

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HESAI TECHNOLOGY CO., LTD.,
Petitioner,

v.

OUSTER, INC.,
Patent Owner.

IPR2023-01457
Patent 11,190,750 B2

Before MEREDITH C. PETRAVICK, KEVIN W. CHERRY, and
JON M. JURGOVAN, *Administrative Patent Judges*.

JURGOVAN, *Administrative Patent Judge*.

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

I. INTRODUCTION

Hesai Technology Co., Ltd. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) to institute an *inter partes* review of claims 44–48 and 50 of U.S. Patent 11,190,750 B2 (Ex. 1001, “the ’750 patent”). Ouster, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

We have jurisdiction under 35 U.S.C. § 6. Institution of an *inter partes* review is authorized when “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Based on the current record, and for the reasons explained below, we determine that Petitioner has established a reasonable likelihood that it would prevail with respect to at least one challenged claim. Accordingly, we grant institution of *inter partes* review.

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies itself, Hesai Group, and Hesai Inc. as real parties in interest. Pet. 82. Patent Owner identifies itself as the real party in interest. Paper 5, 1.

B. *Related Matters*

Petitioner and Patent Owner identify the following related matters:

- *Ouster, Inc. v. Hesai Group et al*, No. 23-cv-00406 (D. Del.).
- *Certain LiDAR (Light Detection and Ranging) Systems and Components Thereof*, Inv. No. 337-TA-1363 (USITC) (“ITC case”).

Pet. 82; Paper 5, 1.

C. The '750 Patent (Ex. 1001)

The '750 patent is titled “Optical Imaging System with a Plurality of Sense Channels.” Ex. 1001, code (54). The '750 patent discloses “a new and useful optical system for collecting distance information in the field of optical sensors.” *Id.* at 1:22–25.

Figure 1 of the '750 patent is shown below.

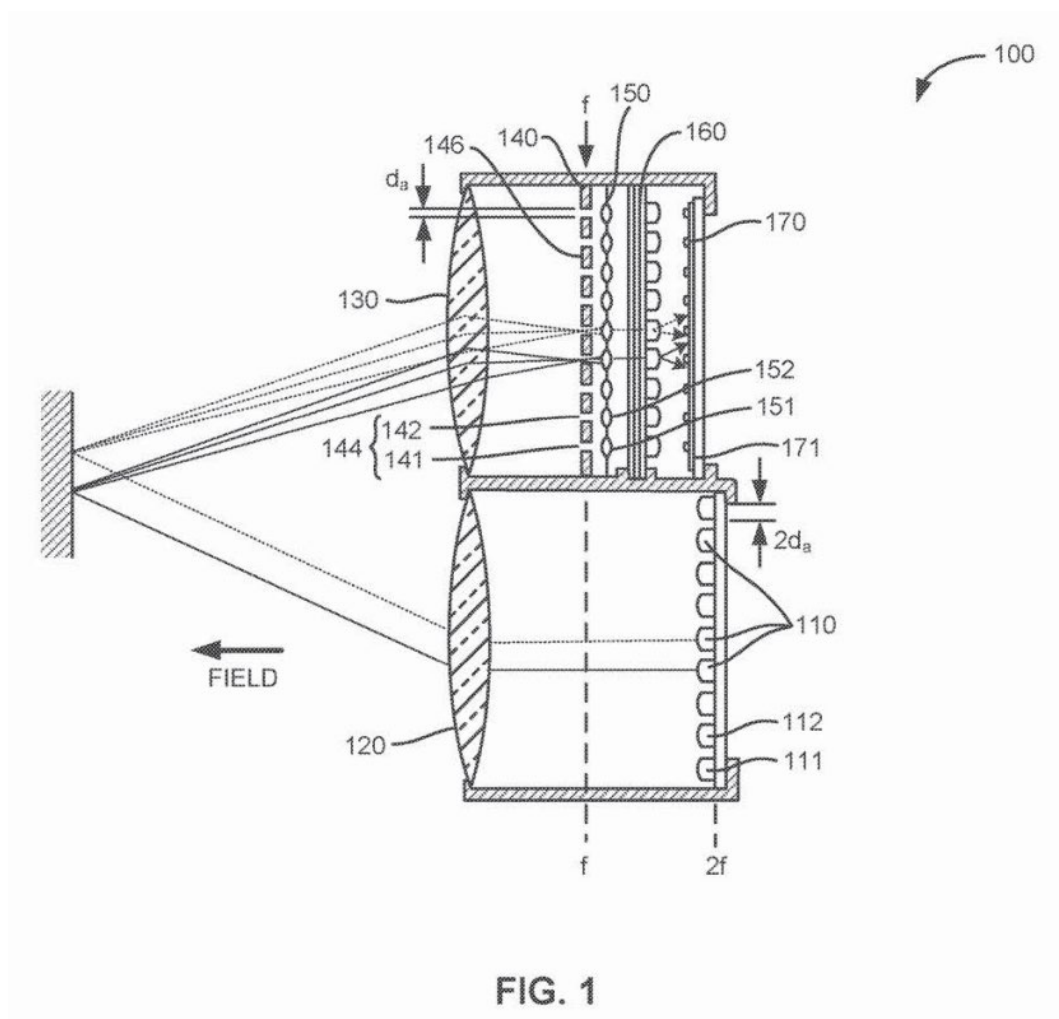


Figure 1 shows optical system 100 including illumination sources 110, bulk transmitter optic 120, bulk imaging optic 130, aperture layer 140, lenses 150, optical filter 160, and pixels 170. *Id.* at 1:63–2:25. Illumination sources 110 are configured to output an illuminating beam with an operating wavelength.

Id. at 1:66–2:3. Illumination sources 110 include an array of laser diodes or light-emitting diodes (LEDs). *Id.* at 1:66–2:3, 11:7–11, 12:19–23. The beam from illumination sources 110 passes through bulk transmitter object 120 into the field where the photons may reflect off objects. *Id.* at 2:48–51, Figs. 1, 2. Reflected photons pass through bulk imaging optic 130 and through apertures 140 which define non-overlapping fields of view. *Id.* at 2:48–51. Photons passing through apertures 140 reach lenses 150 which perform collimation. *Id.* at 2:14–19, Figs. 1, 2. Optical filter 160 passes a narrow band of light wavelengths including the operating wavelength. *Id.* at 2:53–55. Pixels 170 correspond to each lens 150, and each includes a set of sub-pixels. *Id.* at 2:23–26. A diffuser 180 (not shown) between optical filter 160 and pixels 170 spreads collimated light from the lenses 150 across a set of subpixels. *Id.* at 2:26–29.

D. Illustrative Claim

Of the challenged claims, only claim 44 is independent, and the remaining claims depend directly therefrom. Claim 44 is shown below with Petitioner's identifiers in brackets.

[44(a)] An optical imaging system comprising:

[44(b)] a bulk imaging optic;

[44(c)] a plurality of pixels arranged behind the bulk imaging optic, wherein each pixel in the plurality of pixels comprises a plurality of single photon avalanche diodes (SPADs) and has a field of view that is non-overlapping beyond a threshold distance in a field external to the optical imaging system with fields of view of all other pixels in the plurality of pixels, and wherein the plurality of pixels includes at least a first pixel and a second pixel;

[44(d)] an aperture layer disposed between the bulk imaging optic and the plurality of pixels, the aperture layer comprising a plurality of apertures separated from each other by a stop region, the plurality of apertures including a first aperture disposed in a first optical path extending between the bulk imaging optic and the first pixel and a second aperture disposed in a second optical path extending between the bulk imaging optic and the second pixel;

[44(e)] a bulk transmitting optic disposed adjacent to the bulk imaging optic; and

[44(f)] a plurality of emitters arranged to project electromagnetic radiation through the bulk transmitting optic and into the field according to an illumination pattern where electromagnetic radiation output from each emitter in the illumination pattern is coincident with a field of view of a corresponding pixel in the plurality of pixels.

