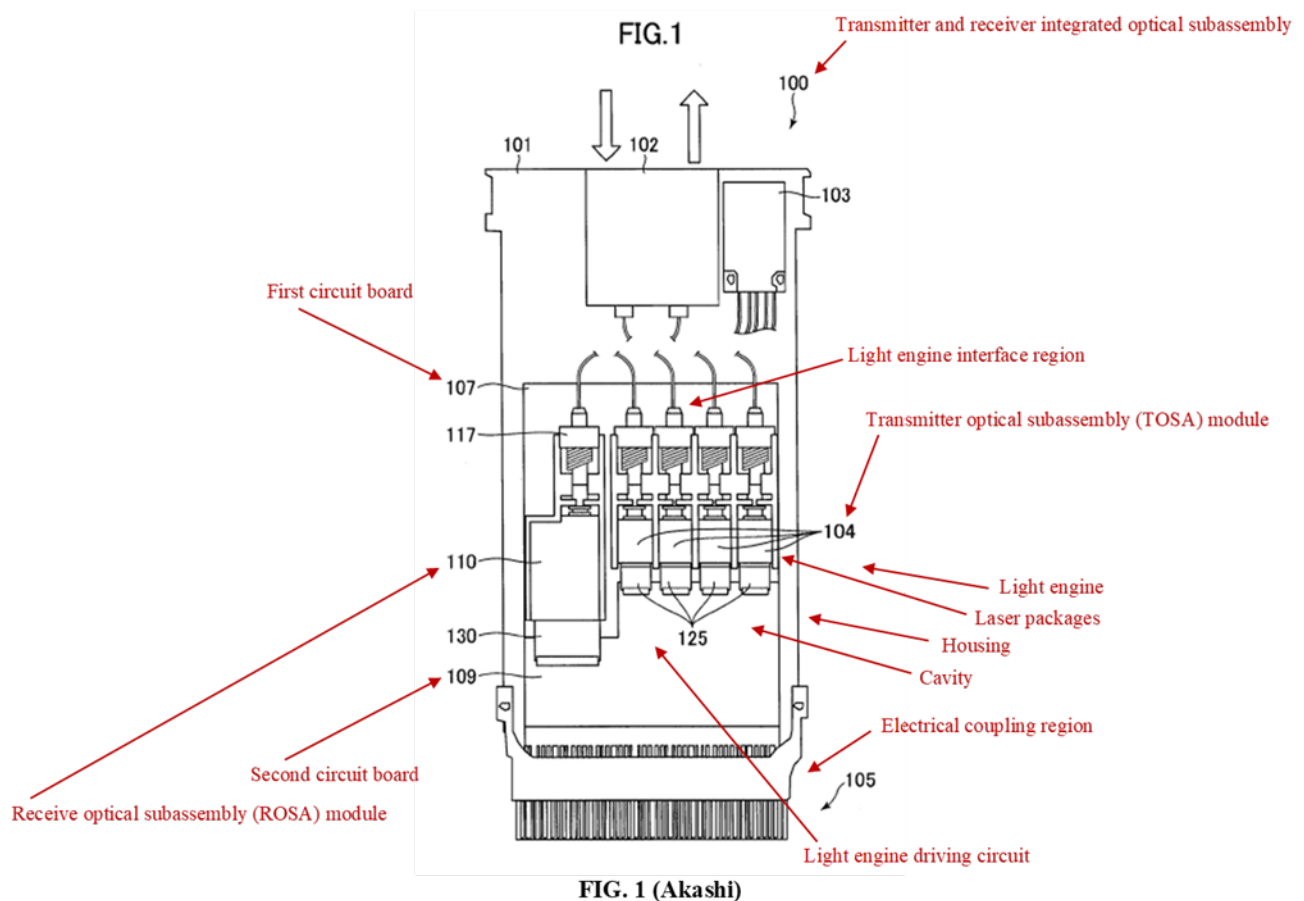
Claim 17

Claim 17 includes all of the limitations of Claims 15 and 4. Ex. 1003, ¶ 119. Accordingly, a POSITA would have understood that Mizobuchi, together with knowledge of skill in the art, discloses all of the limitations of Claim 17 for the reasons set forth *supra* for Claims 15 and 4. *Id.*, Ex. 1003, ¶¶ 119-120.

B. Ground 2: Claims 1-17 Are Unpatentable Under 35 U.S.C. § 102 as Anticipated by Akashi

Claim 1

[1a] Akashi discloses a transmitter and receiver integrated optical subassembly that includes a TOSA module. *See* Ex. 1007, FIG. 1, ¶¶ [0008], [0016], [0026]; Ex. 1003, ¶ 121.



[1b] Akashi discloses a hermetically sealed light engine having a housing that defines a hermetically sealed cavity, with multiple laser packages disposed within the cavity. Ex. 1007, FIG. 1, ¶¶ [0010], [0026], [0027]. A laser package of

each TOSA 104 is configured as a light emitting element and emits an associated channel wavelength. *Id.* A POSITA would have understood that the TOSA 104 and ROSA 110 modules are enclosed within hermetically sealed cavities to prevent environmental factors (e.g., dust) from degrading the performance of the lasers. Ex. 1003, ¶ 122.

