

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HESAI TECHNOLOGY CO., LTD.
Petitioner

v.

OUSTER, INC.
Patent Owner

Case No. IPR2023-01456
U.S. Patent No. 11,178,381

**PATENT OWNER'S
PRELIMINARY RESPONSE
UNDER 37 C.F.R. §42.107**

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The Board should not institute *inter partes* review of claims 1-3, 5-8, and 10-17 (the “challenged claims”) of U.S. Patent No. 11,178,381 (the “’381 patent”).

I. OVERVIEW

Ouster’s ’381 patent describes and claims an innovative technology that has transformed the burgeoning field of light detection and ranging (“LIDAR”). Hesai now challenges Ouster’s patent using impermissible hindsight, unsupported and unsupportable assertions by Hesai and its expert, and positions that directly contradict Hesai’s litigation positions regarding the meaning of the claims. The Board should deny review as to all of Hesai’s asserted grounds.

Ouster was founded in 2015 to pursue a new and innovative approach to LIDAR design. Prior to Ouster, the conventional wisdom viewed a strong signal and a high signal-to-noise ratio as substantial contributors to a successful design. As a result, conventional LIDAR devices prior to 2015 combined a high wattage laser emitter with avalanche photodiode (“APD”) sensors able to filter out all but the strongest signals. Ouster, however, demonstrated that with the right optical design, a LIDAR sensor could be built upon a pairing of low-power vertical-cavity surface-emitting lasers (“VCSELs”) to single-photon avalanche diodes (“SPADs”), resulting in a highly efficient, accurate, and low-cost system. Ouster’s design, including its unique optical components, yields a smaller and more compact sensor, reduces cross-talk and background noise, and improves the ability to record an image at a

distance in detail

Hesai seeks to challenge the patents Ouster has earned on its innovative technology through an *à la carte* approach in which it uses the very claims it challenges to assemble combinations of disparate components it has clipped from the prior art. In so doing, Hesai relies upon references that teach away from each other and combinations that defy common sense, and still does not even manage to find prior art structures to match all the elements of the challenged claims. Further, Hesai ignores the difficult realities of designing systems that rely on VCSELs and SPADs and instead, offers only the conclusory *ipse dixit* of its expert witness in support of a reasonable likelihood of success. The only motivation driving these combinations is Hesai's litigation needs; no POSITA would have had a reasonable expectation of success in the outcome since no POSITA would ever have contemplated the proposed combinations in the first place.

Further, Hesai's petition ignores claim construction positions Hesai has taken in prior litigation between Ouster and Hesai. In 2023, Ouster brought a Section 337 investigation against Hesai before the International Trade Commission (ITC)—*Certain Lidar (Light Detection and Ranging) Systems and Components Thereof*, Inv. No. 337-TA-1363—in which Ouster asserted the challenged claims of the '381 patent. In that investigation, Hesai insisted that resolution of the parties' dispute required construction of *10 terms* of the claims of the '381 patent.

(Ex. 2001.) Hesai now generally asserts that “the prior art renders the challenged claims obvious under the constructions advanced by both parties,” so “no formal claim constructions are necessary.” (Pet. at 4.)

However, despite Hesai’s claim to the contrary, its petition and accompanying expert declaration *fail* to account for its claim construction positions before the ITC. Before the ITC, Hesai proposed the following construction for the term “field of view”: “detection area defined by an aperture or lens tube.” (Ex. 2002 at 2.) But now, Hesai fails to identify an “aperture” or “lens tube” required by its own construction in *any* of the combinations it asserts.¹

Hesai’s selective approach to claim construction is just the latest in a long line of inconsistent positions Hesai has taken before different forums. For example, Hesai’s filing of IPRs against Ouster’s patents come after Hesai argued before the ITC—leading to termination of the investigation—that Hesai and Ouster’s dispute over patents, including the patent Hesai challenges here, must be arbitrated.²

¹ Hesai’s position here is similar to its refusal to apply its own definition of “aperture” to the prior art it asserts against Ouster’s U.S. Patent No. 11,175,405 in Case No. IPR2023-01421.

² It should be noted that Ouster denies that the parties are subject to an arbitration agreement. The ITC has referred the question of a duty to arbitrate to arbitration.

Arbitration between the parties proceeds, but now Hesai has apparently changed its tune and decided that a non-arbitration panel—the Board—should decide this dispute between the parties.

The Board should deny review of all of Hesai’s asserted grounds.

II. BACKGROUND

A. Level of Ordinary Skill in the Art

For the limited purpose of this Preliminary Response, Patent Owner adopts Petitioner’s definition of a POSITA as having an undergraduate degree in mechanical or electrical engineering or physics and two to three years of experience in LIDAR design. (Pet. at 3.)

B. Specification Overview

The ’381 patent discloses embodiments of a “new and useful optical system for collecting distance information in the field of optical sensors.” (Ex. 1001, 1:28-31.) Figure 1 of the ’381 patent is reproduced below:

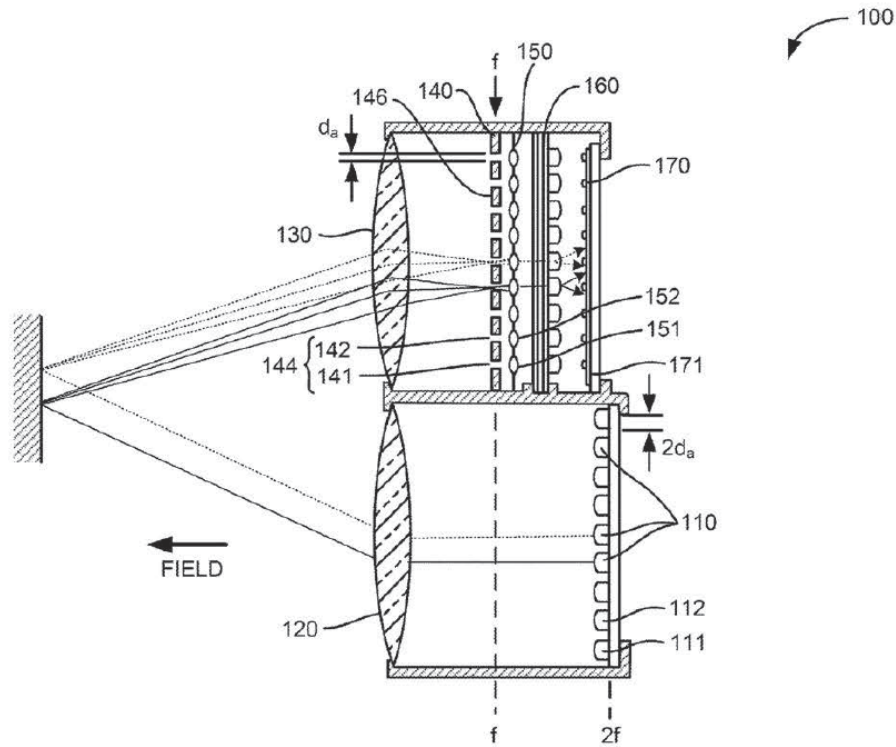


FIG. 1

(*Id.*, Fig. 1.) Light beams are shown emitting from illumination sources **110** and being directed into the external field via a bulk imaging optic **130**. (*Id.*, 2:5-12.) Illumination sources **110** can consist of an array of VCSELs. (*Id.*, 11:4-30.) The light beams deflect off of objects in the field and are directed into the receive side of the device through bulk imaging optic **130**. (*Id.*, 2:11-12.) The beams pass through aperture layer **140** consisting of stop regions **146** around apertures **144**, which define a field of view coincident with a “discrete spot output by a corresponding illumination source” in the field. (*Id.*, 2:12-22.) Then, the beams pass through lenses **150**, which are aligned with the apertures in aperture layer **140**. (*Id.*, 2:22-29.) After

passing through optical filter **160** and diffusers **180**, the light beams reach pixels **170**, which detect the light. (*Id.*, 2:29-38.) The pixels can be made up of single-photon avalanche diode detectors (“SPADs”). (*Id.*, 9:7-44.)

III. PETITIONER’S ASSERTED PRIOR ART

A. Retterath (Ex. 1005)

U.S. Patent No. 10,203,399 B2 (“Retterath”; Ex. 1005) teaches LIDAR systems using “an array of emitter/detector sets . . . where each emitter/detector set is configured to receive reflected light energy that is on a given coincident axis[.]” (Ex. 1005, 2:66-3:5.) Retterath does not disclose the types of detectors used in its system, instead indicating that “[e]ach detector of detector elements **200** can be configured as a photoreceptor such as a photodiode or phototransistor which converts light into an electrical signal.” (*Id.*, 6:57-59.)

Retterath discusses disadvantages of various LIDAR approaches. (*Id.*, 1:18-2:62.) Retterath indicates that “problems remain in developing effective LiDAR units that can address the interference challenges and operate reliably in an environment where hundreds or thousands of like devices are operating simultaneously.” (*Id.*, 2:58-62.)

For example, Retterath indicates that “[f]lash LiDAR devices[.]” which “illuminate an entire 2D field of view with a blanket of light and measure the return value time for each photoreceptor location in the field of view[.]” are “relegated to very close proximity applications due to the low incident laser power for each

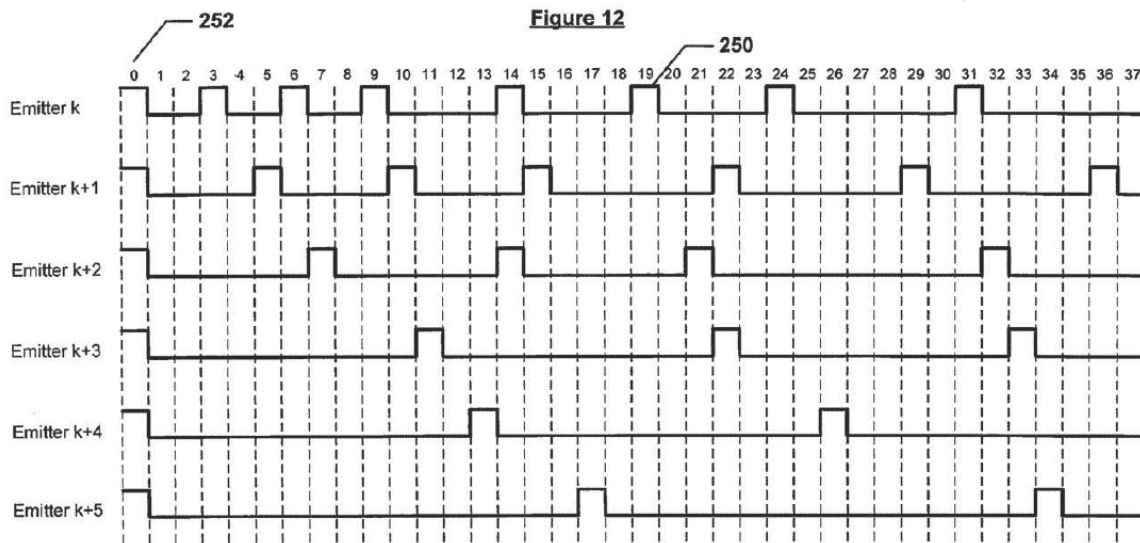
location in the field of view.” (*Id.*, 1:54-61.) For flash LIDAR systems at longer ranges, Retterath warns that “the usable field of view is typically too small for applications like autonomous vehicle navigation without the use of high performance cameras operating in the picosecond range for exposure times.” (*Id.*, 1:61-65.)

