

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EOPTOLINK TECHNOLOGY USA INC.,

Petitioner,

v.

APPLIED OPTOELECTRONICS, INC.,

Patent Owner.

Case IPR2026-00122

Patent No. 10,714,890

**PATENT OWNER RESPONSE TO PETITION FOR *INTER PARTES*
REVIEW OF U.S. PATENT 10,714,890**

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Exhibit No.	Description
2007	Declaration of Dr. Alan Willner
2008	July 31, 2025 Memorandum from Acting Director Stewart

I. INTRODUCTION

Patent Owner Applied Optoelectronics, Inc. (“AOI”) submits this Patent Owner Response to the Petition of Eoptolink Technology USA Inc. (“Petitioner” or “Eoptolink”) for an *inter partes* review (“IPR”) of U.S. Patent No. 10,714,890 (the “’890 Patent”, Exhibit 1001) entitled “Transmitter Optical Subassembly Arrangement with Vertically-Mounted Monitor Photodiodes.” The Petition challenges the patentability of Claims 1, 2–9, and 15–19 (the “Challenged Claims”).

On May 6, 2026, the Board granted institution of *Inter Partes* Review. The ’890 patent generally relates to a multi-channel TOSA with vertically-mounted MPDs to reduce TOSA housing dimensions and improve RF driving signal quality. The ’890 patent has three independent claims: claims 1, 11, and 15.

Claim 1 is directed to a transmitter optical subassembly (TOSA) module that includes a first LD having a back-side emission surface for emitting a portion of optical power along a first optical path, a base portion including a feedthrough device wherein a first MPD is mounted vertically and optically aligned with the first LD via the first optical path based at least in part on the vertical MPD mounting surface extending substantially transverse relative to the LD mounting

surface such that the first optical path intersects with the light receiving region of the first MPD.

Claim 11 and dependent claims 12–14, which are not challenged here, are directed to a method for optically coupling MPDs to corresponding laser diodes (LDs) in a multi-channel TOSA housing.

Claim 15 is directed to a multi-channel optical transceiver module including a TOSA, the TOSA includes a first LD having a back-side emission surface for emitting a portion of optical power along a first optical path, a base portion including a feedthrough device wherein a first MPD is mounted vertically and optically aligned with the first LD via the first optical path based at least in part on the vertical MPD mounting surface extending substantially transverse relative to the LD mounting surface such that the first optical path intersects with the light receiving region of the first MPD.

Eoptolink only challenges a subset of the '890 claims. Eoptolink presents three grounds of invalidity against the Challenged Claims. *See* Petition at pp. 3–4.

In Ground 1, Eoptolink challenges Claim 1 as anticipated by Takashi (Japanese Patent Publication No. JP 2010-161146, Ex. 1004).

In Ground 2, Eoptolink challenges Claims 2–9 as obvious over Takashi in view of Sato (U.S. Patent No. 9,385,830, Ex. 1005).

In Ground 3, Eoptolink challenges Claims 15–19 as obvious over Ho (U.S. Patent No. 9,306,371, Ex. 1006) in view of Takashi in further view of Sato.

Petitioner has not met its burden to prove the unpatentability of any of the Challenged Claims.

As for Ground 2, neither Takashi nor Sato disclose the limitation of claim 5 requiring “a plurality of transmit (TX) radio frequency (RF) traces, the TX RF traces being disposed on a surface of the base that extends away from the vertical mounting surface along a direction that is substantially parallel with the LD mounting surface.”

In addition, neither Takashi nor Sato disclose the limitation of claim 6 requiring “wherein the plurality of TX RF traces are disposed below the MPD when mounted to the vertical MPD mounting surface to allow the plurality of TX RF traces to extend towards the LD mounting surface, and wherein a portion of the plurality of TX RF traces are disposed adjacent the LD mounting surface.”

As for Ground 3, Takashi fails to disclose the limitation of claim 19 requiring “the multi-channel optical transceiver of claim 15, further comprising a plurality of transmit (TX) radio frequency (RF) traces, the TX RF traces being disposed on a surface of the base that extends away from the vertical mounting

surface along a direction that is substantially parallel with the LD mounting surface.”

II. BACKGROUND

A. '890 Patent

The '890 Patent is directed to a multi-channel TOSA with vertically-mounted MPDs to reduce TOSA housing dimensions and improve RF driving signal quality. *See* Ex. 1001, Abstract; *see also* Ex. 2007 at ¶ 56. The TOSA housing includes at least one vertical MPD mounting surface that extends substantially transverse relative to a LD mounting surface, with the result being that a MPD coupled to the vertical MPD mounting surface gets positioned above an associated LD coupled to the LD mounting surface. *Id.* The vertically-mounted MPD thus makes regions adjacent an LD that would otherwise be utilized to mount an MPD available for patterning of conductive RF traces to provide an RF driving signal to the LD. *See* Ex. 1001 at col. 3:10–13; *see also* Ex. 2007 at ¶ 56. The conductive RF traces may therefore extend below the vertically-mounted MPD to a location that is proximate the LD to allow for relatively short wire bonds therebetween. *See* Ex. 1001 at col. 3:13–16; *see also* Ex. 2007 at ¶ 56.

In embodiments, the at least one vertical MPD mounting surface is provided by a feedthrough device. *See* Ex. 1001 at col. 3:17–19; *see also* Ex. 2007 at ¶ 57. The

feedthrough device can provide a conductive RF trace mounting surface for patterning conductive RF traces. *See* Ex. 1001 at col. 3:22–26; *see also* Ex. 2007 at ¶ 57. A plurality of transmit RF traces can be disposed below the MPD when the MPD is mounted to the vertical MPD mounting surface to allow the plurality of TX RF traces to extend towards the LD mounting surface, and wherein a portion of the plurality of TX RF traces are disposed adjacent the LD mounting surface. *See* Ex. 1001 at col. 3:33–38; *see also* Ex. 2007 at ¶ 57.