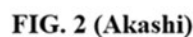
[1c] Akashi discloses a first circuit board 107 that has first and second surfaces disposed opposite each other and defines a substrate; the first circuit board is connected to a second circuit board 109. Ex. 1007, FIG. 1, ¶ [0026]. The substrate defined by the first circuit board 107 includes an electrical coupling region (flexible printed circuits 125) and a light engine interface region (adjacent to optical connector 117). *Id.*, ¶ [0027]. The electrical coupling region is configured to electrically couple with a transmit connecting circuit and the light engine interface region is configured to electrically couple with the hermetically sealed light engine via the second circuit board. *Id.*, ¶¶ [0026]-[0027]; Ex. 1003, ¶ 123.

[1d] A POSITA would have understood that Akashi discloses a light engine driving circuit disposed on the substrate 107 and is designed to provide an RF signal and a power signal to drive the hermetically sealed light engine to output one or more channel wavelengths. *See* Ex. 1007, FIG. 1, ¶¶ [0026]-[0027]. Ex. 1003, ¶ 124.

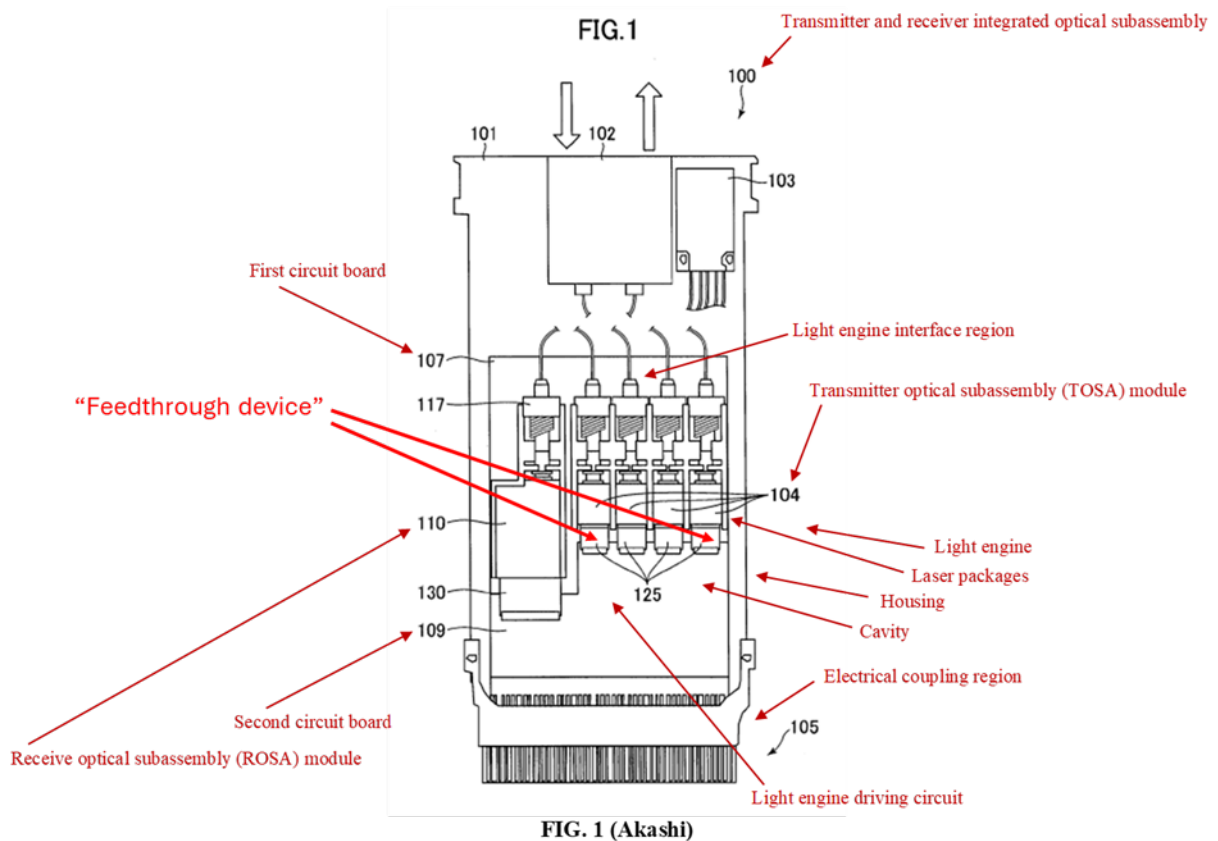
[1e] Akashi discloses the substrate 107 includes a first trace disposed on its first surface to provide the power signal and a second trace disposed on its second surface to provide the RF signal. Ex. 1007, FIGS. 1, 2, 6, ¶¶ [0010], [0015] (“In the optical module according to the aspect of the invention, the flexible printed circuit may further include one of surfaces on which a wire that transmits at least a high frequency [RF] signal is disposed, and the other surface on which a wire that supplies at least a fixed potential [DC voltage] is disposed, the one surface of the flexible printed circuit may be arranged on the terminal portion side, and the other surface may be arranged on the lead fixing portion side”), Claim 6. The first trace and the second trace are disposed in an opposing arrangement, which provides electrical isolation and thereby reduces electrical interference between the power signal and the RF signal. *Id.*, ¶¶ [0015], [0030]-[0033], [0038] (explaining that circuit board configuration for the ROSA 110 also applies to the TOSAs 104); Ex. 1003, ¶ 125.