Ex. 1001, 21:40–22:20.

E. Prior Art and Asserted Challenges to Patentability

Petitioner asserts that claims 44–48 and 50 are unpatentable on the following challenges (Pet. 1–2):

Ground	Claim(s) Challenged	35 U.S.C. § ¹	Basis/Reference(s)
1A	44, 45, 48, 50	103	Retterath ² , Borowski ³
1B	44–48, 50	103	Retterath, Borowski, Weimer ⁴
1C	44, 45, 48, 50	103	Retterath, Borowski, Hipp ⁵
1D	44–48, 50	103	Retterath, Borowski, Weimer, Hipp

¹ Because the '750 patent issued from a patent application that was filed after March 16, 2013, patentability is governed by the version of 35 U.S.C. § 103 set forth in the Leahy-Smith America Invents Act (“AIA”), Pub L. No. 112–29, 125 Stat. 284 (2011).

² Retterath et al., U.S. Patent 10,203,399 B2, issued Feb. 12, 2019 (Ex. 1005). Petitioner contends that Retterath is prior art under § 102(a)(2). Pet. 2.

³ Borowski et al., U.S. Patent Pub. 2013/0300838 A1, published Nov. 14, 2013 (Ex. 1006). Petitioner contends that Borowski is prior art under § 102(a)(1). Pet. 2.

⁴ Weimer et al., U.S. Patent 8,736,818 B2, issued May 27, 2014 (Ex. 1008). Petitioner contends that Weimer is prior art under § 102(a)(1). Pet. 2.

⁵ Hipp, U.S. Patent 7,787,105 B2, issued Aug. 31, 2010 (Ex. 1007). Petitioner contends that Hipp is prior art under § 102(a)(1). Pet. 2.

Ground	Claim(s) Challenged	35 U.S.C. § ¹	Basis/Reference(s)
2	44–48, 50	103	Imai ⁶ , Higashi ⁷ , Grzesik ⁸
3	44–48, 50	103	Weimer, Borowski, Hipp

In support of its proposed challenges, Petitioner relies on the Declaration of James Shanley, Ph.D. *See* Ex. 1003.

III. ANALYSIS

A. *Legal Standards*

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the [claimed invention] and the prior art are such that the [claimed invention] as a whole would have been obvious [before the effective filing date of the claimed invention] to a person having ordinary skill in the art to which [the claimed invention] pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of

⁶ Imai, U.S. Patent Pub. 2016/0274223 A1, published Sep. 22, 2016 (Ex. 1009). Petitioner contends that Imai is prior art under § 102(a)(2). Pet. 2.

⁷ Azuma et al., JP2015-078953, published Apr. 23, 2015 (Ex. 1010 - Japanese version; Ex. 1011 - English version). Petitioner contends that this document is prior art under § 102(a)(1). Pet. 2. Consistent with the parties’ references in the Petition and Preliminary Response, we will refer to this document as “Higashi” although we note it does not appear to be the name of the applicant or any inventor. We refer to the English version herein only (Ex. 1011).

⁸ Grzesik, U.S. Patent Pub. 2017/0040368 A1, published Feb. 9, 2017 (Ex. 1012). Petitioner contends that Grzesik is prior art under § 102(a)(2). Pet. 2.

the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.⁹ *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

In conducting an obviousness analysis, one must determine whether the claimed elements are present in the prior art. *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1194–1198 (Fed. Cir. 2014). However, a patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. An obviousness determination requires finding “both ‘that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted); *see KSR*, 550 U.S. at 418. Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418; *In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (a finding of a motivation to combine “must be supported by a ‘reasoned explanation’”).

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed.

⁹ Neither Petitioner nor Patent Owner have presented any objective evidence of obviousness or nonobviousness in the record.

Cir. 2016) (citing 35 U.S.C. § 312(a)(3)); *see also Intelligent Bio-Sys.*, 821 F.3d at 1369. Therefore, to prevail in an *inter partes* review, Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. We determine whether the information presented in the Petition shows there is a reasonable likelihood that Petitioner would prevail in establishing that at least one of the challenged claims would have been obvious over the proposed combinations of prior art.

B. Level of Ordinary Skill in the Art

The person of ordinary skill in the art is a hypothetical person who is presumed to know the relevant prior art. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey–Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)). In determining the skill level, the Board may consider various factors including “the type of problems encountered in the prior art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *Id.* In a given case, every factor may not be present, and one or more factors may predominate. *Id.*

Petitioner asserts that a person of ordinary skill in the art would have had an undergraduate degree in mechanical or electrical engineering or physics, plus 2–3 years of experience in LiDAR design.

Pet. 3 (citing Ex. 1003 ¶¶ 72–77).

For the limited purpose of its Preliminary Response, Patent Owner adopts Petitioner's definition of a person of ordinary skill in the art. Prelim. Resp. 4.

We apply Petitioner's proposed definition of the level of ordinary skill in the art in this decision. We determine that the undisputed level of skill is consistent with the problems and solutions identified in the '750 patent and the prior art. *Okajima v. Bourdeau*, 261 F.3d 1350 (Fed. Cir. 2001). We also determine that the proposed level of skill is reflective of the education and experience a person of ordinary skill would have had.

C. Claim Construction

In an *inter partes* review, claims are construed 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). This standard was articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc) and its progeny.

Petitioner contends that no claim construction is necessary to resolve the patentability disputes in this case. Pet. 3–4.

Patent Owner argues that, in the ITC case, Petitioner proposed the construction that “field of view” in claim 44 of the '750 patent means “detection area defined by an aperture or lens tube.” Prelim. Resp. 21–22. Patent Owner argues that Petitioner failed “to provide any evidence to support that Retterath teaches a ‘field of view’ per Petitioner’s construction for limitation 44(c) or 44(f).” *Id.* at 24.

Patent Owner states that Petitioner relied on various textbooks for its proposed constructions before the ITC. *Id.* at 23–24. This evidence defines “field of view” as “[t]he maximum angle of view that can be seen through a

lens or optical instrument.” Prelim. Resp. 22 (citing Ex. 2004, 282 (the Graf textbook)). Patent Owner also provides evidence stating that “[t]he presence of apertures in an optical system influences its image-forming properties . . . by limiting the field of view,” which “determines how much of the surface of a broad object can be seen by looking back through the optical system.” *Id.* (citing Ex. 2005, 51 (the Pedrotti textbook)). The Pedrotti textbook compares the field of view to the limited view created by an ordinary window, and discusses the concept of vignetting caused by the aperture shielding an outer portion of an image at off-axis object points. *Id.* at 22–23 (citing Ex. 2005, 51, 54–55, 70, Fig. 3). This evidence also indicates that “[t]he observable object field is limited in the primary image plane by a field stop,” which is an “aperture” that has a diameter referred to as the “field number or field-of-view number.” *Id.* at 23–24 (citing Ex. 2006, 28 (the Kubitscheck textbook)).

Neither party proposes that we adopt any construction that was proposed before the ITC. The rules provide that we should consider an ITC *determination* on claim construction in an *inter partes* review proceeding. 37 C.F.R. § 42.100(b). However, the ITC made no determination on claim construction before the Section 337 investigation was terminated upon Petitioner’s request for arbitration. Prelim. Resp. 3. Accordingly, the ITC case does not provide any determination on claim construction that we must consider in this proceeding.