Further, Retterath teaches that for “[s]canning LiDAR units,” “[c]are must be taken to ensure that signals received by the photoreceptor are reflected light from the desired emitter source.” (*Id.*, 2:10-12.) Retterath discloses that “[t]wo LiDAR units, call them A and B, operating with lasers at the same wavelength have the potential to experience crosstalk.” (*Id.*, 2:12-14; *see also id.*, 2:14-17.) Retterath indicates that “[i]n an application like autonomous vehicle navigation with multiple LiDAR sensors per vehicle on a busy roadway, the potential for crosstalk among pulsed-laser LiDAR units is quite high.” (*Id.*, 2:17-20.) Retterath teaches that “time division synchronization between the units” can reduce crosstalk interference, but it is “impractical when the individual units are integrated with separate, independently-controlled systems.” (*Id.*, 2:21-28.) Such crosstalk interference among LIDAR units will cause “one or more distances being computed as lower than the actual distances or failure to find a signal, resulting in no value being reported for an individual point.” (*Id.*, 2:29-32; *see also id.*, 2:33-35.)

Retterath attempts to address the identified issues with LIDAR systems using

emitter/detector channels, including the use of a unique “multi-bit sequence of emitter pulses for each emitter/detector cycle . . . wherein the bit sequence differs from the bit sequences for emitters whose coincident axis/vectors are in close proximity.” (*Id.*, 3:10-15.) Retterath discloses that “[b]y selecting locally unique bit patterns for each emitter, the interference from other emitters and other similar LiDAR devices is dramatically reduced[,]” as well as interference from “non-LiDAR devices that are transmitting or reflecting energy at the target detector wavelength.” (*Id.*, 3:15-21.)

Figure 12 of Retterath shows an example of a pulse timing sequence scheme for use with neighboring emitter-detector channels:

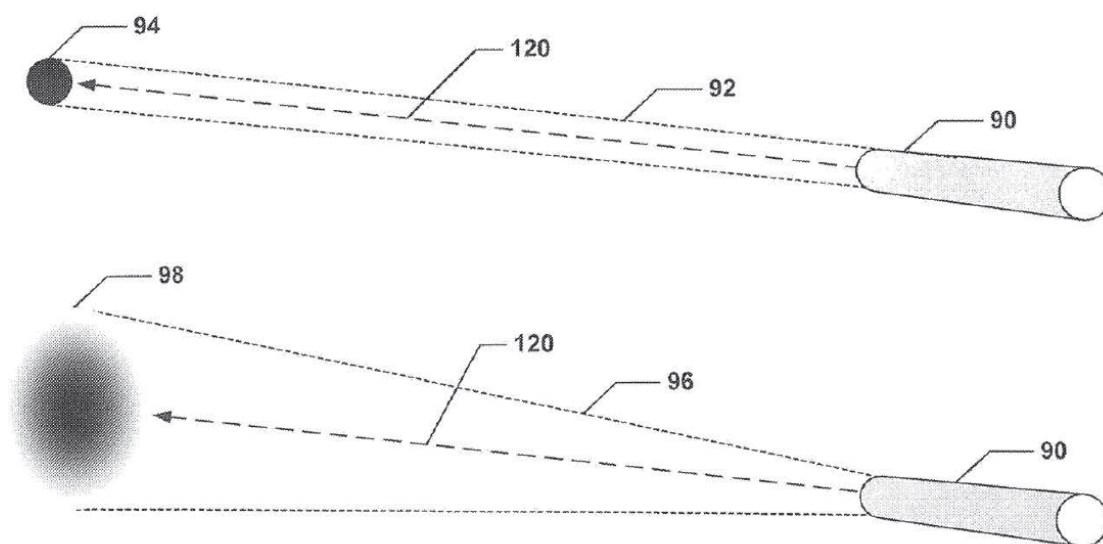


(*Id.*, Fig. 12; *see also id.*, Figs. 13-16, 11:26-16:56.) Retterath indicates that “[s]ince the vectors are similar, emitted energy from one emitter will possibly be received at a detector that is not its pair.” (*Id.*, 11:33-35.) Accordingly, “[t]he circuitry for each

paired detector is configured to detect the pulse sequence from its paired emitter.”
(Id., 11:37-39.) Retterath teaches the use of “sparsely populated” pulse sequences,
 “[t]o accommodate detection of pulse sequences from a detector’s paired emitter.”
(Id., 11:35-37.)

Retterath further discusses the use of different beams for emitters, as shown
 in Figure 7:

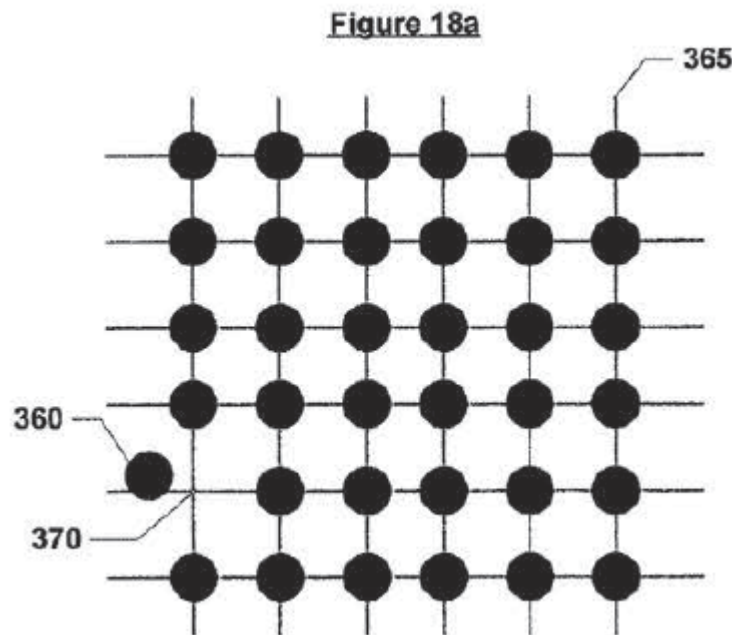
Figure 7



(Id., Fig. 7; *see also id.*, 9:29-52.) Retterath indicates that the bottom diagram is the
 “more typical beam profile,” which “diverges as it travels through space,” and “[t]he
 spot **98** on the surface of the reflected object is elliptical in shape.” *(Id.*, 9:44-46.)
 Further, “[t]he light intensity is non-uniform throughout the surface of the spot **98**”
 and “[t]he point of greatest intensity will not always be the center point of the spot

98.” (*Id.*, 9:47-48, 9:51-52.) Retterath teaches that the top diagram in Figure 7 shows a beam that has advantages in “precision LiDAR systems.” (*Id.*, 9:35-36.) Retterath indicates that the top diagram beam is a “perfectly collimated beam 92 that produces a round spot 94 on the surface of the reflecting object,” where “[t]he beam intensity is uniform throughout the round spot 94, and the intensity of the light transitions sharply at the edge of the round spot 94.” (*Id.*, 9:30-35.)

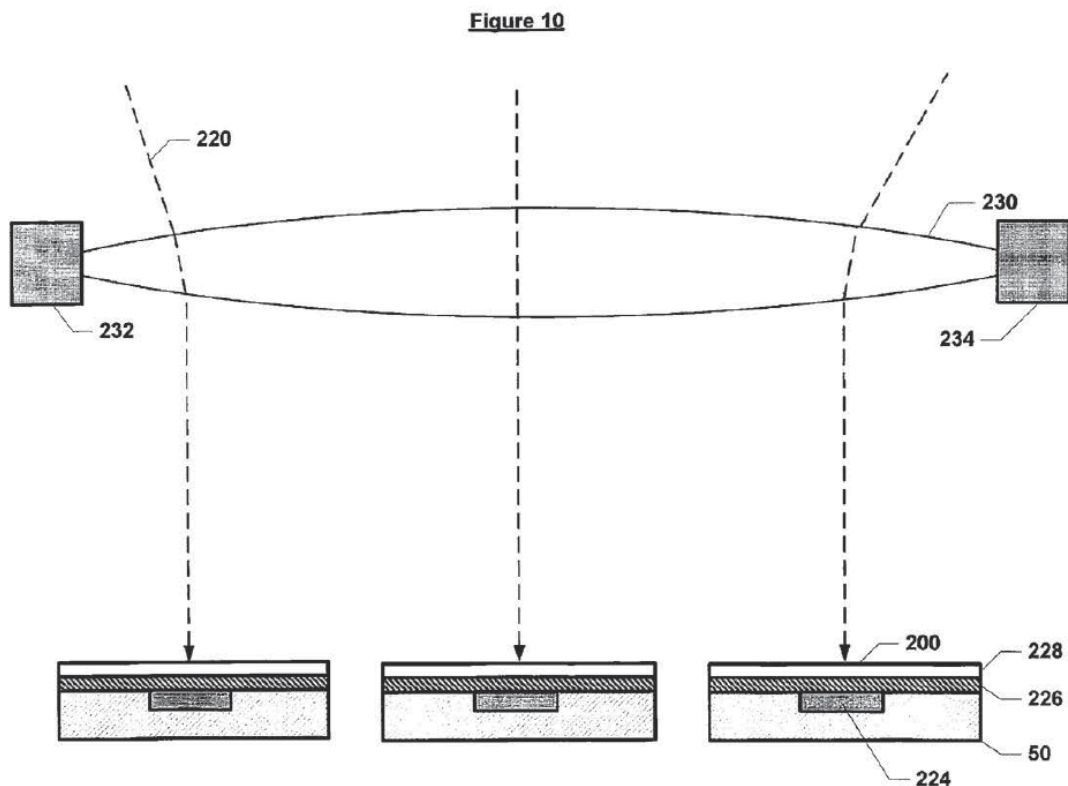
In Figure 18a, Retterath illustrates “a grid 365 showing an ideal location 370 for emitted beams,” which “could be used for device characterization.” (*Id.*, 17:11-14.)



(*Id.*, Fig. 18a; *see also id.*, 17:11-42.)

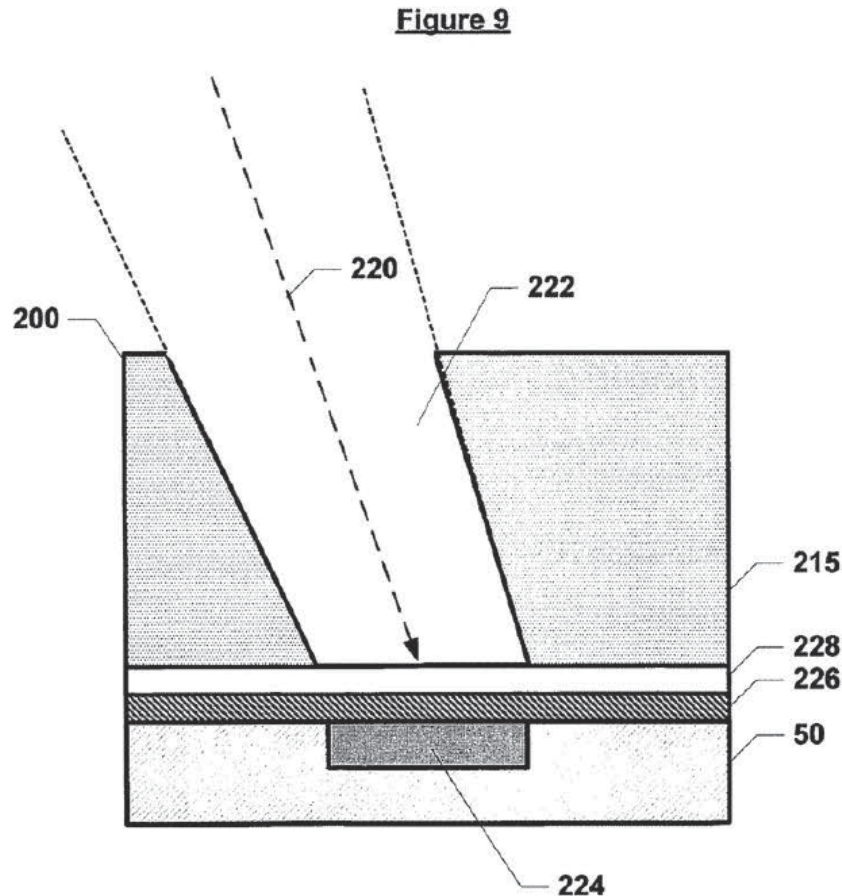
Further, Retterath discusses LIDAR systems that can use either (1) waveguides or (2) a macro lens in the receive path for light reflected back into

Retterath's system. (*Id.*, 17:46-48 (“The dense detector array **290** can be utilized with waveguide detectors or with macro lens detectors.” (emphasis added)), 3:58-4:12 (disclosing “waveguides” and “macro lens” detectors in separate embodiments).) Retterath indicates 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.*, 9:62-65; *see also id.*, Fig. 8, 3:58-4:12, 17:46-48.) Figure 10 of Retterath shows an embodiment using a macro detector lens **230**:



(*Id.*, Fig. 10; *see also id.*, 10:23-39.) Figure 9 of Retterath shows an embodiment using a waveguide, which consists of waveguide material **215** and waveguide **222**,

which “shall be an air gap or . . . shall consist of a material that is substantially non-reflective for the wavelength or range of wavelengths of the emitted light.” (*Id.*, 10:9-17.)