Moreover, a POSITA would have understood the opposing arrangement of RF and power traces on the substrate 107 of Akashi was required to correspond to the design of the feedthrough device that couples the substrate to the TOSAs, which also has its first and second traces located in an opposing arrangement to reduce noise. Ex. 1007, ¶¶ [0015], [0030]-[0033], [0038]. Further, a POSITA would have understood that locating the RF and power signals on opposite sides of a substrate was the preferred design for RF electronics, e.g., as taught by Hartzell, Ex. 1008, to

[1f] Akashi describes a feedthrough device that includes flexible printed circuit 130 and a portion of circuit board 112 that extends from the hermetically sealed housing and couples the laser packages of the TOSAs 104 to the light driving engine on first circuit 107. Ex. 1007, FIG. 2, ¶¶ [0027]-[0028]. A POSITA would have understood from the disclosure in Akashi that describes the feedthrough device for the ROSA 110, that the same feedthrough structure applies to electrically couple the laser packages of TOSAs 104 to the light engine driving circuit. Ex. 1007, FIGS. 1, 2, ¶¶ [0030], [0035], [0038] (explaining that circuit board configuration for the ROSA 110 also applies to the TOSAs 104); Ex. 1003, ¶ 127.



[1g] Akashi discloses a feedthrough device that includes flexible printed circuit 130 and a portion of the receiver substrate 112 that electrically couples the laser packages of the TOSAs to the light engine driving circuit on the first circuit 107. Ex. 1007, FIGS. 1, 2, ¶¶ [0010]-[0012], [0015], [0038]. Akashi discloses that the receiver substrate portion 112 of the feedthrough device extends substantially parallel with the substrate 107. *Id.*, FIG. 1, ¶¶ [0010], [0015], [0026], [0031]; Ex. 1003, ¶¶ 128.



Accordingly, a POSITA would have understood that Akashi anticipates Claim

1. Ex. 1003, ¶ 129.

Claim 2

[2a] A POSITA would have understood, as a matter of design choice, that the flexible printed circuits disclosed in Akashi could be joined to the traces on the upper and lower surfaces of the circuit boards of TOSAs 104 using any of the available connectors available in April 2018, for example, by soldering or using FPC connectors, as described *supra* in Mizobuchi, Ex. 1006. Further, a POSITA would have understood Akashi to offer such flexibility in choice of connectors with respect to its disclosure of the embodiment of FIG. 8, which describes that the leads on the flexible printed circuit may be aligned in a single row. Ex. 1007, ¶¶ [0036]-[0038]; Ex. 1003, ¶ 130.

Accordingly, a POSITA would have understood that it would have been a matter of design choice to use any of a variety of connections suitable for RF signal transmission, such as soldering, or wire bonds, to serve as a first interconnect device to couple to RF signals to the substrate 112 of the hermetically sealed light engine. *See* Ex. 1007, FIGS. 1, 2, ¶¶ [0010], [0014], [0015], [0033], [0038]; Ex. 1003, ¶ 131. A POSITA also would have understood that it would have been a matter of design choice to use a second interconnect device of a second, different type, suitable for DC voltage, such as a DC busbar or FPC connector, to electrically couple a power signal to a corresponding trace of the housing of the light engine, and thus that Akashi anticipates Claim 2. *Id.*, ¶ 132.

Claim 3

[3a] As discussed above with respect to Claim 2, a POSITA would have understood that it would have been a matter of design choice to use a first interconnect device of a first type, suitable for transmitting a DC voltage, such as a DC busbar or FPC connector, to electrically couple a power signal to a corresponding trace of the housing of the light engine. Ex. 1007, FIG. 2, ¶¶ [0010], [0015], Claim 6; Ex. 1003, ¶ 133.

Accordingly, a POSITA would have found that Akashi, together with knowledge of those of skill in the art, anticipates Claim 3. *Id.*, ¶ 134.