The TOSA module can further include a plurality of sidewalls to define a cavity with the LD mounting surface disposed within the cavity. *See* Ex. 1001 at col. 4:63–66; *see also* Ex. 2007 at ¶ 58. The cavity can be hermetically sealed. *See* Ex. 1001 at col. 6:51–52. The housing can include a thermoelectric cooler (TEC) mounted therein. *See* Ex. 1001 at col. 8:66–9:10; *see also* Ex. 2007 at ¶ 58. The TOSA module can include a plurality of LD and MPDs with input ports optically aligned with each optical path. *See* Ex. 1001 at col. 4:33–5:40; *see also* Ex. 2007 at ¶ 58. The TOSA module can include a multiplexing arrangement to receive and combine received channel wavelengths. *See* Ex. 1001 at col. 5:41–45; *see also* Ex. 2007 at ¶ 58. The multiplexing arrangement can include an arrayed waveguide grating (AWG) to multiplex the received channel wavelengths. *Id.*

The '890 Patent is also directed to a multi-channel optical transceiver module that includes a printed circuit board assembly (PCBA), a multi-channel TOSA arrangement coupled to the PCBA, and the TOSA arrangement feature of the TOSA described above. *See* Ex. 1001 at col. 10:28–42; *see also* Ex. 2007 at ¶ 59.

The '890 Patent is also directed to methods for optically coupling MPDs to corresponding LDs in a multi-channel TOSA housing. *See* Ex. 1001 at col. 10:43–59; *see also* Ex. 2007 at ¶ 60.

B. Relevant File History

Application no. 16/268,765 for the '890 Patent was filed on February 6, 2019. *See* “'890 Patent File History,” Exhibit 1002. The '890 Patent issued on July 14, 2020, with 19 claims, including three independent claims. *Id.* (*see* Exhibit 1002 for the full prosecution history); *see also* Ex. 2007 at ¶ 61.

C. Alleged Prior Art References

1. Takashi (Exhibit 1004)

Takashi is directed to an optical transmission module wherein a LD carrier has a sloped surface between a mounting surface and an electrode pad installation surface such that the LD is raised relative to a monitor PD (MPD) so that the monitor PD can receive rearward emitted light from the LD. *See* Ex. 1004, Abstract; *see also* Ex. 2007 at ¶ 64.

2. Sato (Exhibit 1005)

Sato is directed to a transmitter module having a plurality of semiconductor laser diodes (LDs) as optical signal sources that emit optical beams with specific wavelengths where the wavelengths of the optical beams are different from each other. *See* Ex. 1005, Abstract; *see also* Ex. 2007 at ¶ 65. In addition to the LDs, the transmitter module includes a driver to drive LDs in the shunt-driving configuration. *Id.* Inductors through which the bias currents for the LDs are provided are mounted on the driver as interposing a spacer and a top carrier. *Id.*

3. Ho (Exhibit 1006)

Ho is directed to a thermally isolated multi-channel transmitter optical subassembly (TOSA) that generally includes an array of lasers optically coupled to an arrayed waveguide grating (AWG) to combine multiple optical signals with different channel wavelengths. *See* Ex. 1006, Abstract; *see also* Ex. 2007 at ¶ 66. The lasers, and possibly other components, are wire bonded to a thermal isolation bar which provides an electrical connection to external circuitry and is thermally coupled to a temperature control device, such as a thermoelectric cooler (TEC). *Id.* The optical transceiver may be used in a wavelength division multiplexed (WDM) optical system, for example, in an optical line terminal (OLT) in a WDM passive optical network (PON). *Id.*

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

For the purposes of this Patent Owner Response, AOI applies Eoptolink's proposed level of skill in the art: A person of ordinary skill in the art ("POSITA") knowledgeable of the technical field of the '890 Patent would have had (1) a bachelor's degree in electrical or electronic engineering or an equivalent degree, and (2) 2–4 years of work experience in optoelectronics, optical networking, optical communications, or a closely related field. *See* Ex. 1003, ¶ 39; *see also* Ex. 2007 at ¶¶ 42–45.

IV. CLAIM CONSTRUCTION

Eoptolink states that no claim terms require claim construction. *See* Petition at p. 14. Therefore, for the purposes of this Patent Owner Response, AOI will give all claim terms their plain and ordinary meaning as understood by a POSITA at the time of the invention. *See* Ex. 2007 at ¶¶ 62–63.

V. GROUND 2: EOPTOLINK HAS NOT SHOWN THAT TAKASHI IN VIEW OF SATO RENDERS OBVIOUS CLAIMS 5 and 6.

A. Claim 5

- 1. Neither Takashi nor Sato disclose the limitation requiring “a plurality of transmit (TX) radio frequency (RF) traces, the TX RF traces being disposed on a surface of the base that extends away from the vertical mounting surface along a direction that is substantially parallel with the LD mounting surface.”**

Claim 5 requires “a plurality of transmit (TX) radio frequency (RF) traces, the TX RF traces being disposed on a surface of the base that extends away from the vertical mounting surface along a direction that is substantially parallel with the LD mounting surface.” Takashi does not disclose the limitation, and Petitioner does not rely on Sato to remedy this deficiency. *See* Ex. 2007 at ¶ 67.

Specifically, claim 5 requires that the TX RF traces are “disposed on a surface of the base.” As claimed, the base portion comprises a feedthrough device 262 as shown below in an annotated version of FIG. 8b. *See* Ex. 2007 at ¶ 68.