We decline to explicitly construe “field of view” since neither party advocates for a particular construction. Therefore, we apply the plain and ordinary meaning of “field of view” in the analysis of limitations 44(c) and 44(f), which is “the maximum angle of view that can be seen through a lens

or optical instrument,” which may be defined by an aperture, consistent with the textbook definitions discussed above.

*D. Alleged Obviousness Over Retterath and Borowski
(Ground 1A)*

Petitioner contends claims 44–45, 48, and 50 of the ’750 patent would have been obvious over the combination of Retterath and Borowski.

Pet. 9–33.

1. Retterath (Ex. 1005)

Retterath is titled “Methods and Apparatus for Array Based Lidar Systems with Reduced Interference.” Ex. 1005, code (54). Retterath discloses an “array-based light detection and ranging (LiDAR) unit includes an array of emitter and detector sets configured to cover a field of view for the unit.” *Id.* at code (57). “Each emitter/detector set emits and receives light energy on a specific coincident axis unique to that emitter/detector set.” *Id.* “A control system coupled to the array of emitter/detector sets controls initiation of light energy from each emitter and processes time of flight information for light energy received on the coincident axis by the corresponding detector for the emitter/detector set.” *Id.* “Time of flight information provides imaging information corresponding to the field of view.” *Id.* Because each detector receives light energy along its coincident axis, interference with respect to other detectors is reduced. *Id.*

Retterath’s Figure 4 is shown below.

Figure 4

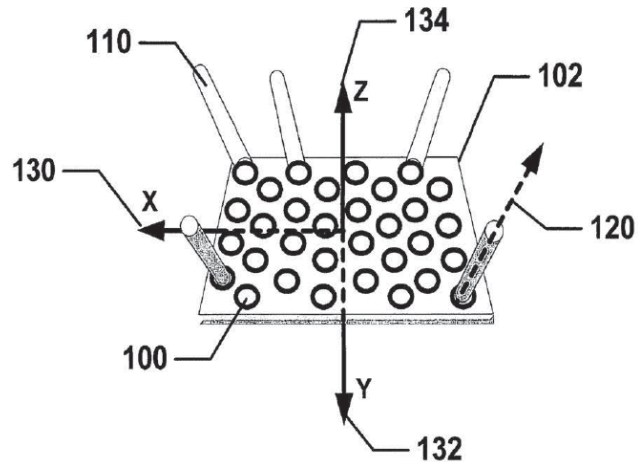


Figure 4 shows each beam of light is emitted along a unique vector 120 angularly spaced from the other vectors in the array. *Id.* at 7:41–8:14.

Retterath's Figure 5a is shown below.

Figure 5a

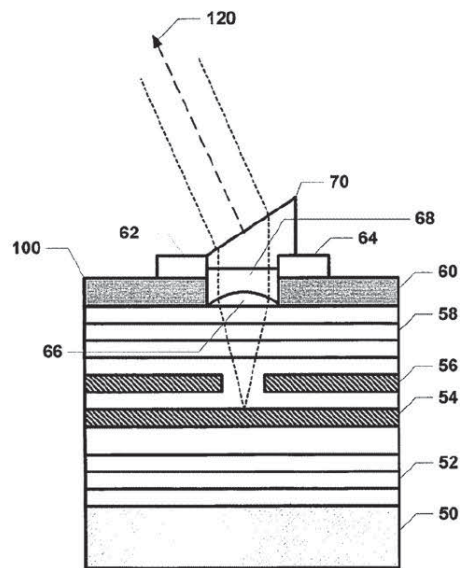


Figure 5a shows a cross section side view of a vertical emitter with a micro

lens. *Id.* at 4:46–48, 8:20–21. Emitter element 100 comprises a vertical semiconductor laser including substrate 50, lower reflector 42, active layer 54, high-resistance region 56, upper reflector 58, and electrode 60 sequentially stacked on substrate 50. *Id.* at 8:20–35. Emitter lens 66 collimates light from the semiconductor laser to produce collimated light 68. *Id.* at 8:36–38. Directional lens 70 directs collimated beam of light 68 along emitter vector 120. *Id.* at 8:39–40.

Retterath's Figure 6 is shown below.

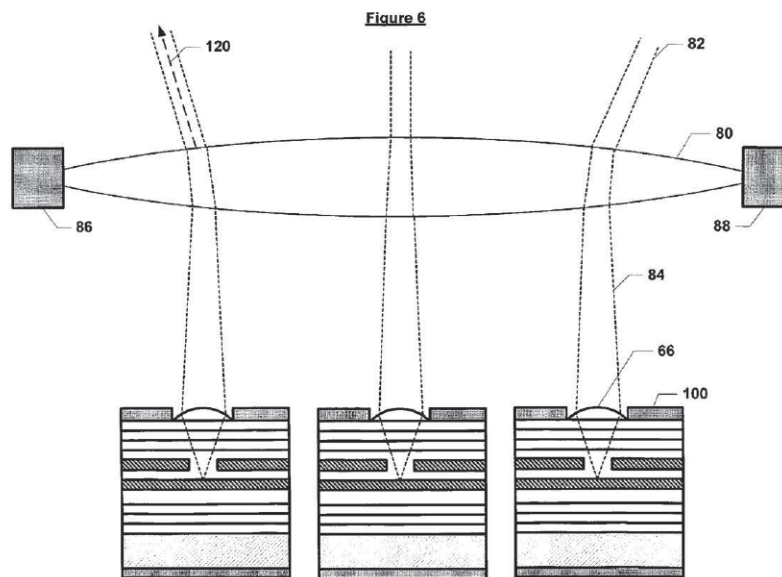


Figure 6 shows a cross section side view of emitters 100 producing beams 82 that pass through macro lens 80 to the surrounding environment. *Id.* at 9:12–20.

Retterath's Figure 10 is shown below.

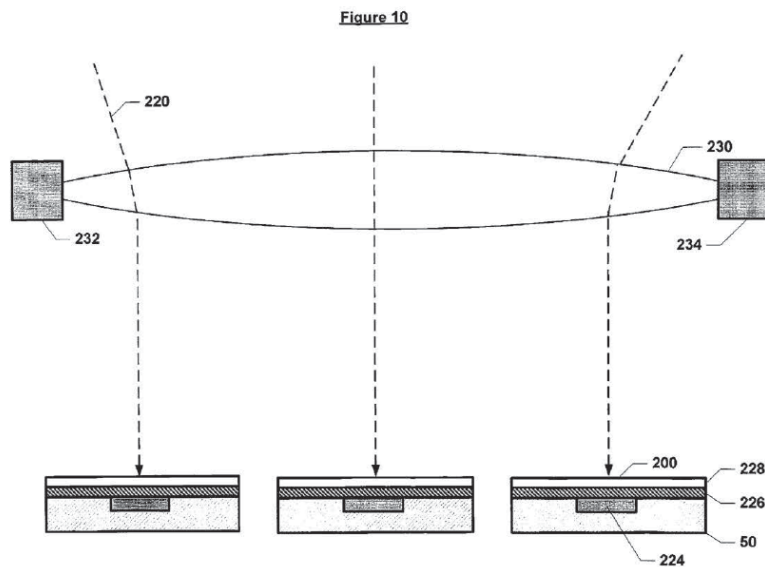


Figure 10 shows a cross section side view of a detector element with macro detector lens 230 and detector elements 200. *Id.* at 10:23–27. Each detector element 200 comprises substrate 50, photoreceptor 224, bandpass filter layer 226, and protective layer 228. *Id.* at 10:25–27. Macro detector lens 230 receives light from a diverging field of view at macro detector lens 230 that directs in-bound light to the surface of detector elements 200. *Id.* at 10:27–30.