Claim 4

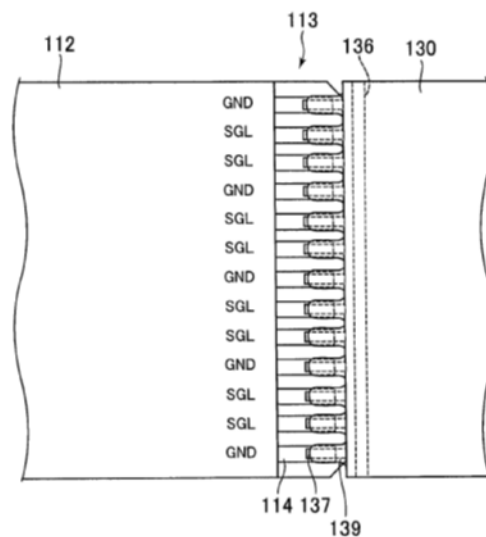
As discussed above with respect to Claim 2, a POSITA would have understood that it would have been a matter of design choice to use a second interconnect device of a second type, suitable for transmitting RF signals, such as a solder or a wire bond, to electrically couple an RF signal to a corresponding trace of the housing of the light engine. Ex. 1007, FIG. 2, ¶¶ [0010], [0015], Claim 6; Ex. 1003, ¶135.

Accordingly, a POSITA would have found that Akashi, together with knowledge of those of skill in the art, anticipates Claim 4. *Id.*, ¶ 136.

Claim 5

As a matter of simply understanding RF electronics, a POSITA would have understood in April 2018 that providing a ground trace between adjacent traces carrying RF signals would provide isolation and reduce crosstalk between the RF signals. Moreover, Akashi discloses using at least one ground trace disposed adjacent to traces that carry RF signals for purposes of reducing interference. See, Ex. 1007, FIG. 4, (reproduced below), ¶ [0031]; Ex. 1003, ¶ 137.

FIG.4



Akashi therefore anticipates Claim 5. Ex. 1003, ¶ 138.

Claim 6

As discussed for Claims 3-5 above, a POSITA in April 2018 would have been thoroughly familiar with use DC busbars, wire bonds and ground traces located adjacent to RF signal traces, and moreover, would have considered the use of any or

all of these features to be simple design choices for implementing an embodiment of the optical transceiver of Akashi. Ex. 1003, ¶ 136. Claim 6 simply combines these well-known and well-understood alternative design features. *Id.* Thus, based on Akashi and the knowledge possessed by those of skill in the art, a POSITA in April 2018 would have understood that Claim 6 is anticipated. *Id.*, ¶¶ 139-140.

Claim 7

A POSITA would have understood in April 2018 that varying the width of a substrate or varying the material properties of the substrate would improve electrical isolation of traces disposed in an opposing arrangement on the substrate. *See* Ex. Ex. 1007, FIGS. 1, 6, ¶ [0033]; Ex. 1003, ¶ 141. Accordingly, a POSITA would have understood that such techniques could be used to enhance isolation between the power signals and RF signals in Akashi. Ex. 1003, ¶¶ 141-142.

Claim 8

A POSITA in April 2018 would have understood that it often is necessary to mechanically strengthen physical interconnections between circuit boards, e.g., to account for differential thermal expansion of the boards caused by the electrical components located thereon or bending stresses. Ex. 1003, ¶ 143. A POSITA further would have understood that RF signal electronics and laser packages often generate high heat loads that can exacerbate mechanical stresses imposed by thermal expansion. A POSITA would have understood that it would have been a simple

matter of design choice to use a plurality of electrical interconnects to brace the substrate in the housing of the light engine. *Id.*, ¶ 144. Moreover, Akashi discloses that a plurality of electrical interconnects may be used to brace the substrate to the housing of the hermetically sealed light engine. *See* Ex. 1007, FIG. 2, ¶¶ [0028], [0029], [0030]; Ex. 1003, ¶¶ 144-145.

Claim 9

A POSITA in April 2018 would have understood that adjacent circuit boards readily could be joined using end-to-end connectors. Accordingly, a POSITA would have understood that Akashi discloses that the first and second surfaces of the feedthrough device could, as a matter of design choice, be coupled to the substrate using an end-to-end connection. Ex. 1003, ¶¶ 146-147.

Claim 10

A POSITA in April 2018 would have understood that having adjacent connected circuit boards be coplanar would be a matter of design choice, based on the type of connector used and the desired length of the housing accommodating the optical module. For example, use of an end-to-end connector necessarily would result in the joined boards being coplanar. Ex. 1003, ¶ 148.

Notably, the '024 Patent does not explain that any particular benefit could be achieved by making the feedthrough device coplanar with the substrate. On the contrary, such an arrangement would seem undesirable as potentially elongating the

transceiver module. However, a POSITA further would have understood this connection mode as being a simple matter of design choice if space was available. Ex. 1007, FIGS. 1, 2; Ex. 1003, ¶¶ 149-150.

Claim 11

Akashi discloses that the TOSA modules include at least one trace for receiving the power signal from the light engine driving circuit on the first surface of the feedthrough device and at least one trace for receiving the RF signal from the light engine driving circuit on the second surface. *See* Ex. 1007, FIGS. 1, 2, ¶¶ [0010], [0015], [0033], [0038] (explaining that circuit board configuration for the ROSA 110 also applies to the TOSAs 104); Ex. 1003, ¶¶ 151-152.