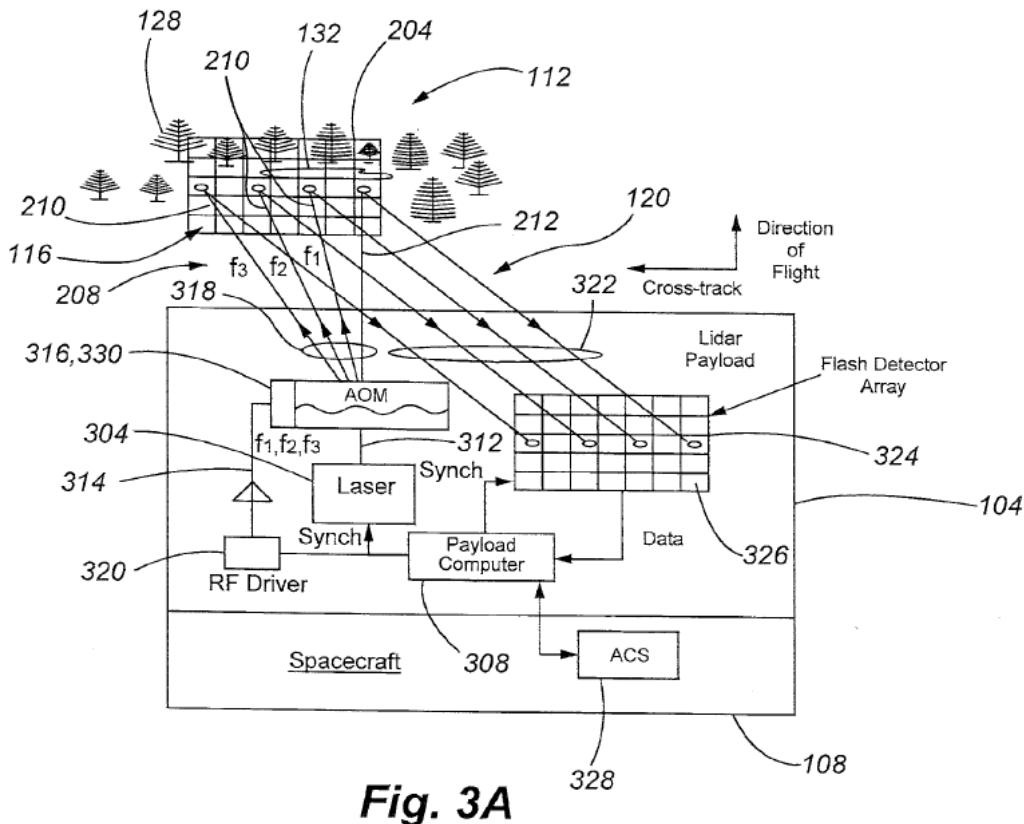


(*Id.*, Fig. 9; *see also id.*, 10:4-22.) Figure 9 also shows bandpass filter layer **226**, protective layer **228**, and photoreceptor **224**. (*Id.*, 10:9-12.)

B. Weimer (Ex. 1008)

U.S. Patent No. 8,736,818 (“Weimer”; Ex. 1008) discloses “electronically steered flash LIDAR systems and methods in which illumination within a scene is adaptively controlled[.]” (Ex. 1008, 1:5-8.)

Figure 3A of Weimer illustrates an embodiment of a flash LIDAR system in a spacecraft **108**, in which laser light is sent through transmit optics **318**, bounces off a target scene **112**, and is received through receiver optics **322** to “Flash Detector Array” **324**. (*Id.*, Fig. 3A, 8:48-10:45.)



(*Id.*, Fig. 3A.)

Weimer discusses using its system in spacecraft and aircraft applications, including satellites, landers, rovers, and airplanes. (*E.g.*, Figs. 1A-D.) Weimer indicates that space applications include “rendezvous and docking, robotic rovers, planetary mapping, terrain relative navigation for future landers, and long range target position and range tracking.” (*Id.*, 1:20-23.) Weimer teaches away from the

use of various types of LIDAR systems given the requirements of these application contexts. For example, Weimer teaches that “[a]n along track vegetation LIDAR design preferably has continuous coverage by the laser and a 25 meter footprint,” which requires a “laser repetition rate of approximately 250 Hz” when carried by a satellite. (*Id.*, 1:24-27.) Weimer further discloses that 250 Hz “is a relatively high repetition rate, and has a significant impact on laser reliability because of the high number of laser shots required for the mission (e.g., 10 billion).” (*Id.*, 1:27-30.) Weimer indicates that “[t]he high repetition rate also means that, in order to keep the average output power reasonable to improve laser reliability, the peak power per shot must be kept relatively low (e.g., 15 mJ).” (*Id.*, 1:30-33.) Accordingly, Weimer warns that “such a system may have insufficient power to make measurements through clouds and heavy aerosol layers.” (*Id.*, 1:33-35.)

Weimer discloses that some LIDAR approaches do not fit the requirements of its system’s application contexts. For example, Weimer teaches that “covering a large across-track swath on the ground using a staring LIDAR approach with multiple lasers is prohibitive in terms of available electrical power in space.” (*Id.*, 1:48-51.) Further, Weimer discusses that large fields of view for detectors are not desirable due to “more background light,” which reduces the signal to noise ratio—but generating fields of view slightly larger than laser spot size can require “accurate boresighting” via “mechanical” means that “can be heavy and are expensive to

produce and test.” (*Id.*, 1:53-61.)

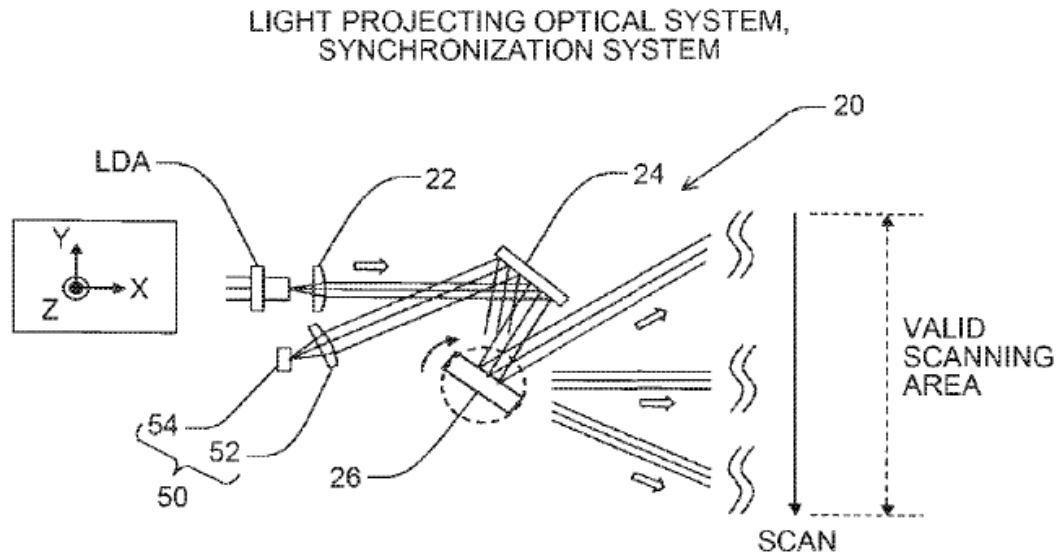
Further, Weimer indicates that proposed “complex laser transmitter optics that shape or form the beam into patterns, or mechanical scanning systems[]” are undesirable. (*Id.*, 1:62-65.) Weimer warns that “such mechanisms typically result in the wastage of photons in at least some configurations, and introduce elements that can be subject to mechanical failure and/or misalignment.” (*Id.*, 2:7-10.) Further, Weimer discloses that “[t]hese systems [] have the effect of shifting the effective dynamic range of the overall detector, rather than broadening that dynamic range.” (*Id.*, 2:10-13.)

C. Imai (Ex. 1009)

U.S. Patent Application Publication No. 2016/0274223 A1 (“Imai”; Ex. 1009) discloses an “object detecting device.” (Ex. 1009, [0008].) Petitioner relies on JP2015-055314 in asserting that Imai is prior art to the ’381 patent. (Pet. at 2-3.)

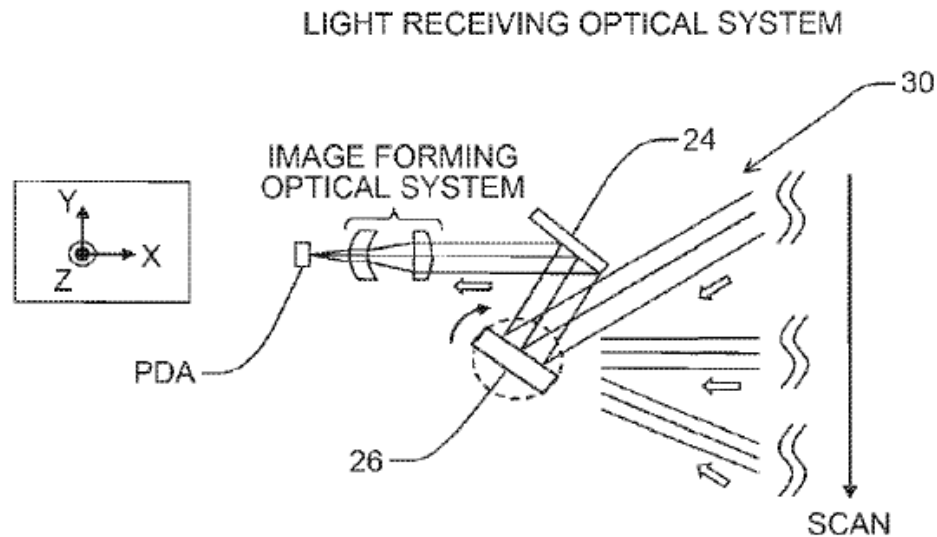
Imai indicates that its object detecting device consists of “a light source which includes a plurality of light emitting units arranged in a sub-scanning direction; a deflector which deflects light from the light source; and an optical detector which includes a plurality of light receiving units arranged in the sub-scanning direction so as to correspond to the plurality of light emitting units, and receives light deflected by the deflector and reflected by an object.” (Ex. 1009, [0008].) Imai discloses a rotating mirror system for emitting light as shown in Figure 2(A) below:

(A)



(*Id.*, Fig. 2(A); *see also id.*, [0031]-[0037].) A laser diode array (“LDA”) is shown emitting light through coupling lens **22**, which reflects off of reflecting mirror **24** and is shined into the external world via rotary mirror **26**. (*Id.*, [0032].) Imai further discloses a rotating mirror system for receiving light, as shown in Figure 2(B) below:

(B)

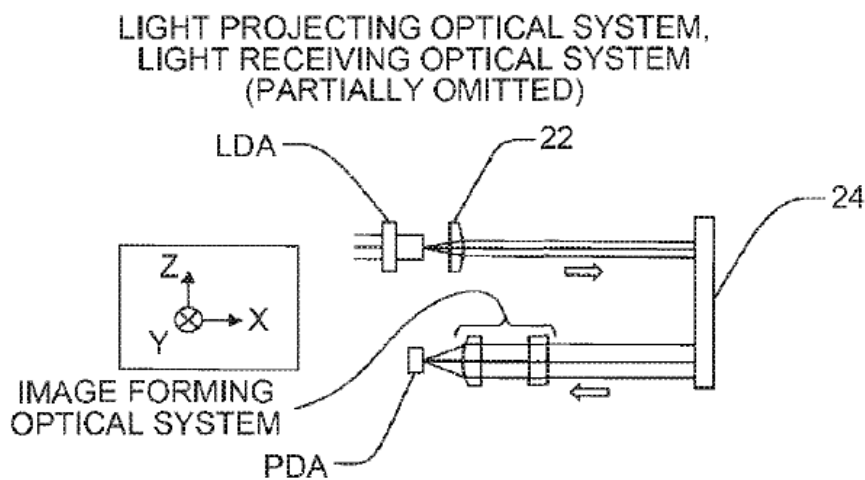


(*Id.*, Fig. 2(B); *see also id.*, [0040]-[0041].) Imai discusses a photo diode array

(“PDA”) receiving light reflected from the environment through an image forming optical system, which consists of two lenses in Figure 2(B).

Figure 2(C) of Imai shows a “partially omitted” diagram of an embodiment. (*Id.*, Fig. 2(C), [0038].)

(C)

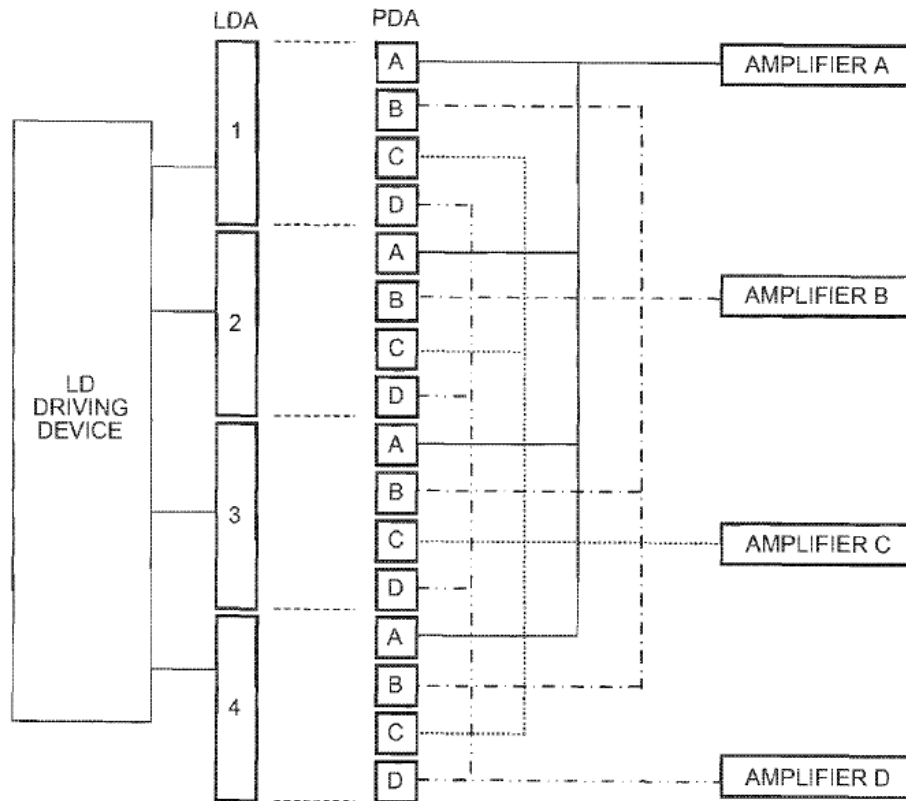


(*Id.*, Fig. 2(C).) Imai generally discusses the “light projecting optical system **20** and the light receiving optical system **30**” as “overlapped in the Z-axis direction.” (*Id.*, [0039].) However, it is clear from Figure 2(C) that it is not an accurate representation of the spatial relationship between elements of Imai’s system. For example, light rays extend straight from the LDA and PDA units to reflecting mirror **24**, such that no light would escape Imai’s system and reflect off objects in the external world if implemented according to the above diagram.

Imai discloses PDAs and LDAs arranged in a vertical, “sub-scanning” direction, as shown in Figure 10. (*Id.*, Fig 10; [0036], [0096], [0098].)

FIG.10

FIRST MODIFICATION



(*Id.*, Fig. 10.) Imai indicates that

[e]ach of the four LDs of the LD1 to LD4 is turned on periodically (herein, with the same lighting period T) at different timings among the LDs, and switching time of the LD to be turned on, that is to say, time after the lighting of one LD finishes until the lighting of the next LD starts is set to be shorter than the lighting period.

(*Id.*, [0116].) Imai further discusses that this off-set timing scheme “inhibit[s] heat generation and deterioration in light emission quantity of the LD” and makes it “possible to make a lifetime of the LD longer.” (*Id.*)

Further, Imai indicates that “[t]he irradiation range of each LD is set to be slightly larger than [sic] corresponding light receiving ranges of the four PDs[,]” such that “light reception quantity in the light receivable range may be increased and detection accuracy and a detection distance may be improved.” (*Id.*, [0101].)

D. Other Asserted Prior Art

Petitioner also relies on US 2013/0300838 (“Borowski”; Ex. 1006); U.S. Patent No. 7,787,105 (“Hipp”; Ex. 1007); JP Publication No. 2015-078953 (“Higashi”; Ex. 1010 (original); Ex. 1011 (English translation)); U.S. Patent Application Publication No. 2017/0040368 (“Grzesik”; Ex. 1012); and U.S. Patent Application Publication No. 2014/0211194 (“Pacala”; Ex. 1013) in its asserted grounds. Since these references merely add to proposed combinations that, as shown below, cannot be sustained, discussion of the additional references is currently unnecessary.

IV. CLAIM CONSTRUCTION

No claim construction rulings have issued in the pending litigation between Petitioner and Patent Owner. However, Petitioner proposed a claim construction before the ITC that, among other reasons, shows that the Board should not institute *inter partes* review of the challenged claims of the ’381 patent.

A. “field of view” (claims 1 and 14)

In Patent Owner’s ITC case against Petitioner, Petitioner proposed the following construction for the term “field of view” in claims 1 and 14 of the

'381 patent: “detection area defined by an aperture or lens tube.” (Ex. 2002 at 2.)
Petitioner cited extrinsic evidence in support of its proposed construction of the
“field of view” term. (Ex. 2003 at 2.)

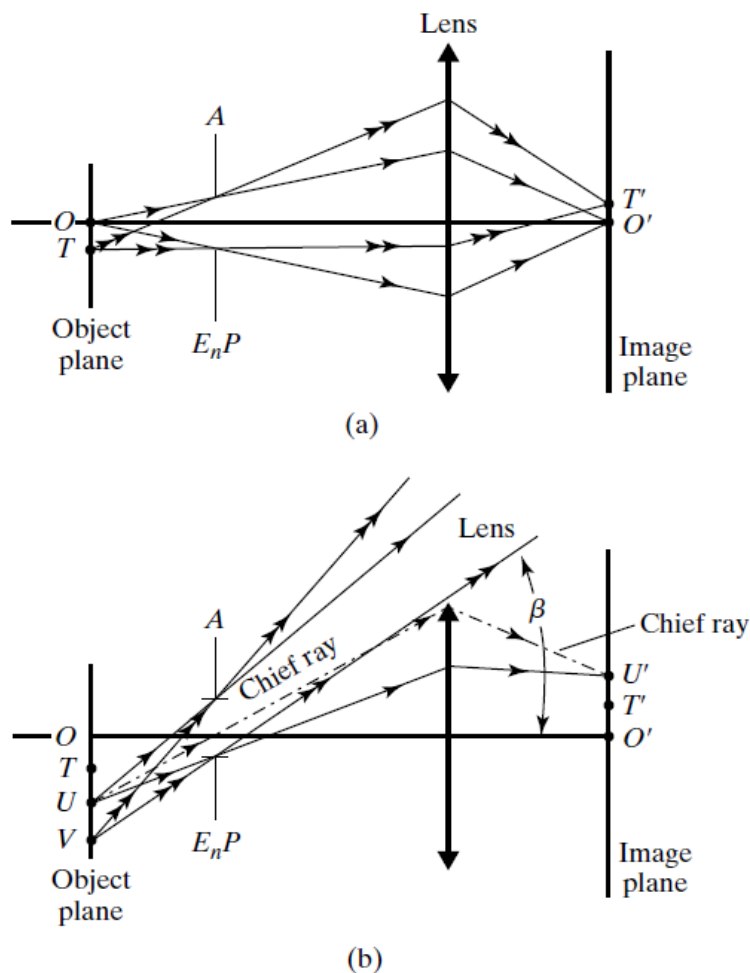
Petitioner relied on Rudolf F. Graf, *Modern Dictionary of Electronics* (7th Ed., 1999), which defines “field of view” as: “The maximum angle of view that can be seen through a lens or optical instrument.” (Ex. 2004 at 282.)

Further, Petitioner relied on Frank L. Pedrotti *et al*, *Introduction to Optics* (3d Ed. 2006) (“Pedrotti”; Ex. 2005), which discusses limiting “field of view” via apertures. For example, Pedrotti discloses 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.” (Ex. 2005 at 51 (emphasis in original).) Pedrotti compares the field of view of an optical system to the limited view created by a window:

A simple experience of a limitation in the field of view is that of looking through an ordinary window. The edges of the window determine how much of the outdoors we can see. This field of view can be described in terms of the lateral dimensions of the object viewed, or in terms of the angular extent of the window, relative to the line of sight. One can talk about the field of view in terms of the object being viewed or in terms of the image formed at the viewer (on the retina, in this example).

(*Id.* at 54.) Pedrotti further indicates that its Figure 3—reproduced below—shows

“how an aperture restricts the field of view.” (*Id.* at 55.)



(*Id.*, Fig. 3(a)-(b).) For Figure 3(b), Pedrotti indicates that apertures cause “vignetting”—*i.e.*, “partial shielding of the outer portion of the image by the aperture for off-axis object points.” (*Id.* at 55.) As a result, “[t]he lateral field of view processed by this optical system is at most a circle of radius OV.” (*Id.*; *see also id.* at 56 (“limitation of the field of view using an aperture”), 70.)

Petitioner also relied on Ulrich Kubitscheck (Ed.), *Fluorescence Microscopy* - From Principles to Biological Applications (2nd Ed. 2017) (“Kubitscheck”; Ex.

2006) in support of its construction of “field of view.” Kubitscheck discloses 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*.” (Ex. 2006 at 28 (emphasis in original).)

V. THE BOARD SHOULD DENY REVIEW OF ALL GROUNDS

A. Overview of Petitioner’s Asserted Grounds

1. Ground 1A: Obviousness of claims 1-3, 6-8, 10, 11, 14-17 in light of Retterath and Borowski

Petitioner relies on Retterath as the primary reference for Ground 1A. (Pet. at 9-19.) Since Retterath does not disclose the use of SPADs or multiple detectors per pixel, Petitioner relies on an obviousness combination with Borowski in an attempt to import into Retterath the use of multiple SPADs in place of each of Retterath’s detectors. (*Id.* at 13-15.)