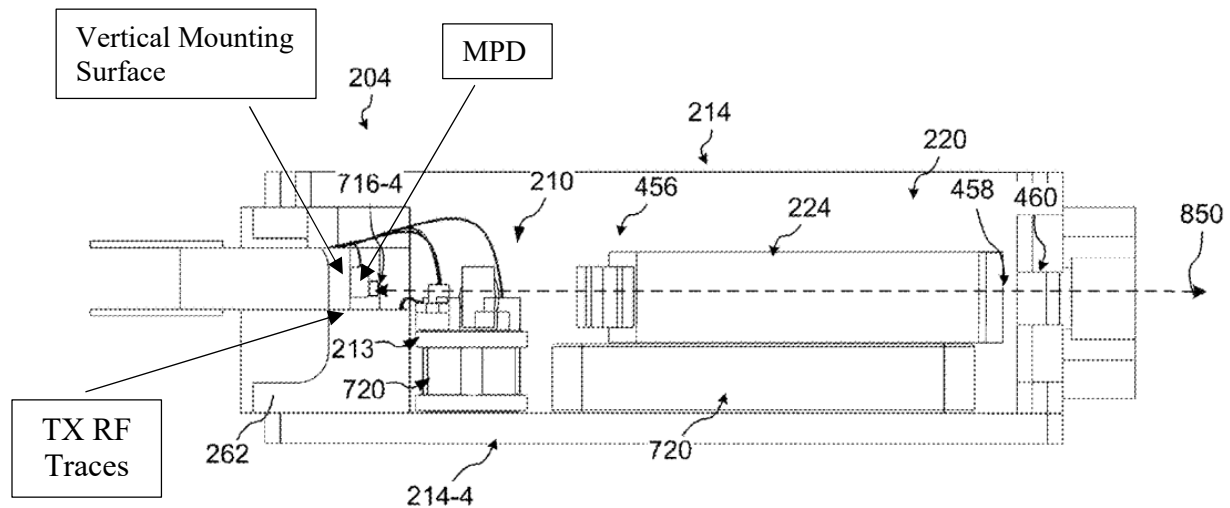


FIG. 8B

FIG. 7 further shows the traces running directly below the vertical mounting surface. *See* Ex. 2007 at ¶ 68; *see also* Exhibit 1001 at col. 7:62 to col. 8:44. FIG. 7 is reproduced below for convenience. For example, the '890 Patent explains that “The conductive RF traces may therefore extend below the vertically-mounted MPD to a location that is proximate the LD to allow for relatively short wire bonds therebetween.” *See* Ex. 2007 at ¶ 68; *see also* Exhibit 1001 at col. 3:13-16.

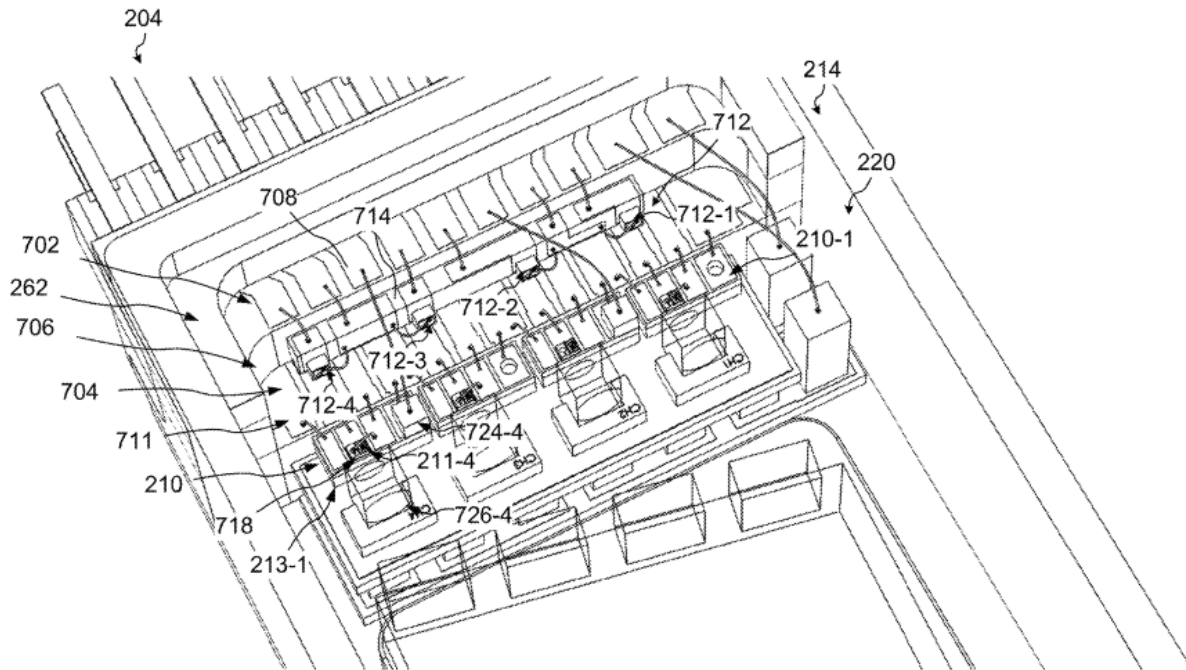
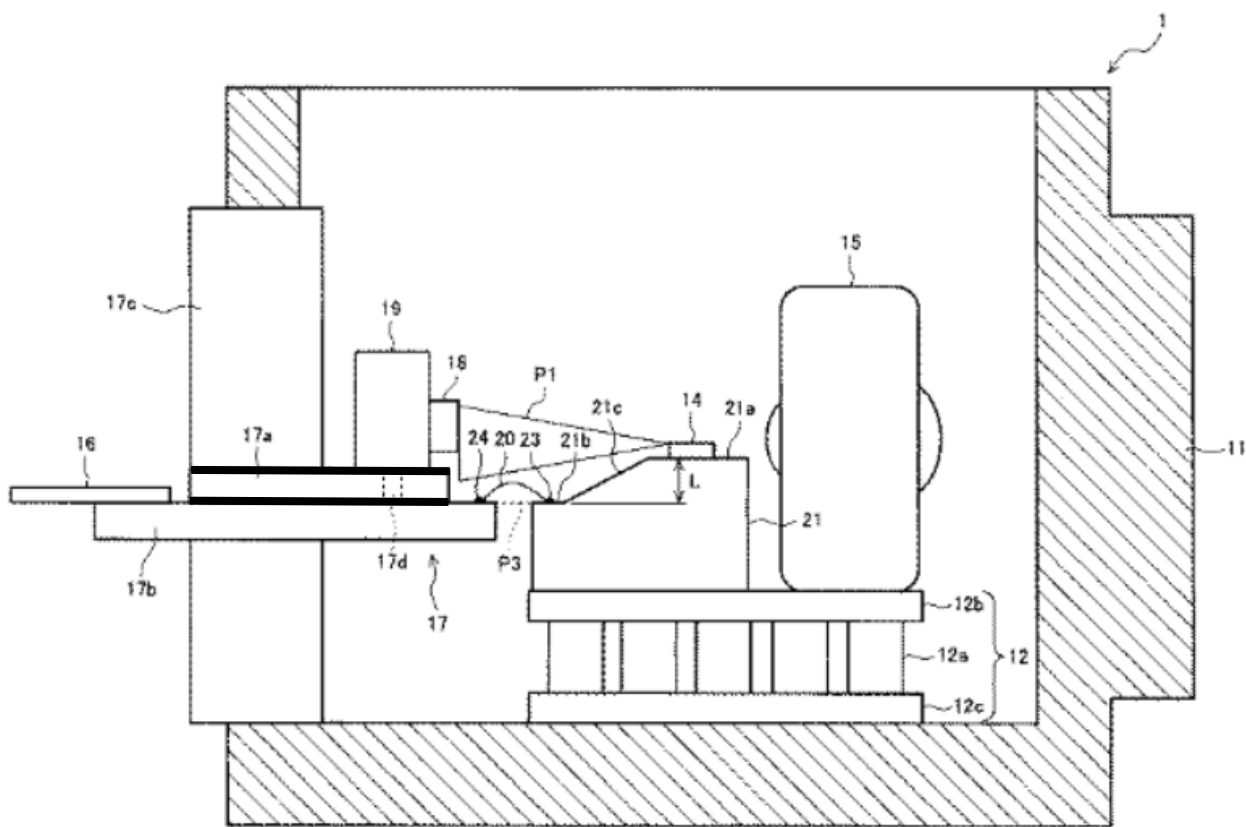