Claim 12

Claim 12 combines the limitations of Claims 1 and 2 of the '024 Patent, except that it requires at least first and second “interconnect devices” instead of a “feedthrough device.” Claim 12 also requires that the TOSA be located in the housing of an optical transceiver; and that the transceiver include a receive optical subassembly (ROSA) in the housing. *See* Ex. 1002, pp. 32-33 (referring to application claim 14); Ex. 1003, ¶ 153.

Akashi discloses first and second interconnect devices that separately carry RF signals and power signals between corresponding traces of the substrate and hermetically sealed light engine. Specifically, Akashi discloses, in FIGS. 2 and 3,

upper and lower sets of metal lead 137 that engage traces 113 on the top and bottom surfaces of substrate 112 (which extends into the hermetically sealed cavity). Ex. 1007, ¶¶ [0029]-[0031]; Ex. 1003, ¶ 154.

A POSITA would have understood that the upper and lower sets of metal leads 137 couple to respective RF signal and power traces located on substrate 112 and meet the claim limitation of first and second interconnect devices. Ex. 1003, ¶ 154. Akashi also discloses an optical transceiver that includes a TOSA within a hermetically sealed housing and a ROSA disposed within the housing. Ex. 1007, FIGS. 1-3, ¶¶ [0010]-[0012], [0015], [0025]-[0027], [0038]; Ex. 1003, ¶¶ 154-155.

Claim 13

Claim 13 includes all of the limitations of Claims 12 and 3. Ex. 1003, ¶¶ 156. Accordingly, a POSITA would have understood that Akashi, together with knowledge of skill in the art, discloses all of the limitations of Claim 13 for the reasons set forth *supra* for Claims 12 and 3. *Id.*, ¶¶ 156-157.

Claim 14

Claim 14 includes all of the limitations of Claims 12 and 4. Ex. 1003, ¶ 158. Accordingly, a POSITA would have understood that Akashi, together with knowledge of skill in the art, discloses all of the limitations of Claim 14 for the reasons set forth *supra* for Claims 12 and 4. *Id.*, ¶¶ 158-159.

Claim 15

Claim 15 combines all of the limitations of Claims 1 and 2, except that Claim 15 requires at least first and second “interconnect devices” instead of a “feedthrough device. Ex. 1002, pp. 32-33 (referring to application claim 18); Ex. 1003, ¶ 160.

As demonstrated above with respect Claim 12, Akashi discloses first and second interconnect devices that separately carry RF signals and power signals between corresponding traces of the substrate and hermetically sealed light engine. Akashi also discloses all of the other limitations of Claim 15 for the reasons set forth *supra* for Claims 1 and 2. Ex. 1003, ¶¶ 160-161.

Claim 16

Claim 16 includes all of the limitations of Claims 15 and 3. Ex. 1003, ¶ 162. Accordingly, a POSITA would have understood that Akashi together with knowledge of skill in the art, discloses all of the limitations of Claim 16 for the reasons set forth *supra* for Claims 15 and 3. *Id.*, ¶¶ 162-163.

Claim 17

Claim 17 includes all of the limitations of Claims 15 and 4. Ex. 1003, ¶ 164. Accordingly, a POSITA would have understood that Akashi, together with knowledge of skill in the art, discloses all of the limitations of Claim 17 for the reasons set forth *supra* for Claims 15 and 4. *Id.*, ¶¶ 164-165.

VIII. DISCRETIONARY ISSUES

A. The Petition Does Not Present the Same References Addressed in Prosecution

The Board should not deny institution under 35 U.S.C. § 325(d). As held in *Advanced Bionics*, “under § 325(d), the Board uses the following two-part framework [in determining whether to exercise its discretion in instituting *inter partes* review]: (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.” *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, No. IPR2019-01469, Paper 6 (P.T.A.B. Feb. 13, 2020), at 7–8 (precedential).

The Board has held that the first prong of *Advanced Bionics* is not met where “neither [the prior art on which the petition for *inter partes* review relies] nor similar prior art was before the examiner and, as such, the prosecution history does not include any overlapping arguments directed to this prior art.” *Godbersen-Smith Constr. Co. v. Guntert & Zimmerman Const. Div., Inc.* No. IPR2021-00050, Paper 24 (P.T.A.B. May 7, 2021), at 19–21. Further, in such cases, the Board “need not address part two of the analysis.” *Id.* at 21.