Retterath's Figure 8 is reproduced below.

Figure 8

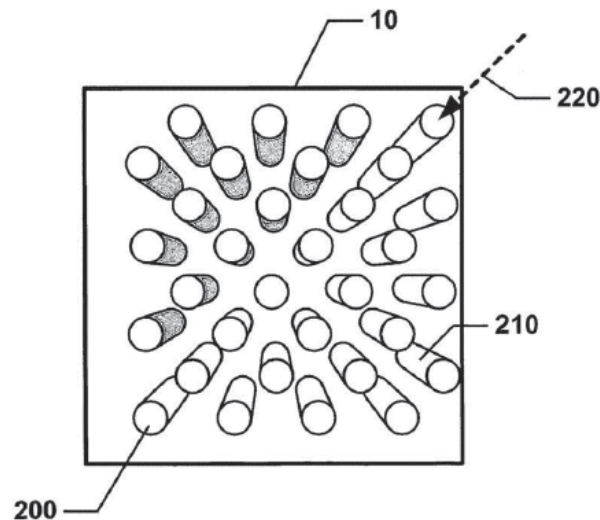


Figure 8 is a top view of detector elements 200 on the emitter/detector array 10. *Id.* at 9:53–55. Light is received at each detector 200 on an optimal detector vector (coincident axis) 220 along which the maximum optical energy will be transferred. *Id.* at 9:56–59.

2. *Borowski (Ex. 1006)*

Borowski is titled “Methods and Devices for Generating a Representation of a 3D Scene at a Very High Speed.” Ex. 1006, code (54). Borowski discloses a “3D landscape real-time imager” with “at least one illuminating part which is designed to scan . . . the landscape” with “an ultrashort laser pulse source.” *Id.* The imager also includes “an optical rotating block, with a vertical axis of rotation, and controlled such that given packets of pulses are shaped in a pattern of rotating beams sent toward the . . . landscape.” *Id.* The imager further includes “at least one receiving part which comprises a set of SPAD detector arrays, each arranged along a vertical direction and rotating at a given speed in synchronism with the

optical rotating block of the illuminating part.” *Id.* The “detection data of the SPAD detector arrays [is] combined to acquire 3D imaging data” of the “landscape in a central controller.” *Id.*

Borowski purports “to provide an imaging technique capable of generating a precise image of complex scenes in a faster way than with conventional imaging techniques,” and “offers an improved trade-off between image depth resolution and fast data acquisition for the detection of movements.” *Id.* ¶ 3. Borowski discloses “using multiple SPADs in parallel in combination with a diffuser, which distributes received light to these SPADs.” *Id.* ¶ 44. “Even if some of the SPADs have been triggered already, the remaining SPADs can still receive light.” *Id.* Borowski uses “ultra-sensitive SPADs, which can be easily fabricated with a CMOS process, combined with a simple low cost germanium process.” *Id.* ¶ 14.

Borowski’s Figure 1 is shown below.

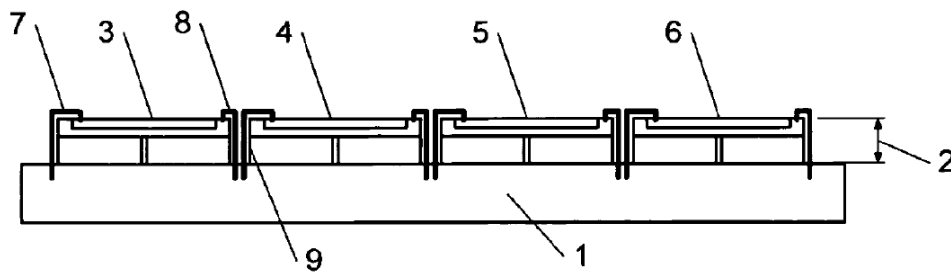


Fig. 1

“In the example shown in FIG. 1, four SPAD sensor cells 3-6 are built on the same first CMOS IC 1.” *Id.* ¶ 154.

3. Analysis of Independent Claim 44

We analyze Petitioner's and Patent Owner's contentions concerning claim 44 below using Petitioner's identifiers to indicate the limitations under discussion.

a) Motivation to Combine

(1) Petitioner's Contentions

Petitioner contends that a person of ordinary skill in the art would have been motivated to implement Retterath's LiDAR system using multiple SPADs per pixel, as suggested by Borowski, to achieve known benefits. Pet. 13–14 (citing Ex. 1005, code (54), 3:5–9, 6:23–28, 7:41–8:14, 8:20–40, 9:53–10:31, Figs. 4, 5a, 6, 8, 10; Ex. 1006 ¶¶ 21, 34, 42, 62, 127, 192, 197–98, 233, 241–42, 323, claim 23, Figs. 6, 11, 12a, 12b, 18–19, 27–28, 223–224; Ex. 1029 ¶¶ 33–34; Ex. 1003 ¶¶ 137–133).

Petitioner contends that there were several reasons that would have prompted a person of ordinary skill in the art (“POSITA”) to make the combination. *Id.* at 15. First, Petitioner asserts that the benefits of SPADs were well known in the art, and that Borowski's multiple SPADs per pixel would predictably enhance the signal-to-noise ratio of Retterath's detectors to improve system performance. *Id.* at 15–16 (citing Ex. 1006 ¶ 19; Ex. 1003 ¶ 134; Ex. 1023, 8 (very high sensitivity, easily incorporated into array); Ex. 1019, 4 (extraordinary sensitivity for LiDAR applications)).

Second, Petitioner contends that a POSITA would have been prompted to make the combination “to achieve the performance advantages of SPADs known before September 2015, such as a high data-rate output in combination with low-power operation.” *Id.* (citing Ex. 1003 ¶ 135; Ex. 1028 ¶¶ 12–14, 20–21; Ex. 1012, 1:19–26, 1:42–52, 3:66–4:4).

Third, Petitioner alleges that a POSITA would have been prompted to make the combination because Borowski's suggestion to use multiple SPADs per pixel with Retterath's detectors improves detection capability and accuracy. *Id.* (citing Ex. 1003 ¶ 136). Petitioner contends that the combination increases the likelihood the pixel would more accurately detect photons when one or more of the individual SPADs was subject to quenching and reset. *Id.* at 16–17 (citing Ex. 1006 ¶¶ 44, 53; Ex. 1003 ¶ 136; Ex. 1028 ¶¶ 49–50, 138–139). Petitioner asserts that “Borowski teaches the known benefit in which the output of a multi-SPAD pixel would be filtered and averaged such that it ‘acts as the equivalent of a single ‘perfect’ SPAD having no recovery time.’” *Id.* at 17 (citing Ex. 1006 ¶ 53).

Fourth, Petitioner argues that “a POSITA would have been prompted to implement the Retterath-Borowski combination due to Borowski's express suggestion for ‘an improved trade-off between image depth resolution and fast data acquisition for the detection of movements’ by ‘local averaging between adjacent detectors to optimize the tradeoff between speed and sensitivity.’” *Id.* at 17 (citing Ex. 1006 ¶¶ 3, 26, 83, 136–138, 220–222, 233, 237, 249, 258, 267–271, Fig. 12; Ex. 1003 ¶ 137).