FIG. 7

The TX RF traces in Takashi are formed on a lower layer 17b of a circuit board 17 as shown in Fig. 1 of Takashi. The TX RF traces in Takashi connect with a subset of lead terminals 16. (“[T]he interconnect conductors are formed on second ceramic substrate 17b, shown in Figure 1.” Ex. 1004 at ¶ 28.) *See* Ex. 2007 at ¶ 70.

While circuit board 17 may be a feedthrough device, neither layer 17b nor the surface of layer 17b is the claimed surface of the feedthrough device. The surface of layer 17a of circuit board 17 would be the surface of the feedthrough

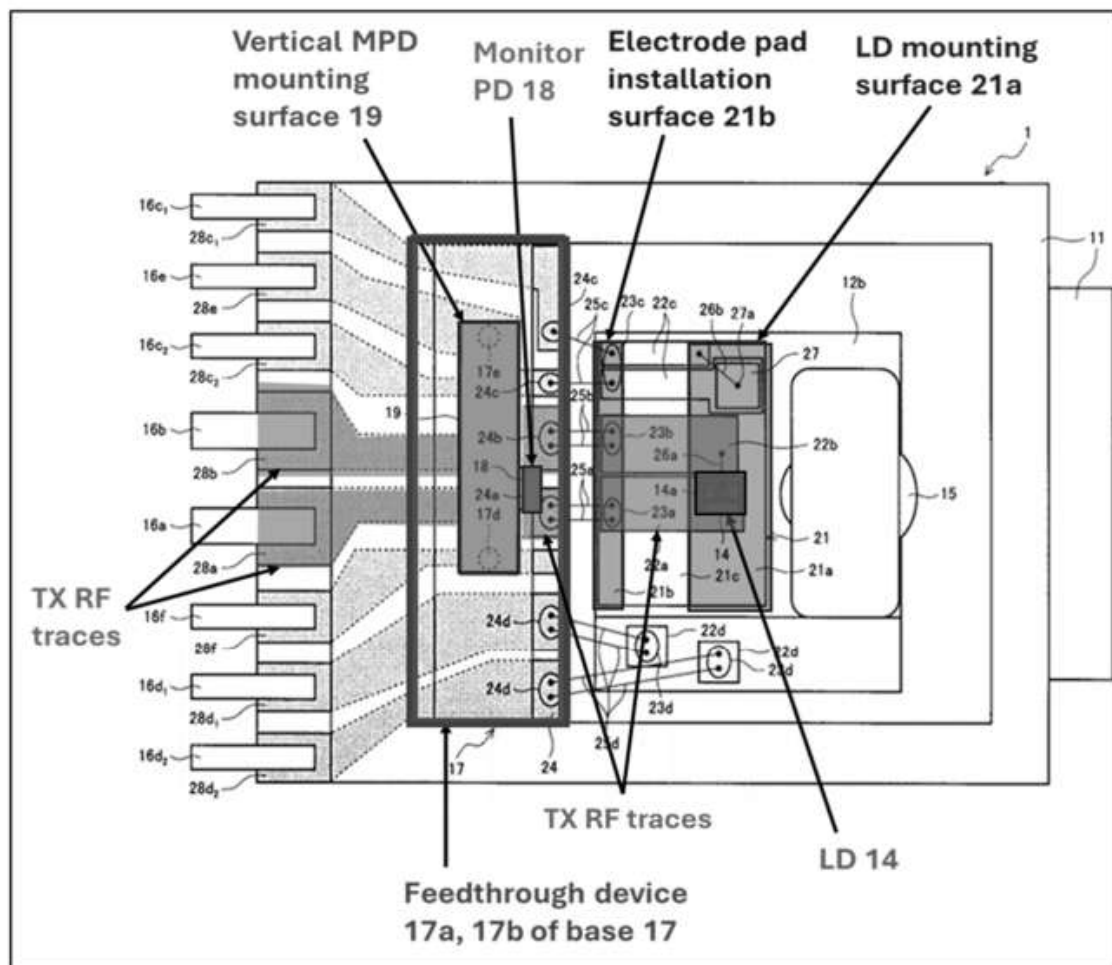
device, or base portion, that is adjacent to the vertical mounting surfaces and arguably extends away from the vertical mounting surface along a direction that is substantially parallel with the LD mounting surface. However, the surface of layer 17a does not contain the TX RF traces and thus Takashi does not satisfy the limitations of claim 5. See the annotated version of Takashi Fig. 1 below. *See* Ex. 2007 at ¶ 71.