As discussed in Section V, *supra*, this Petition does not principally rely on any prior art reference that was cited during the original prosecution of the '246 Application that matured as the '024 Patent, nor is any of the prior art included in this Petition cumulative of the art considered by the Examiner during prosecution of the '246 Application. Ex. 1003, ¶¶ 26, 63, 68. Accordingly, the references cited in this Petition cannot be cumulative of the art and/or arguments raised during prosecution because there are material differences between the grounds presented herein and those previously presented. *See, e.g., Tianma Microelectronics Co., v. Japan Display Inc.*, No. IPR2021-01058, Paper 16, at 31 (P.T.A.B. Jan. 5, 2022). Since the first *Advanced Bionics* prong is not met here, the Board need not consider the second prong of the two-part framework. *Id.*; *Oticon Med. AB; William Demand Holding A/S v. Cochlear Ltd.*, No. IPR2019-00975, Paper 15, at 20 (P.T.A.B. Oct. 16, 2019).

B. The Board Should Not Deny Institution Under *Fintiv*

The claims of the '024 Patent have never been tested against the most relevant prior art available. In view of the strong challenges to the validity of the '024 Patent's claims presented herein and the nascent nature of the pending district court proceeding, institution should not be discretionarily denied under 35 U.S.C. § 314(a). *See Apple Inc. v. Fintiv, Inc.*, No. IPR2020-00019, Paper 11, at 5–16 (P.T.A.B. Mar. 20, 2020) (precedential) (enumerating factors favoring institution of

inter partes review); *contra NHK Spring Co., Ltd. v. Intri-Plex Techs., Inc.*, No. IPR2018-00752, Paper 8, at 19–20 (P.T.A.B. Sept. 12, 2018) (precedential) (denying institution based, in part, on pending district court proceeding nearing final stages).

Under *Fintiv*, six factors are balanced in determining whether to discretionarily deny institution of *inter partes* review due to an earlier trial date:

[1] whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted; [2] proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision; [3] investment in the parallel proceeding by the court and the parties; [4] overlap between issues raised in the petition and in the parallel proceeding; [5] whether the petitioner and the defendant in the parallel proceeding are the same party; and [6] other circumstances that impact the Board’s exercise of discretion, including the merits. *Apple Inc. v. Fintiv, Inc.*, No. IPR2020-00019, Paper 11, at 5–6 (P.T.A.B. Mar. 20, 2020) (precedential).

Applying the *Fintiv* factors to the present Petition favors institution of *inter partes* review:

The **first factor** (potential stay of the pending district court proceeding) is neutral because no party has requested a stay. *VMWare, Inc. v. Intellectual Ventures I LLC*, No. IPR2020-00470, Paper 13 (P.T.A.B. Aug. 18, 2020), at 17 (finding, in the absence of a stay motion, that the first factor “does not weigh for or against discretionary denial”).

The **second factor** (proximity of the district court trial date to the Board’s

statutory deadline) weighs against discretionary denial of institution. The trial date for the currently pending district court case is far in the future, with a jury trial scheduled to begin on June 8, 2026. *See* Ex. 1005, p. 2. Because much can change in 18 months, the current trial date does not support denial of institution. *See Dish Network L.L.C. v. Broadband iTV, Inc.*, No. IPR2020-01280, Paper 17, at 16 (P.T.A.B. Feb. 4, 2021) (“We cannot ignore the fact that the currently scheduled trial date is more than nine months away and much can change during this time.”).

The **third factor** (investment in the district court proceeding by the court and the parties) weighs heavily against discretionary denial. The associated district court case remains in the very early stages of litigation: discovery remains in preliminary stages, with a claim construction hearing not scheduled until April 10, 2025. *See* Ex. 1005, p. 2. Moreover, it is unlikely that a claim construction order will issue prior to the PTAB’s projected institution decision date. Accordingly, the district court will not have invested significant resources or issued any substantive orders regarding the challenged ’024 Patent prior to the issuance of an institution decision. *See Fintiv*, No. IPR2020-00019, Paper 11, at 9–12. Further, Petitioner has diligently prepared and filed this Petition in advance of the statutory deadline to do so, which weighs against denying institution.

The **fourth factor** (overlapping issues between Petition and district court proceeding) favors institution. Instituting trial will allow issues to be narrowed in

the district court case because, if trial is instituted by the Board, Petitioner stipulates that it will not pursue invalidity against the asserted claims in the district court using the specific combination of prior art references set forth in the grounds presented in this Petition for purposes of establishing anticipation or obviousness. *See Sand Revolution II, LLC v. Continental Intermodal Group-Trucking LLC*, No. IPR2019-01393, Paper 24, at 11-12 (PTAB June 16, 2020) (holding a similar stipulation weighs against discretionary denial because such stipulation “mitigates . . . the concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions”). Given the lack of overlapping issues between this Petition and the pending district court proceeding, the fourth factor weighs against the Board exercising its discretion to deny institution.

The **fifth factor** (overlapping parties) is neutral, as it is “far from an unusual circumstance that a petitioner in *inter partes* review and a defendant in a parallel district court proceeding are the same.” *Sand Revolution II*, No. IPR2019-01393, Paper 24, at 12–13.