As discussed below, Petitioner fails to show a reasonable likelihood of success as to Ground 1A because (1) Petitioner fails to show that Retterath teaches a “field of view” as construed by Petitioner for limitations 1(e) and 14(e); and (2) Petitioner fails to show that Retterath teaches a “plurality of non-overlapping emission regions” for limitations 1(b) and 14(b). Since Petitioner is only challenging independent claims 1 and 14 and claims that depend from claims 1 or 14, Petitioner’s failure to show a reasonable likelihood of success as to either of these claims means that review should not be instituted as to Ground 1A.

2. Ground 1B: Obviousness of claims 6-8, 17 in light of Retterath in view of Borowski and Hipp

Adding to the Retterath and Borowski combination, for Ground 1B Petitioner relies on the shadow mask of Hipp in an attempt to satisfy the “aperture layer” requirements of claims 6-8 and 17. (Pet. at 39-43.) Since claims 6-8 and 17 depend from claims 1 and 14, Petitioner’s failure to show a reasonable likelihood of success as to Ground 1A means that review should not be instituted as to Ground 1B.

3. Ground 1C: Obviousness of claims 1-3, 5-8, 10-13 in light of Retterath, Borowski, and Pacala

For Ground 1C, Petitioner supplements the Retterath-Borowski combination with Pacala in an effort to show teaching of (1) the limitation 1(d) requirement of “a bulk imaging optic disposed adjacent to the bulk transmitting optic” and (2) the rotation requirements of dependent claim 5. (Pet. at 43-48.) Since Petitioner relies on its Ground 1A Retterath-Borowski combination analysis for the other claims and limitations it is challenging based on Ground 1C, review should not be instituted as to Ground 1C for the same reasons articulated as for Ground 1A.

4. Ground 1D: Obviousness of claims 1-3, 6-8, and 10-17 in light of Retterath in view of Borowski and Weimer

For Ground 1D, Petitioner supplements the Retterath-Borowski combination with Weimer, arguing that a POSITA would have used Weimer to import VCSEL emitters (for dependent claims 12 and 13) and SPAD macro-cells, which Petitioner contends would have met the requirements of limitations 1(c), 1(e), 14(c), 14(e), and

15 related to “field of view” or “field that can be detected.” (Pet. at 48-54.)

As discussed below, Petitioner fails to show a reasonable likelihood of success as to Ground 1D because, in addition to the reasons discussed above for Ground 1A, (1) Petitioner fails to show that the Retterath-Borowski-Weimer combination teaches a “field of view” as construed by Petitioner for limitations 1(e) and 14(e) and (2) Petitioner fails to show adequate motivation to combine Retterath and Weimer. Accordingly, review should not be instituted as to Ground 1D.

5. Ground 1E: Obviousness of claims 1-3, 5-8, and 10-13 in light of Retterath, Borowski, Weimer, and Pacala

For Ground 1E, Petitioner supplements the Retterath-Borowski-Weimer combination with Pacala in an effort to show teaching of (1) the claim limitation 1(d) requirement of “a bulk imaging optic disposed adjacent to the bulk transmitting optic” and (2) the rotation requirements of dependent claim 5. (Pet. at 54-55.) Since Petitioner relies on its Ground 1D Retterath-Borowski-Weimer combination analysis for the other claims and limitations it is challenging based on Ground 1E, review should not be instituted as to Ground 1E for the same reasons articulated as for Ground 1D.

6. Ground 1F: Obviousness of claims 6-8 and 17 in light of Retterath, Borowski, Weimer, and Hipp

Adding to the Retterath-Borowski-Weimer combination, for Ground 1F, Petitioner relies on the shadow mask of Hipp in an attempt to satisfy the “aperture layer” requirements of claims 6-8 and 17. (Pet. at 55.) Since claims 6-8 and 17

depend from claims 1 and 14, Petitioner's failure to show a reasonable likelihood of success as to Ground 1D means that review should not be instituted as to Ground 1F.

7. Ground 1G: Obviousness of claims 6-8 and 17 in light of Retterath, Borowski, Weimer, Hipp, and Pacala

Adding to the Retterath-Borowski-Weimer-Hipp combination with essentially no analysis, for Ground 1G, Petitioner apparently relies on Pacala for the same "bulk imaging optic" and rotation limitations discussed above for Grounds 1C and 1E. (Pet. at 55.) Since Petitioner relies on its Ground 1F Retterath-Borowski-Weimer-Hipp combination analysis (which relies on Ground 1D analysis) for the other claims and limitations it is challenging based on Ground 1G, review should not be instituted as to Ground 1G for the same reasons articulated as for Ground 1D.

8. Ground 2A: Obviousness of claims 1-3 and 10-16 in light of Imai and Higashi

Petitioner relies on Imai as the primary reference for Ground 2A. (Pet. at 55-62.) Petitioner relies on a combination with Higashi in its effort to import (1) a bandpass filter for limitations 1(f) and 14(f) and (2) the use of multiple SPADs for each detector Imai for limitations 1(e) and 14(e). (*Id.* at 58-62.)

As discussed below, Petitioner fails to show a reasonable likelihood of success as to Ground 2A because (1) Petitioner fails to show that Imai teaches a "field of view" as construed by Petitioner for limitations 1(e) and 14(e) and (2) Petitioner fails to show that Imai teaches a "plurality of non-overlapping emission regions" for

limitations 1(c) and 14(c). Accordingly, review should not be instituted as to Ground 2A.

9. Ground 2B: Obviousness of claims 6-8 and 17 in light of Imai in view of Higashi and Grzesik

For Ground 2B, Petitioner adds Grzesik to the Imai-Higashi combination, arguing that Grzesik renders obvious the “aperture layer” requirements of dependent claims 6-8 and 17. (Pet. at 77-79.) Since claims 6-8 and 17 depend from claims 1 and 14, Petitioner’s failure to show a reasonable likelihood of success as to Ground 2A means that review should not be instituted as to Ground 2B.

10. Ground 2C: Obviousness of claim 5 in light of Imai in view of Higashi and Pacala

For Ground 2C, Petitioner adds Pacala to the Imai-Higashi combination, arguing that Pacala renders obvious the rotation requirements of claim 5. Since claim 5 depends from claim 1, Petitioner’s failure to show a reasonable likelihood of success as to Ground 2A means that review should not be instituted as to Ground 2C.

B. There is no reasonable likelihood that Petitioner will prevail based on Grounds 1A to 1G

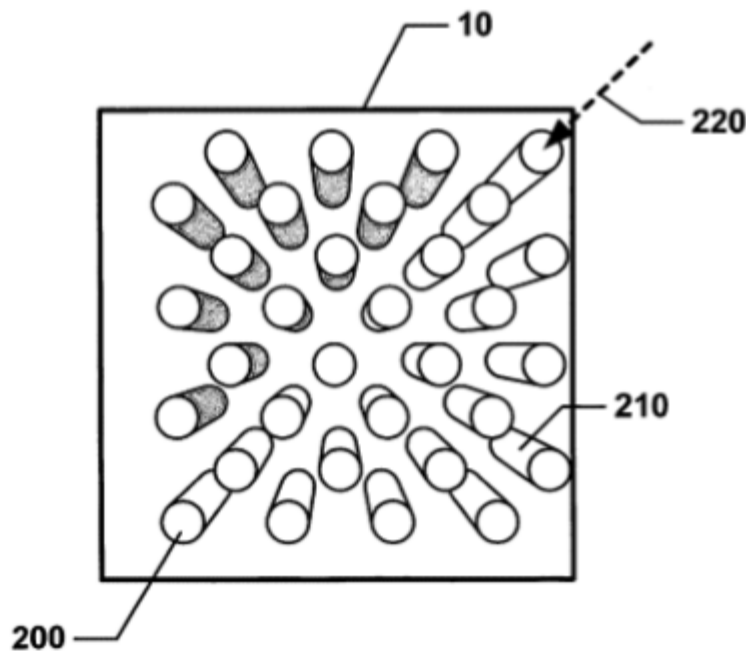
1. Petitioner fails to provide any evidence to support that Retterath or Weimer teaches a “field of view” per Petitioner’s construction for limitations 1(e) and 14(e)

For Grounds 1A to 1G, Petitioner relies on Retterath or Weimer in its effort to show that the following limitations were taught by the prior art: (1) “each pixel

in the plurality of pixels has a field of view coincident with an emission region of a corresponding optical emitter in the plurality of optical emitters” (limitation 1(e)) and (2) “each pixel in the plurality of pixels is paired with a different optical emitter in the plurality of optical emitters and has a field of view coincident with an emission region of its paired optical emitter” (limitation 14(e).) Petitioner fails to—and cannot—raise any evidence to support that Retterath or Weimer satisfies a “field of view” per Petitioner’s construction of that term: “detection area defined by an aperture or lens tube.” (Ex. 2002 at 2; *see supra* § IV.A.)

As discussed above in Section IV.A., in an ITC investigation involving the challenged claims of the ’381 patent, Petitioner proposed the following construction for “field of view” as it is recited in claims 1 and 14 of the ’381 patent: “detection area defined by an aperture or lens tube.” (Ex. 2002 at 2.) Petitioner provided several extrinsic evidence documents in support of its construction, which are discussed above in Section IV.A. (Ex. 2003 at 2.)

For Retterath, Petitioner argues that each detector 200 “has a field-of-view over which it receives light beams 210, each of which is centered along a unique vector 220.” (Pet. at 27.) Petitioner asserts that Retterath’s Figure 8 shows the “FOV arrangement of Retterath’s detector[.]” (*Id.*)



(Ex. 1005, Fig. 8.) Petitioner also points to language from Retterath indicating that “emitter and detector vectors are coincident” as evidence that “the field-of-view for each pixel in the Retterath-Borowski combination is coincident with the emission region of its corresponding emitter.” (Pet. at 28.) Petitioner’s expert declaration mirrors the petition. (Ex. 1003. ¶¶ 159-63.)

Absent from any arguments or evidence provided by Petitioner or its expert is any explanation of how Retterath satisfies the requirements of Petitioner’s construction for “field of view.” Neither Petitioner nor its expert provides any indication of how the identified portions of Retterath teach a “detection area defined by an aperture or lens tube.” (Ex. 2002 at 2.) Neither identify an “aperture” or a “lens tube” anywhere in the disclosures they identify as teaching detectors with

fields of view in Retterath that indicates a detector's "field of view" to be coincident with allegedly corresponding emitters. (Pet. at 26-29; Ex. 1003, ¶¶ 159-63.) For example, Petitioner relies on Figure 8 as teaching the "field of view" requirement of limitation 1(e). But no "aperture" or "lens tube" is shown in Figure 8. The written description accompanying Figure 8 identifies emitter/detector array **10** surface, detector elements **200**, light **210**, and detector vector **220**. (Ex. 1005, 9:53-59.) However, neither Petitioner nor its expert provides any explanation for how any of these elements constitutes an "aperture" or a "lens tube."