Specifically, the red line corresponds to the surface of the lower layer 17b of the circuit board that has TX RF traces in Takashi. The TX RF traces are not on

the surface of layer 17a (shown in blue), as would be required by claim 5. *See* Ex. 2007 at ¶ 72. Eoptolink does not use Sato to correct this deficiency. *Id.*

Petitioner points to an annotated version of Takashi's Fig. 2 in support of its argument that Takashi discloses claim 5. *See* Petition at pp. 40–42. However, Petitioner is incorrect, and the citations to Fig. 2 are not accurate. Petitioner's annotated version of Takashi's Fig. 2 is reproduced below for convenience. *See* Ex. 2007 at ¶ 73.



Petitioner points to the aqua-colored areas as being the TX RF traces and says they are “disposed on a surface of the feedthrough device of base 17.” *See* Petition at pp. 40–42. However, as explained above the traces shown in aqua to the left of the area labeled “Feedthrough device” and in the area labeled “Feedthrough device” are not on the surface of “base 17” as required by claim 5. They are on a lower layer of the circuit board as shown in Takashi’s Fig. 1. Further, the aqua-colored area to the right of the area labeled “Feedthrough device” is not part of a feedthrough device or claimed base, and thus do not contain TX RF traces relevant to claim 5. *See* Ex. 2007 at ¶ 74.

Finally, to the extent Petitioner and its expert argue a POSITA would know to connect the Takashi circuit to the Ho circuit (*see, e.g.,* Ex. 1003 at ¶ 81) such an approach using “general knowledge”—a broad category encompassing AAPA, expert declarations, common sense, and other non-patent or non-printed publication evidence—*cannot be used* to supply a missing claim limitation in an IPR. *See* Exhibit 2008 at p. 1, July 31, 2025 Memorandum from Acting Director Stewart (emphasis added). Thus, as here, if a prior art reference admittedly lacks a specific element, petitioners can no longer argue that a person of ordinary skill in the art (POSITA) would inherently understand or fill that gap based on background knowledge, and the IPR should be denied. *See id.* (“As a practical matter,

enforcement of Rule 104(b)(4) means that applicant admitted prior art (AAPA), expert testimony, common sense, and other evidence that is not ‘prior art consisting of patents or printed publications’ (collectively, ‘general knowledge’) may not be used to supply a missing claim limitation. Per 35 U.S.C. § 312(a)(4), the Board shall deny an IPR petition that fails to comply with Rule 104(b)(4).”).

Petitioner does not cite to Sato to remedy these deficiencies. *See* Ex. 2007 at ¶ 75.

For at least these reasons, the Takashi-Sato combination does not disclose the limitations of claim 5, and therefore, does not render claim 5 obvious. *See* Ex. 2007 at ¶ 76.

B. Claim 6

Claim 6 depends from claim 5. The Takashi-Sato combination does not render claim 6 obvious for the same reasons the combination does not render claim 5 obvious. *See* Ex. 2007 at ¶ 77.

1. **Neither Takashi nor Sato disclose the limitation requiring “wherein the plurality of TX RF traces are disposed below the MPD when mounted to the vertical MPD mounting surface to allow the plurality of TX RF traces to extend towards the LD mounting surface, and wherein a portion of the plurality of TX RF traces are disposed adjacent the LD mounting surface.”**

Further, claim 6 recites the limitation “wherein the plurality of TX RF traces are disposed below the MPD when mounted to the vertical MPD mounting surface to allow the plurality of TX RF traces to extend towards the LD mounting surface, and wherein a portion of the plurality of TX RF traces are disposed adjacent the LD mounting surface.” Takashi does not disclose this limitation, and Petitioner does not cite to Sato to remedy the deficiency. *See* Ex. 2007 at ¶ 78.

As the specification explains, the disclosed invention “includes at least one vertical MPD mounting surface that extends substantially transverse relative to a LD mounting surface, with the result being that a MPD coupled to the vertical MPD mounting surface gets positioned above an associated LD coupled to the LD mounting surface. The vertically-mounted MPD thus makes regions adjacent an LD that would otherwise be utilized to mount an MPD available for patterning of conductive RF traces to provide an RF driving signal to the LD.” *See* Exhibit 1001 at col. 3:5–13. Thus, disposing the plurality of TX RF traces “below the MPD when [the MPD is] mounted to the vertical MPD mounting surface” *allows* “the

plurality of TX RF traces to extend towards the LD mounting surface.” *See* Ex. 2007 at ¶ 79.