The **sixth factor** (other considerations) weighs against discretionary denial. As discussed herein, the merits of the Petition are strong, and the Challenged Claims are invalid. For example, none of the grounds asserted herein were previously considered by either the Office or the district court. *See Comcast Cable Commn’s, LLC v. Rovi Guides, Inc.*, No. IPR2019-00231, Paper 14, at 11 (P.T.A.B. May 20,

2019) (holding that challenges not “previously considered by the Office or by any court . . . weigh in favor of not denying institution based on § 314(a)”). Moreover, the ’024 Patent is currently asserted in two pending district court cases. Institution of this *inter partes* review would provide the opportunity for narrowing and simplifying the litigation for the district courts.

Accordingly, the Board should decline to exercise its discretion under *Fintiv* and institute trial.

IX. CONCLUSION

Petitioner respectfully requests cancellation of the Challenged Claims.

X. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Party-in-Interest (37 C.F.R. § 42.8(b)(1))

The real parties-in-interest are Cambridge Industries USA, Inc, which is a named defendant in the associated district court proceeding, and its parent corporation, CIG Shanghai, Co. Ltd.

B. Related Matter(s) (37 C.F.R. § 42.8(b)(2))

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner is aware of the following pending lawsuit(s) or related matter(s) involving the ’024 Patent:

- *Applied Optoelectronics, Inc. v. Cambridge Industries USA, Inc.*, No. 3:24-cv-01010-JD (N.D. Cal.) (filed Feb. 20, 2024)

- *Applied Optoelectronics, Inc. v. v. Accelight Technologies, Inc.*,
4:24-cv-09041 (N.D. Cal. filed Nov. 19, 2024)

C. Designation of Counsel (37 C.F.R. § 42.8(b)(3))

Petitioner provides the following designation of counsel:

Lead Counsel	Backup Counsel
Nicola A. Pisano Reg. No. 34,408 EVERSHEDS SUTHERLAND (US) LLP 12255 Camino Real, Suite 100 San Diego, California 92130-2071 Phone: (858)252-2952 Fax: (858)794-4091 Email: nicolapisano@eversheds- sutherland.com	Regis Worley Reg. No. 58,430 EVERSHEDS SUTHERLAND (US) LLP 12255 Camino Real, Suite 100 San Diego, California 92130-2071 Phone: (858)252-2952 Fax: (858)794-4091 Email: regisworley@eversheds- sutherland.com

Pursuant to 37 C.F.R. § 42.8(b)(4), counsel agrees to service by mail as detailed above, and to electronic service by at the email addresses set forth above. Pursuant to 37 C.F.R § 42.10(b), a Power of Attorney executed by Petitioner accompanies this Petition.

D. Service Information (37 C.F.R. § 42.8(b)(4))

Please address all correspondence and service to the addresses listed above.

Petitioner consents to electronic service directed to: nicolapisano@eversheds-sutherland.com; and regisworley@eversheds-sutherland.com.

Date: January 17, 2025

By: /Nicola A. Pisano/

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CLAIMS APPENDIX

Claim	Recitation
[1a]	A transmitter optical subassembly (TOSA) module comprising:
[1b]	a hermetically-sealed light engine with a housing that defines a hermetic-sealed cavity and at least one laser package for emitting an associated channel wavelength disposed within the hermetic-sealed cavity;
[1c]	a substrate defined by first and second surfaces disposed opposite each other, the substrate including an electrical coupling region for electrically coupling with a transmit connecting circuit and a light engine interface region for electrically coupling with the hermetically-sealed light engine;
[1d]	a light engine driving circuit disposed on the substrate to provide a radio frequency (RF) signal and a power signal to drive the hermetically-sealed light engine to output one or more channel wavelengths;
[1e]	wherein the substrate includes at least a first trace disposed on the first surface to provide the power signal and at least a second trace disposed on the second surface to provide the RF signal, the first and second traces being disposed in an opposing arrangement to provide electrical isolation to reduce electrical interference between the power signal and the RF signal
[1f]	a feedthrough device to electrically couple the at least one laser package to the light engine driving circuit; and
[1g]	wherein the feedthrough device is defined by at least a first surface disposed opposite a second surface, and wherein the first and second surfaces extend substantially parallel with the first and second surfaces of the substrate.

Claim	Recitation
2	The TOSA module of claim 1, further comprising at least a first interconnect device of a first type electrically coupled to the first trace and a corresponding trace of the hermetically-sealed light engine housing to provide the power signal, and at least a second interconnect device of a second type electrically coupled to the second trace and a corresponding trace of the hermetically-sealed light engine housing to provide the RF signal, the first and second types of interconnect devices being different.
3	The TOSA module of claim 2, wherein the first type of interconnect device is a DC bus bar interconnect.
4	The TOSA module of claim 2, wherein the second type of interconnect device is a wire bond.
5	The TOSA module of claim 1, further comprising at least one ground trace disposed on the second surface adjacent the second trace.
6	The TOSA module of claim 5, further comprising a DC bus bar interconnect device electrically coupled to the at least one ground trace and a wire bond electrically coupled to the second trace.
7	The TOSA module of claim 1, wherein the electrical isolation is provided at least in part by a width of the substrate and/or material properties of a material that forms the substrate.
8	The TOSA module of claim 1, further comprising a plurality of electrical interconnects that brace the substrate to the housing of the hermetically sealed light engine.
9	The TOSA module of claim 1, wherein the feedthrough device is configured to directly couple to the substrate with an end-to-end connection.
10	The TOSA module of claim 1, wherein the first and second surfaces of the feedthrough device are substantially coplanar with the first and second surfaces of the substrate when the feedthrough device and substrate are coupled together.