Fifth, Petitioner contends that “a POSITA would have found it obvious to combine Retterath and Borowski because doing so was the application of known techniques (Borowski's suggestion for multi-SPAD detectors) to a known system (Retterath's LiDAR system that used an array of detectors) ready for improvement to yield predictable results.” *Id.* at 17–18 (citing Ex. 1003 ¶ 138; *KSR*, 550 U.S. at 417 (“[W]hen a patent ‘simply arranges old elements with each performing the same function that it

had been known to perform’ and yields no more than one would expect from such an arrangement, the combination is obvious.”)).

Petitioner further asserts that Retterath and Borowski are analogous and similarly relate to LiDAR systems, and that applying Borowski’s suggestion to Retterath’s system “would have led to predictable results of enabling a user to enhance the sensitivity and extend the capability of the resulting LIDAR device—all while maintaining Retterath’s purpose/functionality as a LiDAR unit.” *Id.* at 18. Petitioner further asserts “a POSITA would have had a reasonable expectation of success in making the proposed modifications based on the similarity of the emitter/detector systems for distance measurement in Retterath and Borowski.” *Id.* Petitioner contends that Retterath discloses that systems other than those disclosed may be utilized, and that Borowski suggests implementing multi-SPAD detectors in a LiDAR system was ubiquitous in the prior art before September 2015. *Id.* (citing Ex. 1003 ¶¶ 138–141; Ex. 1011 ¶ 27, Fig. 4; Ex. 1005, 6:57–59, 19:55–20:22; Ex. 1006 ¶¶ 14, 154).

Petitioner further contends that, to the extent that Retterath does not explicitly show that Retterath’s waveguide layer is implemented together with its macro detector lens, a POSITA would have been motivated to do so for multiple reasons. Pet. 25 (citing Ex. 1005, Fig. 9 (waveguide layer 215), Fig. 10 (macro detector lens 230); Ex. 1003 ¶¶ 157–161).

First, Petitioner contends that Retterath’s waveguide layer implemented together with its macro detector lens would advantageously promote reliable detection of desired optical energy from the paired emitter while blocking out extraneous optical energy from background or

unintended sources. *Id.* at 25–26 (citing Ex. 1005, 9:62–65; Ex. 1003 ¶ 157).

Second, Petitioner contends that the waveguide’s blocking material would advantageously reduce internal reflections from among the neighboring detector elements/protective layer, thereby reducing cross-talk and further improving the signal-to-noise ratio. *Id.* at 26 (citing Ex. 1003 ¶ 157).

Third, Petitioner contends that a POSITA would have been motivated to use Retterath’s waveguide layer and macro detector lens together because Retterath expressly suggests doing so. *Id.* at 26 (citing Ex. 1005, 19:55–20:12 (“elements described with respect to one embodiment can be implemented in other embodiments even when not described in such embodiments unless otherwise noted”)). In other words, according to Petitioner, Retterath teaches that structures from one embodiment (such as waveguide layer 215 in Figure 9) can be implemented in combination with other embodiments (such as the macro detector lens 230 of Figure 10). *Id.* Petitioner contends that Retterath’s suggestion confirms the predictable benefits and expectation of success in using these features together. *Id.* (citing Ex. 1003 ¶ 158). Petitioner argues that waveguides formed over individual pixels together constitute an aperture layer, whether or not formed as part of a continuous piece of material. *Id.* at 27 (citing Ex. 1003 ¶¶ 159–162). Petitioner contends “a POSITA would have found it obvious to form the waveguides as part of a continuous mask over the detector array, to facilitate manufacturing and fabrication of the detector array assembly, and to prevent extraneous optical energy from reaching the detector by

providing continuous coverage via a continuous mask.” *Id.* (citing Ex. 1003 ¶ 162; Ex. 1018, 21:60–22:10, Fig. 16).

(2) *Patent Owner’s Contentions*

Patent Owner does not dispute any of Petitioner’s motivations to combine Retterath and Borowski as discussed in the previous section. However, Patent Owner argues that Retterath discloses waveguides and macro detector lens as “mutually exclusive” alternatives to one another, and asserts that Retterath thus teaches away from using these components together. Prelim. Resp. 28–31.

Specifically, Patent Owner contends that the aperture layer required by limitation 44(d) of the ’750 patent is satisfied by Retterath’s “waveguides,” and the “bulk imaging optic” required by limitation 44(b) of the ’750 patent is satisfied by Retterath’s “macro lens 230.” *Id.* at 28 (citing Pet. 19–20, 24–27). But, according to Patent Owner, Retterath makes clear that “*either* waveguides *or* macro detector lens 230 can be used in its system.” *Id.* at 29 (emphases Patent Owner’s) (citing Ex. 1005, 3:58–4:12, 17:46–48, Figs. 9–10). Patent Owner states that “Retterath indicates that waveguides and a macro detector lens serve the same purpose—blocking light non-parallel to the ‘receive detector vector’—so there is no evident reason to include them both in a single system.” *Id.* at 29 (citing Ex. 1005, 9:59–65).

Patent Owner further argues that Petitioner’s motivation to use the waveguides and macro detector lens together to reduce internal reflections from among neighboring detector elements/protective layer (Pet. 26) is only a motivation to use Retterath’s waveguides, not to use those waveguides together with the macro detector lens. *Id.* at 29–31 (citing Pet. 26; *Henny*

Penny Corp. v. Frymaster LLC, 938 F.3d 1324, 1329, 1331–32 (Fed. Cir. 2019)).

(3) *Analysis of Motivation to Combine*

A prior art reference evidences teaching away if it “criticize[s], discredit[s], or otherwise discourage[s] the solution claimed.” *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). At this time, Patent Owner’s evidence is insufficient to establish that Retterath “criticizes, discredits or otherwise discourages” simultaneous use of Retterath’s waveguides and macro detector lens. *See* Ex. 1005, Fig. 9 (waveguide layer), Fig. 10 (macro detector lens).

Patent Owner may be correct that Retterath describes waveguides and a macro detector lens as alternatives to one another. Prelim. Resp. 30. However, Patent Owner does not show that Retterath (or any other prior art) “criticizes, discredits or otherwise discourages” using the waveguides and macro detector lens together. *Meiresonne v. Google, Inc.*, 849 F.3d 1379, 1382 (Fed. Cir. 2017) (A reference “that ‘merely expresses a general preference for an alternative invention but does not criticize, discredit, or otherwise discourage investigation into’ the claimed invention does not teach away.”)

In support of its contentions, Petitioner provides Dr. Shanley’s testimony, stating that a “POSITA would have recognized that use of the waveguide layer between the macro detector lens and a plurality of detectors would *further* isolate the respective detectors from one another and block extraneous light not directed away from the detector by the macro lens.” Pet. 25 (citing Ex. 1003 ¶ 157) (emphasis added). Hence, Petitioner has presented evidence that the waveguide layer and macro detector lens are not

merely redundant, but that their combination produces the benefit or advantage of *further* isolating the detectors from extraneous light. *See Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1003–04 (Fed. Cir. 2016) (a reason to combine prior art references may be found when the combination produces an advantage).

In contrast, Patent Owner’s assertion that Retterath teaches away from combining its waveguide layer and macro detector lens because they are redundant relies heavily on unsubstantiated attorney argument, which does not sufficiently undermine Petitioner’s evidence. *See Icon Health & Fitness, Inc. v. Strava, Inc.*, 849 F.3d 1034, 1043 (Fed. Cir. 2017) (“Attorney argument is not evidence.”).