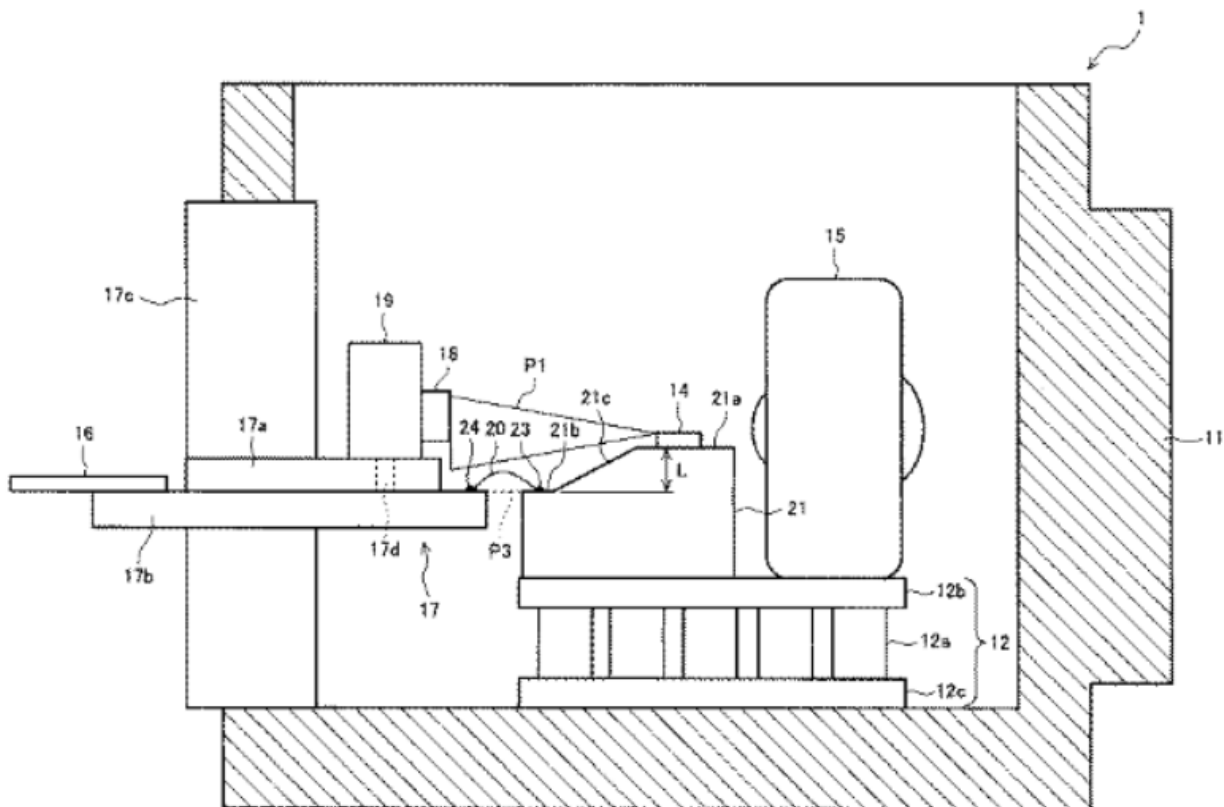
Claim 6 requires the MPD to be mounted to the vertical MPD mounting surface “to allow the plurality of TX RF traces to extend towards the LD mounting surface.” However, Takashi does not seem to have this same issue of needing to utilize space where an MPD would otherwise be mounted. By placing the TX RF traces on a lower layer of the circuit board 17, the TX RF traces do not appear to be impacted by the placement of the MPD. *See* Ex. 2007 at ¶ 80; *see also* Ex. 1004 at ¶ 28 and Fig. 1.

The ‘890 Patent further states that “The conductive RF traces may therefore extend below the vertically-mounted MPD to a location that is proximate the LD to allow for relatively short wire bonds therebetween.” *See* Ex. 2007 at ¶ 81; *see also* Ex. 1001 at col. 3:13–16.

As discussed above, Takashi does not seem to have this same issue because of the differences in its design. For example, Takashi placed the TX RF traces on a lower layer of the circuit board 17. Further, Takashi uses a different structure for interconnection than the ’890 Patent. *See* Ex. 2007 at ¶ 82.

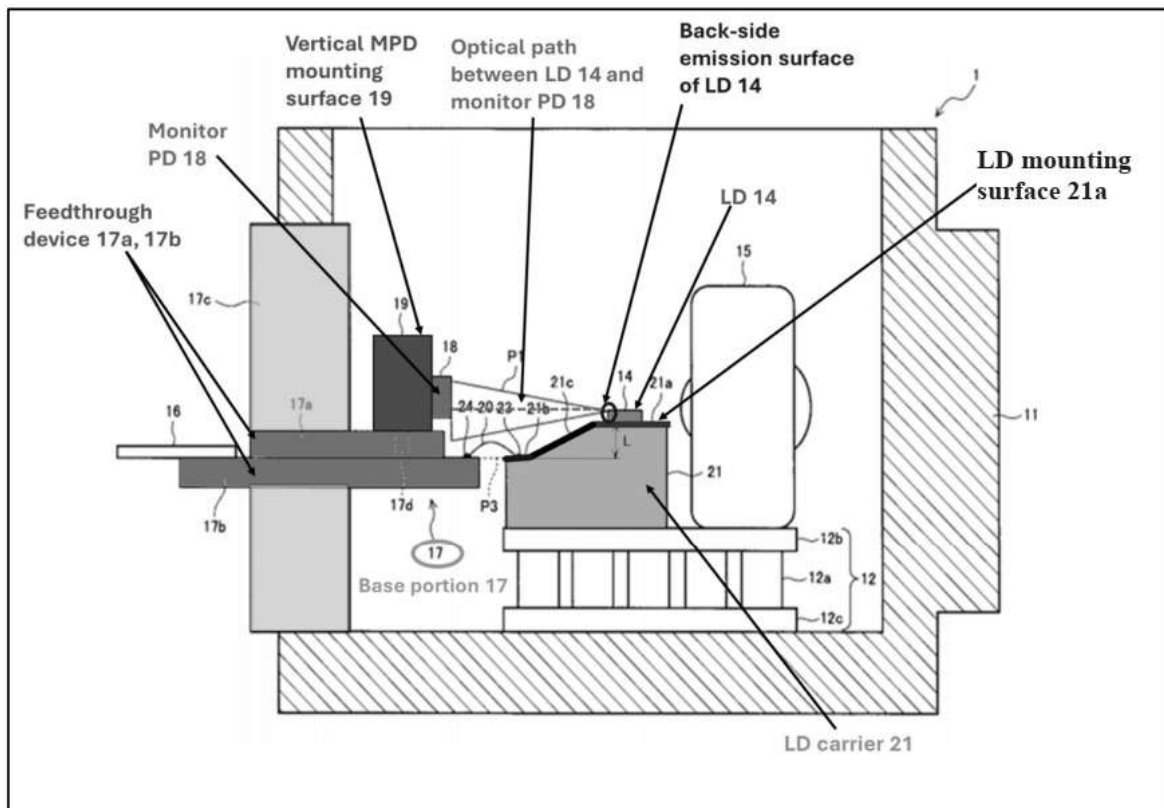
Therefore, the TX RF traces are not disposed below the MPD utilizing space created by vertically mounting the MPD. *See* Ex. 2007 at ¶ 83.