Petitioner and its expert point to excerpts from Retterath disclosing lenses. However, there is no indication that any of these lenses satisfy Petitioner's "field of view" construction, *i.e.*, "detection area defined by an aperture or lens tube." (Ex. 2002 at 2.) For example, Retterath discloses lenses in the path of laser emitters. (Ex. 1005, 8:36-40 ("emitter lens **66**"), 10:54-57 ("micro lens [] used for emitter elements **100**").) But lenses in the emitter path could only define an emission area and not a "detection area" as required by Petitioner's construction. Further, Retterath discloses bulk lenses that are shared by multiple emitters and/or detectors. (Ex. 1005, 9:59-65 ("macro lens"), 10:23-30 ("macro detector lens"), 10:50-51 ("a single global lens can be utilized for both emitter elements **100** and detector elements **200**"), Fig. 10.) However, the claims require "each pixel" to have a field of view coincident with a corresponding detector. Since Petitioner asserts that each

detector in Retterath is a “pixel” (Pet. at 26), it is unclear how a “field of view” could be defined for multiple detectors by a single bulk lens. Rather, Petitioner’s construction requires that each pixel’s “field of view” be defined by “an aperture or lens tube”—*i.e.*, each field of view is defined by an aperture or lens tube *separate* from the apertures or lens tubes used to define *other* fields of view. Furthermore, there is no indication that any bulk lenses disclosed by Retterath constitute an “aperture” or a “lens tube.”

Retterath also discloses “waveguides.” But throughout the petition and Petitioner’s expert’s discussion of Retterath relating to limitation 1(e), there is not a single mention of Retterath’s “waveguides”—let alone any attempt to explain how Retterath’s “waveguides” satisfy Petitioner’s construction of “field of view.” (Pet. at 26-29; Ex. 1003, ¶¶ 158-65.) Petitioner cites Retterath’s “waveguides” only in the context of claim 6, arguing that these waveguides constitute the required “aperture layer.” (Pet. at 30-34, Ex. 1003, ¶¶ 171-78.) Neither Petitioner nor its expert provides *any* explanation attempting to link Retterath’s waveguides in the context of claim 6 to its arguments as to limitations 1(e) or 14(e). (*Id.*) Accordingly, the citation of “waveguides” in the context of claim 6 has no bearing on whether Petitioner has shown that Retterath teaches structures that correspond to limitation 1(e) or 14(e).

Petitioner’s limited discussion of waveguides fails to demonstrate that

Retterath meets the “field of view” requirement for a second reason. Petitioner fails to show that Retterath discloses an embodiment that contains both waveguides and the macro detector lens that Petitioner relies on for limitations 1(d) and 14(d). (Pet. at 30-34.) Further, Petitioner fails to show adequate motivation to use both (1) waveguides and (2) macro detector lens in a single system. Rather, as discussed above for Section III.A, Retterath teaches *away* from using both waveguides and a macro detector lens in a single system. (Ex. 1005, 9:59-65; *see also id.*, Figs. 8-10, 3:58-4:12, 17:46-48.) Petitioner discloses that waveguides and a macro detector lens should be used in the *alternative*, because they both serve the same purpose—*i.e.*, preventing light rays non-parallel to the receive detector vector from reaching a detector. (*Id.*, 9:59-65.) But nothing in Retterath indicates that waveguides and a macro detector lens should be used together.

Petitioner asserts that a POSITA would have been motivated to use both structures to “block[] out extraneous optical energy from background/unintended sources.” (Pet. at 32.) But this is *exactly* the purpose that Retterath discloses can be served by either the macro detector lens *or* waveguides. (Ex. 1005, 9:59-65; *see also id.*, Figs. 8-10, 3:58-4:12, 17:46-48.) Petitioner argues that a POSITA would have been motivated to use both macro detector lens and waveguides because “the blocking material 215 surrounding the waveguides 222 would have advantageously reduced internal reflections from among the neighboring detector

elements/protective layer[.]” (Pet. at 32-33.) However, this only appears to be a motivation to use Retterath’s waveguides in a system—not to use those waveguides *alongside* a macro detector lens. Further, Petitioner asserts that “Retterath expressly suggests” using both a macro detector lens and waveguides in a single system—since Retterath includes the following generic boilerplate: “elements described with respect to one embodiment can be implemented in other embodiments even when not described in such embodiments unless otherwise noted.” (Pet. at 33; Ex. 1005, 19:55-20:12.) This boilerplate disclaimer does not fairly teach that one should combine in the same system two alternative components that perform essentially identical roles. *See Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1329, 1331-32 (Fed. Cir. 2019) (affirming no motivation to combine where combination “would introduce additional complexity and inefficiencies” that “outweighed” any benefits); *South-Tek Sys., LLC v. Engineered Corrosion Sols., LLC*, 748 F. App’x 1003, 1006-1007 (Fed. Cir. 2018) (affirming lack of motivation to combine to add redundant feature); *Ex Parte James Pinon*, No. 2017-005566, 2018 WL 1287471, at *4 (P.T.A.B. Mar. 9, 2018) (finding no motivation to combine references where addition of feature based on secondary reference’s disclosures would be redundant).

For Grounds 1E to 1G, Petitioner also asserts that to the extent Retterath on its own does not satisfy the requirement that each pixel have a field of view coincident with the emission region of its paired emitter, then that limitation would

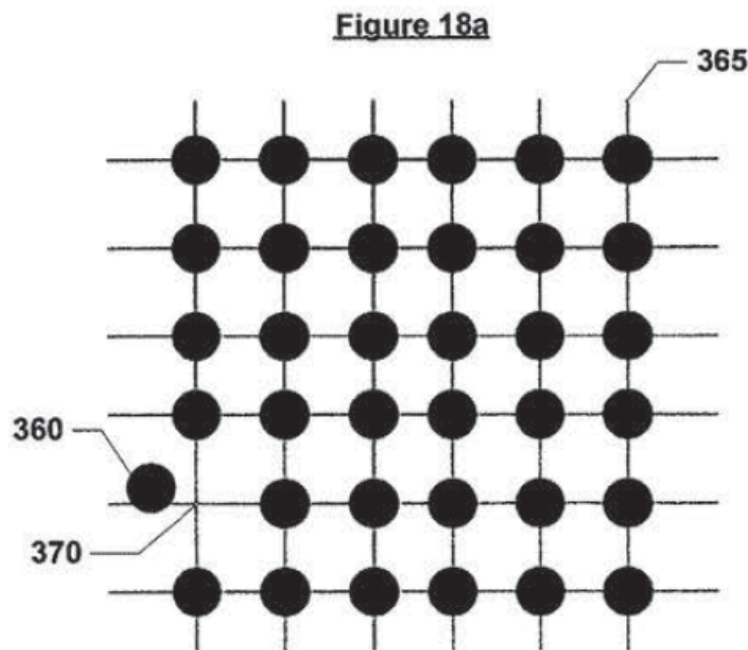
have been obvious based on Retterath in light of Weimer. But Petitioner does not provide any explanation for how Weimer—or the combination of Retterath with Weimer—involves a field of view for each alleged pixel that is “defined by an aperture or lens tube.” (Pet. at 53-54.) Rather, Petitioner merely makes conclusory assertions such as, “Weimer also teaches a pixel array 324, where each pixel 326 has a field-of-view that matches a corresponding beam 208 from the illumination source.” (*Id.* at 53.) But nothing in the cited disclosures from Weimer for this proposition—*i.e.*, Fig. 3A and 10:17-45—discloses an “aperture” or a “lens tube” as required by Petitioner’s construction for “field of view.” And Petitioner provides no guidance or explanation as to what it considers to be the required “aperture” or “lens tube” in Weimer’s disclosures. (Pet. at 53-54; *see also* Ex. 1003, ¶¶ 244-47 (mirroring petition).)

Given Petitioner’s complete failure of proof in its showing regarding its construction for the “field of view” requirement of limitations 1(e) and 14(e), the Board should decline to institute review based on any of Grounds 1A to 1G. *See KioSoft Techs., LLC v. PayRange Inc.*, CBM2020-00026, Paper 11, 17-18 (P.T.A.B. Mar. 22, 2021) (denying institution and citing “the potential problems inherent in the inconsistent claim constructions set forth by Petitioner between the Petition and its proposals at the district court”).

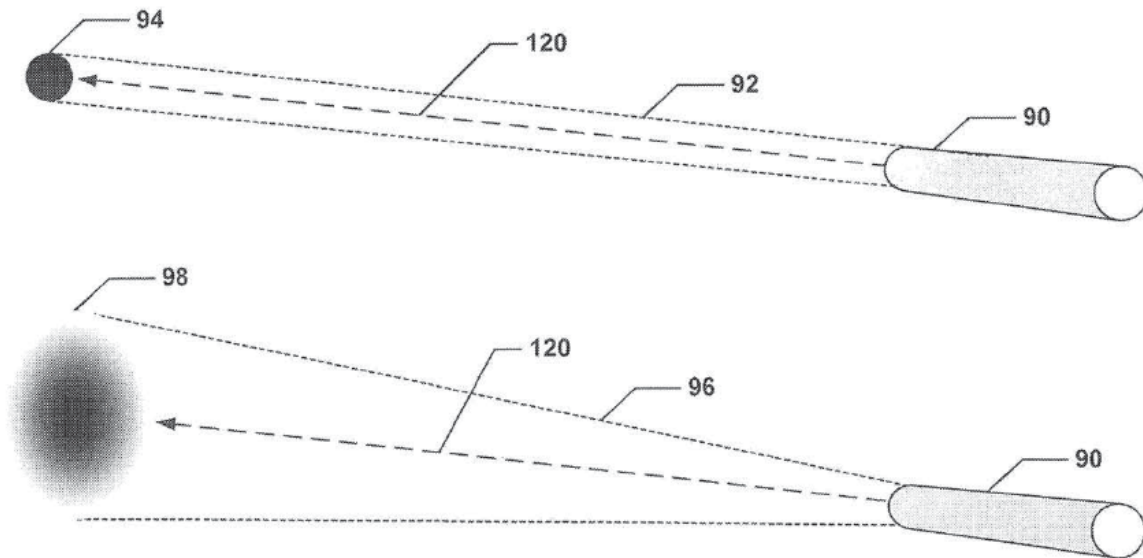
2. Petitioner fails to show that Retterath teaches a “plurality of non-overlapping emission regions” for limitations 1(b) and 14(b)

For Grounds 1A to 1G, Petitioner asserts that Retterath teaches a plurality of optical emitters that emit light in a “plurality of non-overlapping emission regions” for limitations 1(b) and 14(b). However, Petitioner fails to show that Retterath satisfies this limitation. Instead, Retterath provides ample teachings indicating that emission regions of its disclosed emitters *can* and *do* overlap. Accordingly, Petitioner fails in its showing regarding limitations 1(b) and 14(b) for Grounds 1A to 1G.

In support of its contention that Retterath discloses non-overlapping emission regions, Petitioner points to Retterath’s Figure 18a, which shows an “ideal” arrangement of emitter regions in a grid formation. (Pet. at 23; Ex. 1005, 17:11-13.)



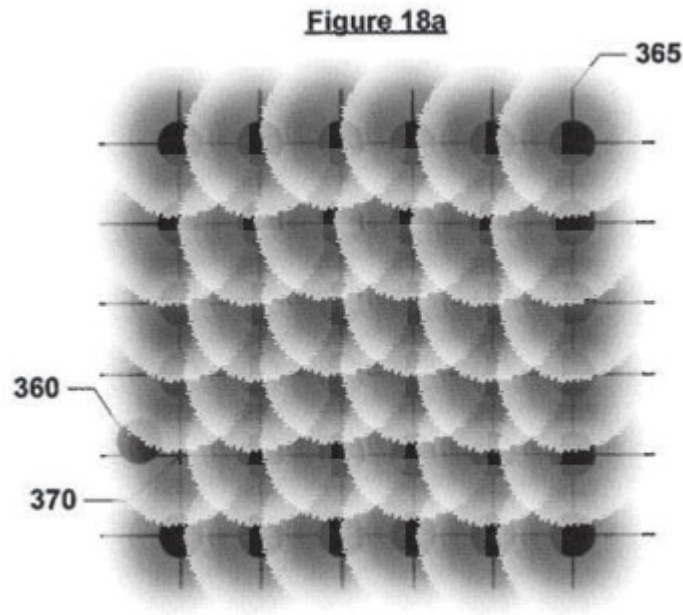
(Ex. 1005, Fig. 18a.) Further, Petitioner points to Retterath’s Figure 7, which shows two different types of emitter region—one using a “perfectly collimated beam” and the other “more typical” beam that “diverges as it travels through space.” (*Id.*, 9:29-52.)