Claim	Recitation
11	The TOSA module of claim 1, further comprising at least one trace for receiving the power signal from the light engine driving circuit disposed on the first surface of the feedthrough and at least one trace for receiving the RF signal from the light engine driving circuit disposed on the second surface.
[12a]	An optical transceiver comprising:
[12b]	a housing;
[12c]	a transmitter optical subassembly (TOSA) module disposed in the housing, the TOSA module comprising:
[12d]	a hermetically-sealed light engine with a housing that defines a hermetic-sealed cavity and at least one laser package disposed within the hermetic-sealed cavity;
[12e]	a substrate defined by first and second surfaces disposed opposite each other, the substrate including an electrical coupling region for electrically coupling with a transmit connecting circuit and a light engine interface region for electrically coupling with the hermetically-sealed light engine;
[12f]	a light engine driving circuit disposed on the substrate to provide a radio frequency (RF) signal and a power signal to drive the hermetically-sealed light engine to output one or more channel wavelengths; and
[12g]	wherein the substrate includes at least a first trace disposed on the first surface to provide the power signal, and at least a second trace disposed on the second surface to provide the RF signal, the first and second traces being disposed in an opposing arrangement to provide electrical isolation to reduce electrical interference between the power signal and the RF signal;
[12h]	at least a first interconnect device of a first type electrically coupled to the first trace and a corresponding trace of the hermetically-sealed light engine to provide the power signal, and at least a second interconnect device of a second type electrically coupled to the second trace and a corresponding trace of the hermetically-sealed light engine to provide the RF signal, the first and second types of interconnect devices being different;

Claim	Recitation
[12i]	a receive optical subassembly (ROSA) module disposed in the housing.
13	The optical transceiver of claim 12, wherein the first type of interconnect device comprises a DC bus bar disposed on the first and second surfaces of the substrate.
14	The optical transceiver of claim 12, wherein the second type of interconnect device is a wire bonds.
[15a]	A transmitter optical subassembly (TOSA) module comprising:
[15b]	a hermetically-sealed light engine with a housing that defines a hermetic-sealed cavity and at least one laser package for emitting an associated channel wavelength disposed within the hermetic-sealed cavity;
[15c]	a substrate defined by first and second surfaces disposed opposite each other, the substrate including an electrical coupling region for electrically coupling with a transmit connecting circuit and a light engine interface region for electrically coupling with the hermetically-sealed light engine;
[15d]	a light engine driving circuit disposed on the substrate to provide a radio frequency (RF) signal and a power signal to drive the hermetically-sealed light engine to output one or more channel wavelengths;
[15e]	wherein the substrate includes at least a first trace disposed on the first surface to provide the power signal and at least a second trace disposed on the second surface to provide the RF signal, the first and second traces being disposed in an opposing arrangement to provide electrical isolation to reduce electrical interference between the power signal and the RF signal; and
[15f]	at least a first interconnect device of a first type electrically coupled to the first trace and a corresponding trace of the hermetically-sealed light engine housing to provide the power signal, and at least a second interconnect device of a second type electrically coupled to the second trace and a corresponding trace of the hermetically-sealed light engine housing to provide the RF signal, the first and second types of interconnect devices being different.

Claim	Recitation
16	The TOSA module of claim 15, wherein the first type of interconnect device is a DC bus bar interconnect.
17	The TOSA module of claim 15, wherein the second type of interconnect device is a wire bond.

CERTIFICATION UNDER 37 C.F.R. § 42.24

Petitioner certifies that the word count in this Petition is 9353 words, as counted by the word-processing program (Microsoft Word for Office 365) used to generate this Petition, such word count excluding the table of contents, table of authorities, mandatory notices under 37 C.F.R. § 42.8, certificate of service, appendix of exhibits or claim listing, and this certificate of word count. This Petition is in compliance with the 14,000-word limit set in 37 C.F.R. §42.24(a)(1)(i).

Date: January 17, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e), 42.105, the undersigned hereby certifies that true and correct copies of the above-captioned PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,313,024, all associated exhibits, and Petitioner's Power of Attorney were served in their entireties on January 17, 2025, upon Patent Owner at the correspondence address of record for the subject patent as listed on the USPTO's Patent Center via Priority Mail Express®:

APPLIED OPTOELECTRONICS, INC.
13115 Jess Pirtle Blvd.
Sugar Land, TX 77478

Date: January 17, 2025

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