Further, claim 6 requires that “a portion of the plurality of TX RF traces are disposed adjacent the LD mounting surface.” That is not the case in Takashi. *See* Ex. 2007 at ¶ 84.



The TX RF traces in Takashi end at or near element 24 where a wire bond connects the signals to a pad on surface 21b. *See* Ex. 2007 at ¶ 85; *see also, e.g.*, Ex. 1004 at ¶¶ 20–28. and Fig. 1. The LD is located on LD mounting surface 21a. *See* Ex. 2007 at ¶ 85; *see also, e.g.*, *id.* at ¶ 18. Sloped surface 21c is disposed between surface 21b and 21a. *See* Ex. 2007 at ¶ 85; *see also, e.g.*, *id.* at ¶ 20.

The claimed traces in the '890 Patent are TX RF traces disposed on a surface of the base. Specifically, claim 6, depends from claim 5. Claim 5 requires “the TX RF traces being disposed on a surface of the base.” Petitioner specifically admits the “base” in Takashi would be circuit board 17 as shown in Petitioner’s annotated version of Takashi Fig. 1. *See* Ex. 2007 at ¶ 87.



Any traces in or near LD carrier 21 are not traces disposed on a surface of the base portion 17 and cannot be used to satisfy this claim limitation. *See* Ex. 2007 at ¶ 88.

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

Petitioner does not use Sato to correct this deficiency. *See* Ex. 2007 at ¶ 89.

For at least each of these reasons, the Takashi-Sato combination does not disclose the limitations of claim 6, and therefore, does not render claim 6 obvious. *See* Ex. 2007 at ¶ 90.

C. A POSITA Would Not Have Been Motivated to Combine Takashi and Sato

1. The Proposed Takashi–Sato Combination Would Render Takashi Unsatisfactory for its Intended Purpose.

Even if the proposed Takashi–Sato combination satisfied limitations of claims 5 and 6, which it does not, a POSITA would not have been motivated to combine the two references to achieve the claimed invention. *See* Ex. 2007 at ¶ 91.

Takashi, in presenting the problem to be solved, discloses that for prior art devices, in order to shorten the length of the interconnect wire to the LD, the circuit board pad(s) must be disposed on the same plane (same level) and the distance between the two electrode pad portions must be short. *See* Ex. 2007 at ¶ 92; *see also* Ex. 1004 at ¶ 10. However, Takashi explains that when both electrode pads are disposed on the same plane, the LD 14 rearward-emitted light cannot efficiently be received by the monitor PD. *See* Ex. 2007 at ¶ 92; *see also* Ex. 1004

at ¶ 11. Takashi's solution includes a carrier member having a level difference between the light-emitting element mounting surface and the electrode pad installing surface. *See* Ex. 2007 at ¶ 92; *see also* Ex. 1004 at ¶ 14 and Fig. 2.

Further, Sato makes clear that an important feature of their disclosed apparatus is having the bonding wires to the LD as short as possible:

In order to realize the operational speed exceeding 10 Gbps, the bonding wires connecting electrical components in the transmitter module should be short as possible. In other words, the electrical components are necessary to be positioned such that the bonding wires become shortest. A longer bonding wire causes an increase of the transmission impedance and degrades the high frequency performance of the transmitter module. The present application is to provide an arrangement of the components in the housing, by which the bonding wires effectively become shortest.

See Ex. 1005 at col. 1:29–39, emphasis added and *see* Ex. 2007 at ¶ 93.

Sato further states:

A feature of the transmitter module of the present application is that the anode electrode of the LD is wire-bonded to the signal pad of the driver through the relay pad on the LD sub-mount, and the cathode electrode of the LD is directly wire-bonded to the ground pad of the driver without being connected to the chassis ground of the housing.

See Ex. 1005 at col. 1:64–2:2, emphasis added; and *see* Ex. 2007 at ¶ 94.

Sato describes the LDs as follows:

The LDs 11 have the type of, what is called as the edge emitting type each having an n-type substrate and some epitaxial layers grown on

the n-type substrate. An LD with the n-type substrate is often assembled as the epitaxial layer is downward and the substrate is upward, which forms the epitaxial layer becomes the cathode while the substrate is the anode. The LDs 11 of the present embodiment, however, have the arrangement where both the anode and the cathode are extracted from the top surface, namely, the side of the epitaxial layers, by pulling up the electrode in the substrate to the top surface by the via hole. This is because the LDs 11 of the present embodiment are driven by, what is called, the shunt-driving mode. In the shunt-driving mode, the anode, namely, the epitaxial layer for the n-type substrate, receives the driving signal; while, the cathode, namely, the n-type substrate, is grounded. As shown in FIGS. 6 and 8, the bonding wires B2 extracted from the pads of the driver 23 b are both bonded to the pads 11 a formed on the top surface of the LDs 11.

See Ex. 1005 at col. 7:15–32 and *see* Ex. 2007 at ¶ 94.

Eoptolink argues that a POSITA would have been motivated to consider Sato’s design and use of multiple laser diodes and multiple monitor photodiodes within a transmitter when modifying Takashi’s TOSA. *See* Petition at p. 30. However, doing so would render Takashi unsatisfactory for its intended purpose. MPEP §2143.01 states that: “if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification,” and the obviousness argument fails. *See* Ex. 2007 at ¶ 96.

Takashi separates the LD from the electrode pads in order to optimize the rearward-emitted light from the LD to optimize the light impinging on the PD. In

contrast, Sato requires that the LD be directly wire-bonded to the substrate in direct conflict to Takashi's approach. Takashi separates the LD from the electrode pad in order to optimize the rearward-emitted light from the LD to optimize the light impinging on the PD. In contrast, Sato requires the wire-bonding to be to a pad located close to the LD in conflict with Takashi's approach. *See* Ex. 2007 at ¶ 97. Consequently, there is no suggestion or motivation to make the proposed modification. *Id.*

2. Sato Teaches Away from Using the Takashi Approach

As discussed above, Sato's approach for wire bonding conflicts with Takashi's approach. Consequently, for at least those reasons, Sato teaches away from Takashi. *See* Ex. 2007 at ¶ 98; MPEP § 2144.05 (citing *U.S. v. Adams*, 383 U.S. 39, 51-2 (1966)) ("A prima facie case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention")

For each of the above reasons, there is no motivation to make the proposed modification, and Eoptolink's obviousness arguments based on the Takashi-Sato combination fail. *See* Ex. 2007 at ¶ 99.