Accordingly, weighing the evidence presented at this stage, Petitioner has shown sufficiently on this record that a person of ordinary skill in the art would have had reasons to combine Retterath and Borowski.

b) Reasonable Expectation of Success

Petitioner contends that a POSITA would have had a reasonable expectation of success in combining Retterath and Borowski because of the similarity between their emitter/detector systems, because Retterath suggests that different embodiments may be combined together (including the waveguide layer and macro detector lens), and because of the predictable benefits that would accrue from the combination (such as smart averaging in time and space, enhancing image depth and acquisition speed, increased signal-to-noise ratio from using Borowski’s multi-SPAD pixels, and increased detector isolation from extraneous light by using Retterath’s waveguide layer and macro detector lens together). Pet. 14, 16–18, 25–26.

Patent Owner argues that the Petition fails to show a reasonable expectation of success because no POSITA would ever have contemplated the proposed combinations. Prelim. Resp. 2. Patent Owner's attorney argument does not sufficiently undermine Petitioner's evidence. *See Icon Health*, 849 F.3d at 1043.

Accordingly, on this record, we determine that Petitioner has presented sufficient evidence to show that a POSITA would have had a reasonable expectation of success in making the combination of Retterath and Borowski.

c) Preamble – Optical Imaging System (44(a))

Petitioner contends that to “the extent the preamble is deemed limiting, the Retterath-Borowski combination provides the recited system.” Pet. 19 (citing Ex. 1003 ¶¶ 142–144, §§ III.A.1–3). Petitioner contends that “Retterath describes ‘LiDAR (light detection and ranging) systems’ that ‘use an array of emitter/detector sets to cover a given field of view where each emitter/detector set is configured to receive reflected light energy that is on a given coincident axis unique for that emitter/detector set.’” *Id.* (citing Ex. 1005, code (57), 1:18–20, 2:66–3:21, 3:58–61, 7:17–40; Ex. 1006, code (57), ¶ 31).

Patent Owner does not dispute Petitioner's contentions at this stage of the proceeding.

We determine that Petitioner adequately shows that the combination teaches a light ranging system as recited in the preamble.¹⁰

¹⁰ Since we determine that Petitioner adequately shows that claim 44's preamble is taught by Retterath and Borowski, we need not and do not

d) Bulk Imaging Optic (44(b))

Petitioner contends that the Retterath-Borowski combination provides a bulk imaging optic. Pet. 19 (citing Ex. 1003 ¶¶ 145–146). Specifically, Petitioner contends that Retterath discloses a bulk imaging optic provided by a “macro lens 230” with detector elements 200 positioned behind it. *Id.* (citing Ex. 1005, 6:8–15; 10:23–30, Fig. 11b). Petitioner contends that, “[l]ike the bulk imaging optic described in the ’750 patent, the macro lens 230 receives light from the external environment and directs it to the detector array.” *Id.* at 19–20 (citing Ex. 1003 ¶ 146; Ex. 1005, Fig. 10). Petitioner contends that the detector array 200 and emitter array 100 are formed as diagonally neighboring sections 246, 248 (each with corresponding electronics 244). *Id.* (citing Ex. 1005, 10:62–11:4, Fig. 11b).

Patent Owner argues that Retterath does not teach to use its macro lens 230 (which Petitioner maps to limitation 44(b)) and waveguide layer 210 (which Petitioner maps to limitation 44(d)) together. Prelim. Resp. 28–31. However, as discussed in § III.D.3.a, Petitioner shows sufficiently that a POSITA would have used the macro lens and waveguide layer together for the advantage of greater detector isolation. Pet. 25–27 (citing Ex. 1003 ¶¶ 157–161). Petitioner also notes that Retterath expressly teaches that its embodiments may be used together. *Id.* at 26 (citing Ex. 1005, 19:58–61). As we explained, at this time, the evidence weighs for Petitioner on this issue, and we do not agree with Patent Owner’s argument. *See* § III.D.3.a. Patent Owner does not otherwise dispute Petitioner’s contentions at this stage.

determine whether the preamble is limiting. *See, e.g., Catalina Mktg. Int’l v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002).

We determine that Petitioner has adequately shown that the Retterath-Borowski combination teaches a bulk imaging optic as recited in limitation 44(b).

e) Plurality of Pixels (44(c))

Petitioner contends that the Retterath-Borowski combination provides limitation 44(c). Pet. 20–21 (citing Ex. 1003 ¶¶ 147–154). Specifically, Petitioner asserts that “each detector 200 on Retterath’s LiDAR device includes a photoreceptor 224 that comprises a ‘pixel’ because it detects incident light received through bulk optic 230 for a specific location in the array.” *Id.* at 21 (citing Ex. 1005, 9:52–10:22, Figs. 9–10; § III.A.3). Petitioner contends that this disclosure “comports with the ’750 Patent, which explains that a pixel may comprise one or more detectors.” *Id.* (citing Ex. 1001, 10:40–54). Petitioner thus shows that the combination teaches a plurality of pixels, and that each pixel may include multiple detectors.

Petitioner asserts that “Retterath also teaches that each pixel in the plurality of pixels has a field of view that is non-overlapping beyond a threshold distance in a field external to the optical imaging system with fields of view of all other pixels in the plurality of pixels.” *Id.* at 21 (citing Ex. 1003 ¶ 148). Petitioner states that Retterath’s Figure 8 “illustrates a FOV arrangement of Retterath’s detector in which each detector 200—and its photoreceptor 224—has a field-of view over which it receives light beams 210, each of which is centered along a unique vector 220.” *Id.* (citing Ex. 1005, 9:56–59 (“Each detector of detector elements 200 has an optimal receive detector vector (coincident axis) 220 along which the maximum optical energy will be transferred.”), 9:53–11:25, 15:14–16:56, Figs. 8, 10; Ex. 1003 ¶ 149). Petitioner further states that the “vectors are angularly

separated, such that the field-of-view for a given detector element is non-overlapping with the field-of view for all other detector elements at a threshold distance beyond the macro lens.” *Id.* (citing Ex. 1003 ¶ 149).

Referring to Retterath’s Figures 4 and 5a, Petitioner contends that “each emitter element 100 includes a collimating lens 66 and directional lens 70 to produce a collimated beam of light 68 that defines an emission region for the individual emitter.” *Id.* at 22 (citing Ex. 1005, 8:36–40; 7:61–8:14). Petitioner contends that the “beam, and thus the emission region, is centered along a unique emission vector 120.” *Id.* (citing Ex. 1003 ¶ 150; Ex. 1005, Figs. 4, 5a (annotated)).

Petitioner contends that in Retterath each emission vector 120 is on-coincident axis with a corresponding detection vector 220 for each emitter/detector set, and that its field of view is non-overlapping with the fields of view of all other pixels. *Id.* at 22–23 (citing Ex. 1005, 6:23–28; 6:29–39; 10:66–11:1; Ex. 1003 ¶ 151). Petitioner’s evidence thus supports that the pixels (including first and second pixels) have non-overlapping fields of view beyond a threshold distance in the field external to the optical imaging system as claimed.

Petitioner further argues that “each pixel in the Retterath-Borowski combination is operable to detect photons emitted from its corresponding optical emitter and received through the bulk imaging optic after being reflected from surfaces within the field.” *Id.* at 23 (citing Ex. 1005, 6:23–28, 8:47–49, Figs. 6, 10; Ex. 1003 ¶ 152). Petitioner’s evidence thus supports that each pixel is positioned behind the bulk imaging optic as claimed.