Additionally, Petitioner points to Retterath’s Figures 4 and 6, which show only the emitters—not the emission regions created by the emitters. (*Id.*, Figs. 4, 6.)

The evidence Petitioner cites from Retterath is not sufficient to show that Retterath teaches using non-overlapping emission regions. Retterath teaches that an emission region from a “typical” beam is the diffuse spot 98 shown in Retterath’s Figure 7—not the small, uniform spot 94. (*Id.*, 9:44-52.) Retterath teaches that an emission region like spot 94 in Figure 7 is only advantageous for “precision LiDAR systems”—not for all applications. (*Id.*, 9:35-36.) Retterath’s “ideal” emitter

regions shown in Figure 18a assume the use of “precision” emitter regions. (*Id.*, Fig. 18a.) If “typical” emitter regions are used instead in Figure 18a, the result is the below modified version of Figure 18a, which shows clear overlap between neighboring emitter regions:

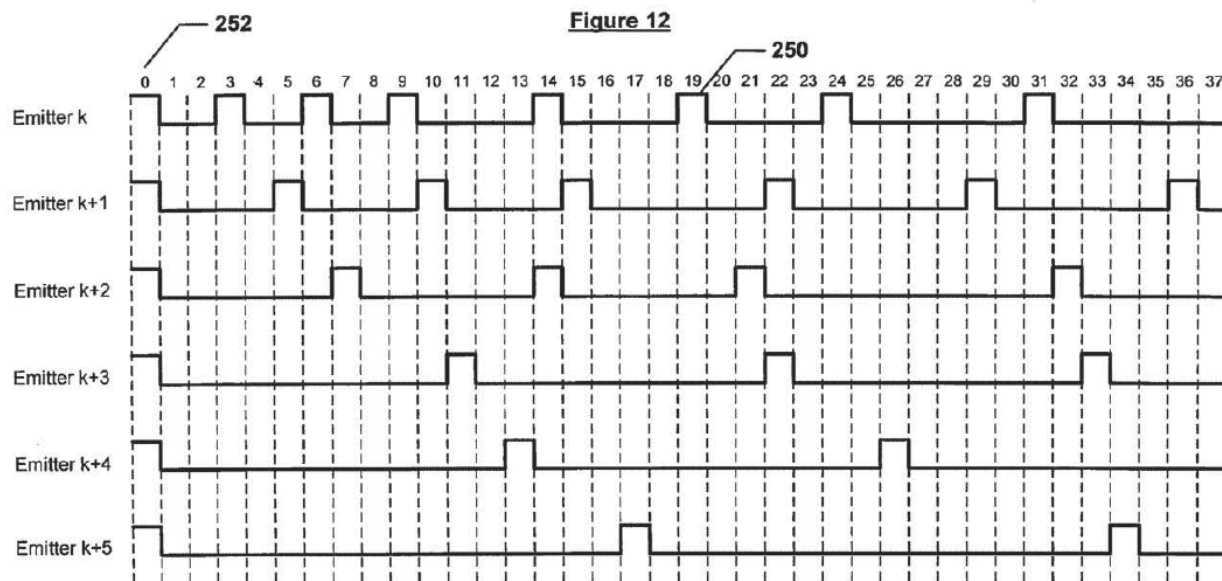


(*Id.*, Fig. 18a (annotated).)

Retterath’s disclosures teach away from the use of its system in a “precision LiDAR” context that might use an “ideal” set of emission regions like those shown in Figure 18a. Rather, Retterath provides extensive disclosures teaching directly away from the need for non-overlapping emission regions. A substantial part of Retterath’s written description—which Petitioner and its expert ignore—is dedicated to disclosing a pulse sequence timing system, whereby each emitter outputs light pulses in a particular timing sequence that its paired detector is

configured to detect. (*Id.*, Fig. 12, 11:35-39; *see also id.*, Figs. 13-16, 11:26-16:56.)

For example, Retterath's Figure 12 shows pulse timing sequences for neighboring emitters, which allow detectors to discriminate between pulses from their paired emitters and other light source, like non-paired emitters:



(*Id.*, Fig. 12; *see also id.*, Figs. 13-16, 11:26-16:56.) Retterath discloses that for neighboring emitters, “emitted energy from one emitter will possibly be received at a detector that is not its pair.” (*Id.*, 11:33-35.) Retterath further discloses that its unique pulse timing sequences between different emitter-detector pairs “dramatically reduce” any interference between neighboring emitter-detector pairs. (*Id.*, 3:10-21.)

Given Retterath's disclosures regarding pulse timing sequences, it is unclear why a POSITA would have considered it important to use the “precision LiDAR system” beam 94 shown in Figure 7 and not the “more typical” beam 98. (*Id.*,

Fig. 7.) Further, it is unclear why a POSITA would have considered it necessary in Retterath's system to ensure non-overlapping emission regions for each of the plurality of emitters. Retterath's unique pulse timing sequences for different emitter-detector channels ensure that a detector detects light from its paired emitter even when there is interference from neighboring channels. Accordingly, instead of using "precision" hardware that might be more costly or have more demanding power requirements, a POSITA would have been motivated based on Retterath's disclosures to use "more typical" hardware that created overlap in the emission regions of neighboring emitters, as shown in the above modified version of Figure 18a of Retterath.

Accordingly, Petitioner fails to show that Retterath satisfies the "non-overlapping emission regions" requirements of limitations 1(b) and 14(b). The Board should decline to institute as to any of Grounds 1A to 1G—all of which rely on Retterath's satisfaction of these claim limitations.

3. Retterath teaches away from flash LIDAR systems like those disclosed by Weimer

An additional reason that Petitioner fails to show a reasonable likelihood of success for Grounds 1D to 1G is the lack of motivation to combine Retterath and Weimer, given that Retterath teaches away from Weimer.

Weimer discloses a "flash LIDAR system." (Ex. 1008, 1:5-8 ("An electronically steered flash LIDAR is disclosed. More particularly, electronically

steered flash LIDAR systems and methods in which illumination within a scene is adaptively controlled are provided.”).) Moreover, Weimer discloses that its system is for use in long range applications. For example, Figure 3A—which Petitioner relies on heavily for Grounds 1B and 1D (*see, e.g.*, Pet. at 35)—indicates that the flash LIDAR system is located on a “[s]pacecraft” and is being used to scan terrain with trees on it. (Ex. 1008, Fig. 3A; *see also id.*, Figs. 1A-1D. 8:48-10:45.)

Retterath teaches away from “flash LiDAR” systems. Retterath indicates that flash LIDAR is “relegated to very close proximity applications due to the low incident laser power for each location in the field of view.” (*Id.*, 1:59-61.) Further, “[f]or flash LiDAR at longer ranges,” Retterath discloses that “the usable field of view is typically too small for applications like autonomous vehicle navigation without the use of high performance cameras operating in the picosecond range for exposure times.” (*Id.*, 1:61-65.)

Petitioner’s generalized asserted motivations to combine are insufficient to overcome the explicit teaching away of Retterath from flash LIDAR systems. Petitioner generally claims that a POSITA would have sought to improve Retterath’s signal-to-noise ratio and reduce interference. (Pet. at 51-52.) But Petitioner fails to indicate that these broad, generic motivations to combine would have been sufficient to overcome Retterath’s clear teaching away from flash LIDAR systems like Weimer’s. In fact, neither Petitioner nor its expert accounts for Retterath’s teaching

away from flash LIDAR systems like Weimer’s at all. (Pet. at 50-52; Ex. 1003, ¶¶ 236-43.)

Since Petitioner fails to provide adequate motivation to combine Retterath and Weimer, review should not be instituted for Grounds 1D to 1G—each of which rely on the Retterath-Weimer combination. *See Chemours Co. FC, LLC v. Daikin Indus., Ltd.*, 4 F.4th 1370, 1376-77 (Fed. Cir. 2021).

C. There is no reasonable likelihood that Petitioner will prevail based on Grounds 2A to 2C

1. Petitioner fails to provide any evidence to support that Imai teaches a “field of view” per Petitioner’s construction for limitations 1(e) and 14(e)

Similar to the deficiencies of Grounds 1A-1G discussed above related to the “field of view” term (*see supra* § V.B.1.), Petitioner and its expert fail to provide any explanation for how Imai satisfies the requirements of Petitioner’s claim construction for “field of view” for Grounds 2A to 2C. While Petitioner’s construction for “field of view” requires an “aperture or lens tube” to define the “detection area” for a pixel, Petitioner fails to point to any apertures or lens tubes defining the field of view for Imai’s detectors. Instead, Petitioner relies exclusively on disclosures in Imai that indicate that light from certain laser diodes is received by certain photodiodes—with no indication of what facilitates this process or whether any apertures or lens tubes are involved. (Pet. at 66-67.)

For example, Petitioner and its expert rely on paragraph [0099] of Imai as

allegedly teaching the requirement of limitations 1(e) and 14(e) that each pixel have a field of view coincident with the emission region of that pixel's paired emitter.

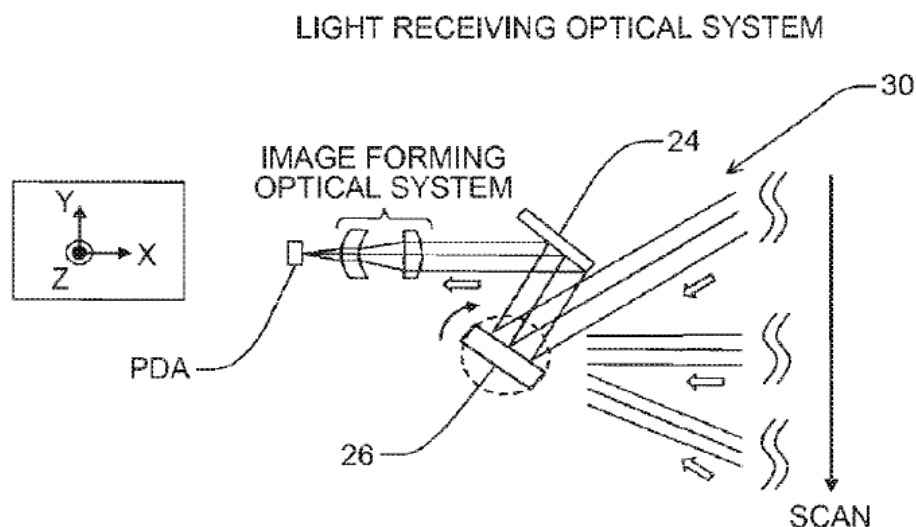
Paragraph [0099] of Imai states:

An irradiation range of the LD1 corresponds to light receivable ranges of the PD1 to PD4, the irradiation range of the LD2 corresponds to the light receivable ranges of the PD5 to PD8, the irradiation range of the LD3 corresponds to the light receivable ranges of the PD9 to PD12, and the irradiation range of the LD4 corresponds to the light receivable ranges of the PD13 to PD16.

(Ex. 1009, [0099].) Nothing in this paragraph indicates how the irradiation range of a given LD “corresponds to” a given PD. No indication is provided as to how any aperture or lens tube is involved. Accordingly, there is no indication of how Imai meets limitation 1(e) or 14(e) with “field of view” as construed by Petitioner—*i.e.*, “detection area defined by an aperture or lens tube.”