Accordingly, for at least each of these reasons, a POSITA would not be motivated to combine Takashi and Sato. Therefore, Eoptolink has not shown that

the Takashi-Sato combination renders obvious Claims 5 and 6, not only because the proposed combination does not satisfy the claim limitations, but also because a POSITA would not have been motivated to combine these references. *See Ex. 2007 at ¶ 100.*

VI. GROUND 3: EOPTOLINK HAS NOT SHOWN THAT HO IN VIEW OF TAKASHI IN FURTHER VIEW OF SATO RENDERS OBVIOUS CLAIM 19.

A. Claim 19

- 1. Takashi fails to disclose the limitation requiring “the multi-channel optical transceiver of claim 15, further comprising a plurality of transmit (TX) radio frequency (RF) traces, the TX RF traces being disposed on a surface of the base that extends away from the vertical mounting surface along a direction that is substantially parallel with the LD mounting surface.”**

Claim 19 recites that “the multi-channel optical transceiver of claim 15, further comprising a plurality of transmit (TX) radio frequency (RF) traces, the TX RF traces being disposed on a surface of the base that extends away from the vertical mounting surface along a direction that is substantially parallel with the LD mounting surface.” Ho in view of Takashi and in further view of Sato fails to disclose this limitation. *See Ex. 2007 at ¶ 101.*

As discussed above, the transmit RF traces on the Takashi device are on layer 17b, which is not disposed on the surface of the base that extends away from

the vertical mounting surface parallel with the LD mounting surface. *See* Ex. 2007 at ¶ 102; *see also*, e.g., Ex. 1004 at ¶ 28. Eoptolink does not cite to Ho or Sato to make up for the deficiency of Takashi. *See* Ex. 2007 at ¶ 102; *see also*, e.g., Petition at pp. 65–75.

For the same reasons as discussed with respect to the similar limitation for in Ground 2, this limitation is not disclosed by Takashi. Therefore, the Ho-Takashi-Sato combination does not render Claim 19 obvious. *See* Ex. 2007 at ¶ 103.

2. Takashi fails to disclose the limitation requiring “wherein the TX RF traces are disposed below the MPD when mounted to the vertical MPD mounting surface to allow the TX RF traces to extend towards the LD mounting surface.”

Further, claim 19 recites the limitation “wherein the TX RF traces are disposed below the MPD when mounted to the vertical MPD mounting surface to allow the TX RF traces to extend towards the LD mounting surface.” Takashi does not disclose this limitation, and Petitioner does not cite to Sato to remedy the deficiency. *See* Ex. 2007 at ¶ 104.

As the specification explains, the disclosed invention “includes at least one vertical MPD mounting surface that extends substantially transverse relative to a LD mounting surface, with the result being that a MPD coupled to the vertical MPD mounting surface gets positioned above an associated LD coupled to the LD mounting surface. The vertically-mounted MPD thus makes regions adjacent an

LD that would otherwise be utilized to mount an MPD available for patterning of conductive RF traces to provide an RF driving signal to the LD.” *See* Exhibit 1001 at col. 3:5–13; *see also* Ex. 2007 at ¶ 105. Thus, disposing the plurality of TX RF traces “below the MPD when [the MPD is] mounted to the vertical MPD mounting surface” *allows* “the plurality of TX RF traces to extend towards the LD mounting surface.” *See* Ex. 2007 at ¶ 105.

Claim 19 requires the MPD to be mounted to the vertical MPD mounting surface “to allow TX RF traces to extend towards the LD mounting surface.” However, as discussed above with respect to claim 6, Takashi does not seem to have this same issue of needing to utilize space where an MPD would otherwise be mounted. *See* Ex. 2007 at ¶ 106.

Therefore, for this additional reason, the Ho-Takashi-Sato combination does not render Claim 19 obvious. *See* Ex. 2007 at ¶ 107.

B. A POSITA Would Not Have Been Motivated to Combine Ho, Takashi, and Sato

Even if the proposed Ho-Takashi-Sato combination satisfied the limitations of claim 19, which it does not, a POSITA would not have been motivated to combine the three references to achieve the claimed invention. *See* Ex. 2007 at ¶ 108.

As discussed above, Sato would render Takashi unsatisfactory for its intended purpose and, further, Sato teaches away from using the approach of Takashi. Consequently, there is no motivation to make the proposed modification, and Eoptolink's obviousness arguments fail. *See* Ex. 2007 at ¶ 109.

Accordingly, for at least each of these reasons, a POSITA would not be motivated to combine Takashi and Sato much less to combine Ho, Takashi, and Sato. Therefore, Eoptolink has not shown that the Ho-Takashi-Sato combination renders obvious Claim 19, not only because the proposed combination does not satisfy the claim limitations, but also because a POSITA would not have been motivated to combine these references. *See* Ex. 2007 at ¶ 109.

VII. CONCLUSION

For the reasons set forth above, Applied Optoelectronics, Inc., respectfully requests that the Board deny Eoptolink's request to cancel the Challenged Claims of the '890 Patent.

Dated: August 17, 2026

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CERTIFICATE OF WORD COUNT

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the Microsoft Office word count including all footnotes for the foregoing Patent Owner Response, excluding the table of contents, table of authorities, certificate of word count, appendix and certificate of service, totals 5,349 words, which is less than the 14,000 words allowed under 37 C.F.R. § 42.24(b)(2).

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CERTIFICATE OF SERVICE

The undersigned hereby certifies service on the Petitioner, pursuant to 37 C.F.R. §42.6(e) and by agreement of counsel, by electronic (e-mail) delivery of a true copy of the foregoing **PATENT OWNER RESPONSE** which was served on August 17, 2026 to the following Counsel for Petitioner via e-mail:

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