Lastly, in the Retterath-Borowski combination, the array of detector 200 on Retterath’s LiDAR system is implemented using Borowski’s

suggested multi-SPAD detector array (e.g., each detector as a macro-cell that includes multiple SPADs) such that each detector array is a pixel comprising a plurality of SPADs. *Id.* (citing *id.* § III.A.3; Ex. 1005, code (57), 3:5–9, 6:23–28, 7:41–8:14, 8:20–40, 9:53–10:31, Figs. 4, 5A, 6, 8, 10; Ex. 1006, code (57), ¶¶ 3, 14, 27, 44, 154–157, 233, 323, Figs. 1, 5, 12, 27; Ex. 1003 ¶¶ 153–154). Petitioner’s evidence thus supports that each pixel comprises a plurality of SPADs as claimed.

Patent Owner argues that Petitioner fails to provide evidence that Retterath teaches a “field of view” that is a “detection area defined by an aperture or lens tube” per Petitioner’s proposed construction before the ITC for limitations 44(c) and 44(f). Prelim. Resp. 33–39. As we explained, neither party proposes that we adopt this construction here, so Patent Owner’s argument is unavailing. *See* § III.C.

Petitioner contends that “the waveguides formed over individual pixels are together ‘an aperture layer.’” Pet. 27 (citing Ex. 1003 ¶¶ 159–162). Dr. Shanley states that “the waveguide helps define the field of view for its corresponding pixel.” Ex. 1003 ¶ 156. In other words, the waveguide helps to define the maximum angle of view that can be seen by the detectors of the pixels, consistent with the ordinary and plain meaning of field of view, as discussed in § III.C.

We determine that Petitioner has adequately shown that the Retterath-Borowski combination teaches limitation 44(c) on the evidence presented at this time.

f) Aperture Layer (44(d))

Petitioner contends that “Retterath describes an aperture layer provided by waveguides 222 associated with Retterath’s detectors 200.”

Pet. 23–24 (citing Ex. 1005, 3:58–4:44, 9:53–10:22, Fig. 9; Ex. 1003 ¶ 155). Petitioner asserts that the “waveguides define openings or apertures for light to pass through along vector 220 to the corresponding detector.” *Id.* at 24 (citing Ex. 1005, 10:12–14 (“[W]aveguide 222 shall be an air gap or shall consist of a material that is substantially transparent to the wavelength of emitted light.”)). Petitioner’s evidence thus supports that Retterath’s waveguides are disposed between the bulk imaging optic and pixels as claimed.

Petitioner states that in Retterath “the waveguide material 215 surrounding the waveguide 222 is a stop region that blocks stray light from reaching the detector element.” *Id.* Petitioner asserts that “[i]nbound optical energy that is more than slightly-non-parallel to the receive detector vector (coincident axis) 220 will be substantially blocked by the detector waveguide or directed elsewhere by the macro lens.” *Id.* at 24–25 (citing Ex. 1005, 3:58–64, 9:62–65). Petitioner argues that “in the Retterath-Borowski combination, the waveguide operates to further define the field of view for its corresponding pixel while achieving added benefits.” *Id.* at 25 (citing Ex. 1005, 6:20–28, 3:58–64, 10:14–22; Ex. 1003 ¶ 156). According to Petitioner, “Retterath expressly contemplates that each of the multiple detector elements is uniquely aligned with a dedicated waveguide 222 that defines an aperture over its respective pixel.” *Id.* (citing Ex. 1005, 3:58–64, 10:4–30, Figs. 6, 9, 11b; Ex. 1003 ¶ 156). Petitioner’s evidence thus supports that Retterath’s waveguides are separated from one another by waveguide materials surrounding each waveguide, and that the waveguides are disposed on respective optical paths between the bulk imaging optic and respective pixels.

Petitioner contends that “the waveguides formed over individual pixels are together ‘an aperture layer,’ whether or not formed as part of a continuous piece of material.” *Id.* at 27 (citing Ex. 1003 ¶¶ 159–162). Petitioner contends that “a POSITA would have found it obvious to form the waveguides as part of a continuous mask over the detector array, to facilitate manufacturing and fabrication of the detector array assembly, and to prevent extraneous optical energy from reaching the detector by providing continuous coverage via a continuous mask.” *Id.* (citing Ex. 1003 ¶ 162; Ex. 1018, 21:60–22:10, Fig. 16). Petitioner’s evidence thus supports that Retterath discloses an aperture layer composed of waveguides which define apertures as claimed.

Patent Owner argues that neither Petitioner nor its declarant discuss Retterath’s waveguides in relation to the “field of view” recited in limitations 44(c) and 44(f). Prelim. Resp. 37. However, limitations 44(c) and 44(f) do not recite the “apertures” for which Petitioner relies on Retterath’s waveguides. Thus, Patent Owner’s argument does not undermine Petitioner’s evidence.

Patent Owner also reiterates its “field of view” arguments which we previously determined insufficient to undermine Petitioner’s evidence. Prelim. Resp. 37; *see* §§ III.C and III.D.3.d. Neither party proposes the construction that Patent Owner asserts that Petitioner failed to address in the Petition.

Patent Owner does not dispute Petitioner’s remaining contentions at this stage.

We determine that Petitioner has sufficiently demonstrated that the Retterath-Borowski combination teaches the aperture layer recited in limitation 44(d) on the evidence of record at this time.

g) Bulk Transmitting Optic (44(e))

Petitioner contends that the Retterath-Borowski combination provides a bulk transmitting optic disposed adjacent to the bulk imaging optic as claimed. Pet. 27 (citing Ex. 1003 ¶¶ 163–167). Petitioner states that “Retterath provides a macro lens, such as macro lens 80 (FIG. 6).” *Id.* (citing Ex. 1005, 4:4–10, 9:12–28). Petitioner argues that, “[l]ike the bulk transmitting optic described by the ’750 patent, the macro lens receives light from multiple emitters and transmits it to the surrounding environment.” *Id.* (citing Ex. 1001, Fig. 1; Ex. 1003 ¶ 164). Petitioner quotes Retterath, stating that “[t]he macro lens 80 is configured to diverge to produce a plurality of beams 82 along a multitude of emitter vectors (coincident axes) 120 throughout the device’s field of view.” *Id.* (citing Ex. 1005, 9:12–20).

Petitioner further contends that “[t]he emitter array 100 is adjacent to the detector array 200, next to one another in quadrants shown in FIG. 11b, thereby providing the macro lens 230 (located in front of the detector array 200) at a location adjacent to the macro lens 80 (located in front of the emitter array 100),” and argues that “the adjacent arrangement is like that of the ’750 patent.” *Id.* (citing Ex. 1001, 2:27–34, 9:12–20, 10:23–30, 11:2–7, Figs. 6, 10; Ex. 1003 ¶¶ 165–197; Ex. 1013, Fig. 2; Ex. 1031, Fig. 6; Ex. 1033, Figs. 1–2)).

Patent Owner does not dispute at this time Petitioner’s contentions that the Retterath-Borowski combination teaches limitation 44(e).

Thus, for purposes of institution, we determine that Petitioner has shown sufficiently that the Retterath-Borowski combination teaches a bulk transmitting optic as recited in limitation 44(e).

h) Optical Emitters (44(f))

Petitioner contends that “the Retterath-Borowski combination provides the claimed plurality of optical emitters in the recited arrangement.” Pet. 28–29 (citing Ex. 1003 ¶¶ 168–172). According to Petitioner, “Retterath describes an array of emitter elements 100, such as illustrated in FIG. 11b.” *Id.* at 29 (citing Ex. 1005, 6:8–15, Fig. 11b). Petitioner asserts that the “array of emitters 100 are arranged behind the macro lens 80.” *Id.* (citing Ex. 1005, 9:12–20, Fig. 6; Ex. 1003 ¶¶ 168–170).

Petitioner asserts that the “emitters output converging light beams 84, which are a form of electromagnetic radiation.” *Id.* (citing Ex. 1003 ¶ 168). Petitioner alleges that the “converging beams 84 pass through the bulk optic into an external field as beams (e.g., beams 82 in FIG. 6).” *Id.* at 30 (citing Ex. 1005, 3:1–4:34, 6:8–7:40, 7:41–9:12, 9:13–10:3, Figs. 12–17).

Petitioner states that “[t]he emitter elements 100 output laser beams according to an illumination pattern where electromagnetic radiation output from each emitter in the illumination pattern is coincident with a field of view of a corresponding pixel in the plurality of pixels.” *Id.* (citing Ex. 1003 ¶¶ 169–170). Petitioner contends that “each emitter element 100 includes a collimating lens 66 and directional lens 70 to produce a collimated beam of light 68 that defines an emission region for the individual emitter.” *Id.* (citing Ex. 1005, 7:61–8:14, 8:36–40, Figs. 4, 5A (annotated)). Petitioner asserts that the “beam, and thus the emission region, is centered along a

unique emission vector 120.” *Id.* (citing Ex. 1005, Figs. 4, 5A (annotated); Ex. 1003 ¶¶ 171–172).

Petitioner argues that “Retterath explains that each emission vector 120 is ‘on-coincident axis’ with a corresponding detection vector 220.” *Id.* at 31. Petitioner quotes Retterath, which states “[f]or each emitter/detector set of elements 100/200, the emitter and detector vectors are coincident and form a common on-coincident axis that is at an angle relative to a vector normal to the plane of the array that is unique for that emitter/detector set.” *Id.* (citing Ex. 1005, 6:23–39; 10:44–47, 10:66–11:1, 3:1–5, 3:24–26, 3:58–4:34; Ex. 1003 ¶ 172).

Patent Owner argues that Retterath does not provide any evidence to support that Retterath teaches a “field of view” under Petitioner’s proposed construction before the ITC. Prelim. Resp. 24. As we have explained, neither party proposes that we should adopt that construction here, so Patent Owner’s arguments are unavailing.

We determine that Petitioner has demonstrated sufficiently at this time that the proposed combination teaches limitation 44(f).

i) Conclusion for Independent Claim 44

On this record, Petitioner has shown a reasonable likelihood that one of ordinary skill in the art would have combined Retterath and Borowski with a reasonable expectation of success in arriving at claim 44, and that each limitation of claim 44 is taught, or at least suggested, by the combination. Accordingly, Petitioner has presented a reasonable likelihood that claim 44 is unpatentable as obvious over the Retterath-Borowski combination.

E. Remaining Claims and Grounds

The Supreme Court has held that the Board, in a decision to institute under 35 U.S.C. § 314(b), may not institute review on less than all claims challenged in the petition. *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1355–56 (2018); *see also* 37 C.F.R. § 42.108(a) (2020); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018). Because we decide that Petitioner’s showing is sufficient for claim 44 on Ground 1A, we do not discuss the remaining grounds in any detail other than to offer the following observations.

For Ground 1A, Petitioner provides un rebutted evidence that the Retterath-Borowski combination teaches each of the dependent claims 45, 48, and 50. Pet. 31–33. We determine on this record that Petitioner has presented a reasonable likelihood that these claims would have been obvious.

Grounds 1B to 1D include the Retterath–Borowski combination with Weimer and/or Hipp. Pet. 1. Patent Owner does not argue on the current record that Weimer or Hipp undermine the Retterath-Borowski combination. Accordingly, since Grounds 1B to 1D subsume the Retterath-Borowski combination, Petitioner has shown a reasonable likelihood that claims 44, 45, 48, and 50 are obvious under Grounds 1B to 1D for the reasons stated for Ground 1A.

Grounds 1B and 1D further challenge dependent claims 46 and 47. For Ground 1B against these claims, on the record developed so far, Petitioner has shown sufficiently that a POSITA would have combined Retterath, Borowski and Weimer with a reasonable expectation of success. Pet. 35–37. We further agree with Petitioner on this record that Weimer

teaches the vertical-cavity surface-emitting laser (VCSEL) emitters recited in these claims, and thus the claims would have been obvious. Pet. 39–40. Since Ground 1D subsumes Ground 1B, and Hipp has not been shown to undermine the Retterath-Borowski-Weimer combination, Petitioner has presented sufficient evidence to present a reasonable likelihood of obviousness for claims 46 and 47 under Grounds 1B and 1D.

For Ground 2, Petitioner presents evidence that a POSITA would have combined Imai, Higashi, and Grzesik with a reasonable expectation of success, and that the limitations of claims 44–48 and 50 are met by the Imai-Higashi-Grzesik combination. Pet. 44–69.

Patent Owner reiterates its “field of view” argument for Ground 2, which does not undermine Petitioner’s evidence for the reasons explained. Prelim. Resp. 26; *see* § III.C.

Patent Owner also argues that Petitioner fails to show how Imai teaches a “bulk transmitting optic disposed adjacent to the bulk imaging optic.” Prelim. Resp. 26. However, Petitioner annotates Imai’s Figures 2(A) and 2(C) to show the adjacent bulk optics. Pet. 59–61. On this record, Petitioner has shown a reasonable likelihood that claims 44–48 and 50 would have been obvious under Ground 2.

For Ground 3, Petitioner presents evidence that a POSITA would have had reason to combine Weimer, Borowski, and Hipp with a reasonable expectation of success in arriving at claims 44–48 and 40. Pet. 69–79. Patent Owner again asserts its “field of view” argument for Ground 3, which does not undermine Petitioner’s evidence for the reasons explained. Prelim. Resp. 48–50; *see* § III.C.

Patent Owner also argues that Petitioner fails to identify a “bulk imaging optic” because there is no element “31” referenced anywhere in Weimer. Prelim. Resp. 50–51 (citing Pet. 76–77). We agree with Patent Owner and it appears the Petition contains a typographical error and should have referenced “318.” Briefing on this issue at trial may be helpful.

Patent Owner further argues that Petitioner did not explain why a POSITA would combine the embodiments of Weimer’s Figure 3A showing optics, with Weimer’s Figure 3D showing a laser array. Prelim. Resp. 51–53. Petitioner’s reasons to combine Retterath, Borowski, and Weimer do not appear to address this issue. Pet. 35–37. Briefing at trial may be helpful to resolve the issue.

In addition, Patent Owner argues that Weimer teaches away from high-speed laser pulse systems like Borowski’s. Prelim. Resp. 53–58. Patent Owner asserts that Weimer is used with aircraft and spacecraft “where energy conservation is paramount” whereas Borowski’s system uses “rapid, short, and high-energy pulses” such that the two systems are incompatible. *Id.* at 53–54. Patent Owner’s attorney argument does not establish on this record, however, that either reference “criticizes, discredits or otherwise discourages” the approach of the other reference. *See Icon Health*, 849 F.3d at 1043. Nor do we find any language in the challenged claims that would support this argument. Briefing during the trial may be helpful to resolve the issue.

IV. CONCLUSION

After considering the evidence and arguments presented in the Petition, we determine Petitioner has established a reasonable likelihood of

prevailing on its assertion that at least one claim of the '750 patent is unpatentable. Accordingly, we institute an *inter partes* review.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 44–48 and 50 of the '750 patent is hereby instituted on all grounds of unpatentability set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial commencing on the entry date of this decision.

IPR2023-01457
Patent 11,190,750 B2

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