To the extent Petitioner argues that its brief reference to a single lens in Imai's image forming system is sufficient to show that Imai satisfies Petitioner's construction of “field of view,” this argument is misplaced. (Pet. at 67; Ex. 1003, ¶ 271.) Petitioner fails to provide *any* explanation for how any lens in Imai's image forming system is a “lens tube” or an “aperture.” And nothing in Imai indicates that anything that could be considered a “lens tube” or “aperture” is present. For example, the following diagram from Imai shows the “image forming optical system”:

(B)



(Ex. 1009, Fig. 2(B).) As the above diagram indicates, no “lens tube” or “aperture” is present in Imai’s system. Without any explanation from Petitioner or its expert as to what constitutes a “lens tube” or “aperture” in Imai’s disclosures, Petitioner has failed to show any reasonable likelihood that limitation 1(e) or 14(e) as construed by Petitioner are satisfied by Imai.

Further, Petitioner’s asserted combinations between Imai and other references do not change anything about the deficiencies in Petitioner’s showing as to limitation 1(e) and 14(e) for Grounds 2A to 2C. Grounds 2B and 2C are only directed at dependent claims—not at independent claims 1 or 14. (Pet. at 76, 80.) And Petitioner only relies on Higashi in the Imai-Higashi combination of Ground 2A in its effort to import a bandpass filter and multiple SPADs per pixel into Imai’s system—which has no impact on the sufficiency of Petitioner’s showing as to the

requirement that each pixel have a field of view (as construed by Petitioner) coincident with an emission region of its paired emitter.

Accordingly, there is a complete failure of proof as to limitations 1(e) and 14(e) for Petitioner's Grounds 2A to 2C. Petitioner has failed to show—or in any way to attempt to show—that its own construction of “field of view” is met by these grounds. The Board should decline to institute review as to Grounds 2A to 2C as a result. *See KioSoft*, CBM2020-00026, Paper 11, 17-18.

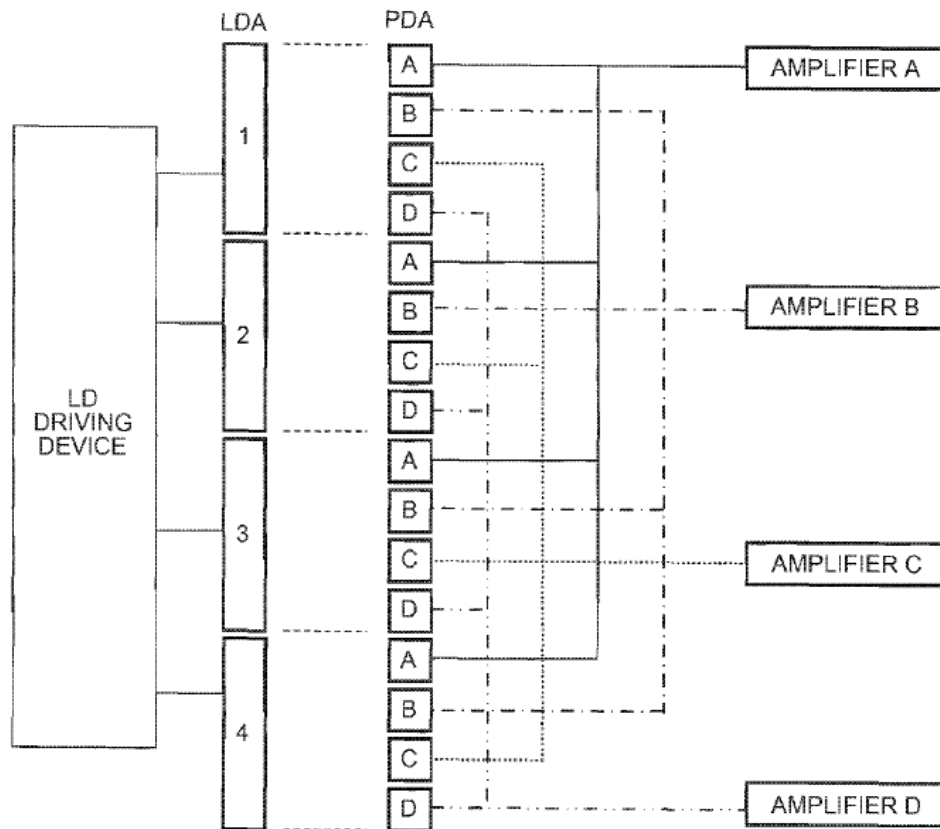
2. Petitioner fails to show that Imai teaches “a plurality of non-overlapping emission regions” for limitations 1(c) and 14(c)

For Grounds 2A to 2C, Petitioner asserts that Imai alone satisfies the requirement of limitations 1(c) and 14(c) that a plurality of optical emitters output light to a “plurality of non-overlapping emission regions.” (Pet. at 64-65.) However, Petitioner fails to point to adequate evidence that Imai discloses the required non-overlapping emission regions. In fact, the disclosures of Imai suggest that the emission regions of the asserted optical emitters of Imai can and do overlap—indicating that Imai fails to satisfy limitations 1(c) or 14(c). Accordingly, the Board should not institute review based on Grounds 2A to 2C.

Petitioner's showing for Imai is focused primarily on the embodiment shown in Figure 10, shown below:

FIG.10

FIRST MODIFICATION

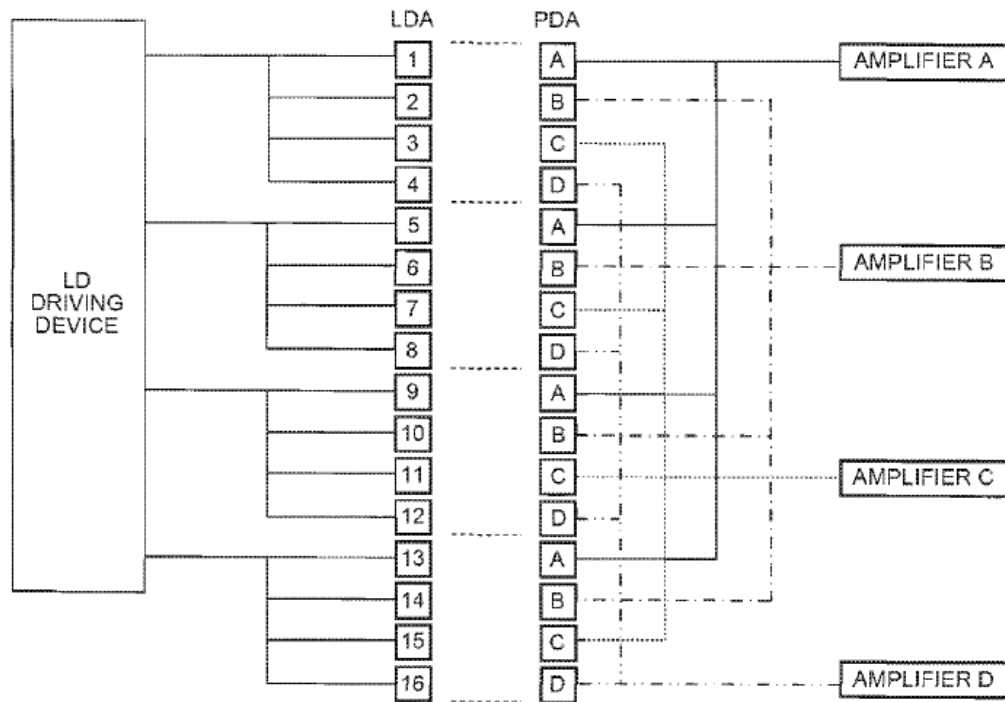


(Ex. 1009, Fig. 10.) This figure shows four LDs in the LDA and 16 PDs in the PDA.

(*Id.*, [0098].) Petitioner relies on Figure 10 in asserting that limitations 1(e) and 14(e) are satisfied by Imai. (Pet. at 66-67.) Petitioner also focuses on Figure 11 of Imai in arguing that limitations 1(e) and 14(e) are obvious in light of Imai and Higashi. (Pet. at 68-70.) Imai's Figure 11 is reproduced below:

FIG.11

SECOND MODIFICATION



(Ex. 1009, Fig. 11.) Figure 11 shows 16 LDs in the LDA and 16 PDs in the PDA. (*Id.*, [0125].)

However, in its showing for limitations 1(c) and 14(c) regarding the “non-overlapping emission regions” limitation, Petitioner points only to evidence related to a *different* embodiment than either of those relied of for limitations 1(e) and 14(e). For limitations 1(c) and 14(c), Petitioner relies on an embodiment with 16 LDs in the LDA and 4 PDs in the PDA. (Pet. at 64-65.) For example, Figures 4 and 5, which Petitioner heavily relies on for limitations 1(c) and 14(c), show 16 LDs and 4 PDs:

FIG.4

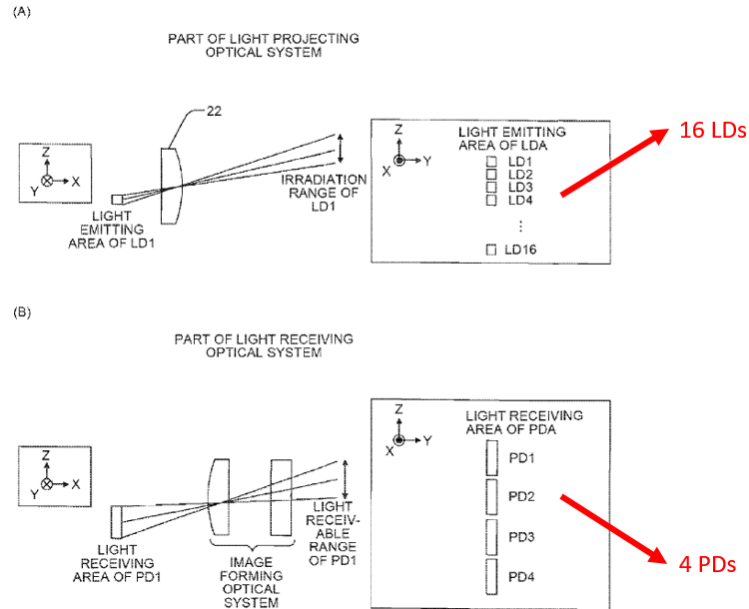
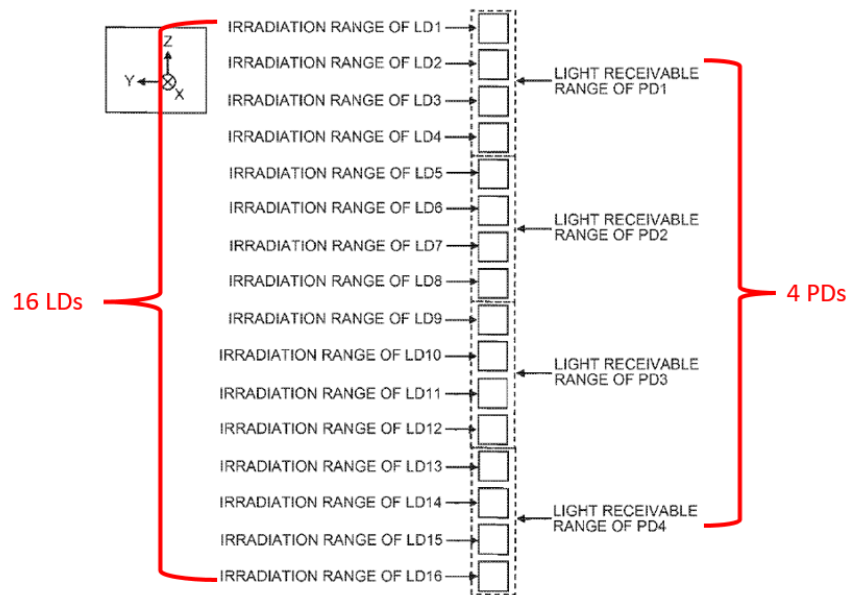


FIG.5



(Ex. 1009, Figs. 4-5 (annotated).)

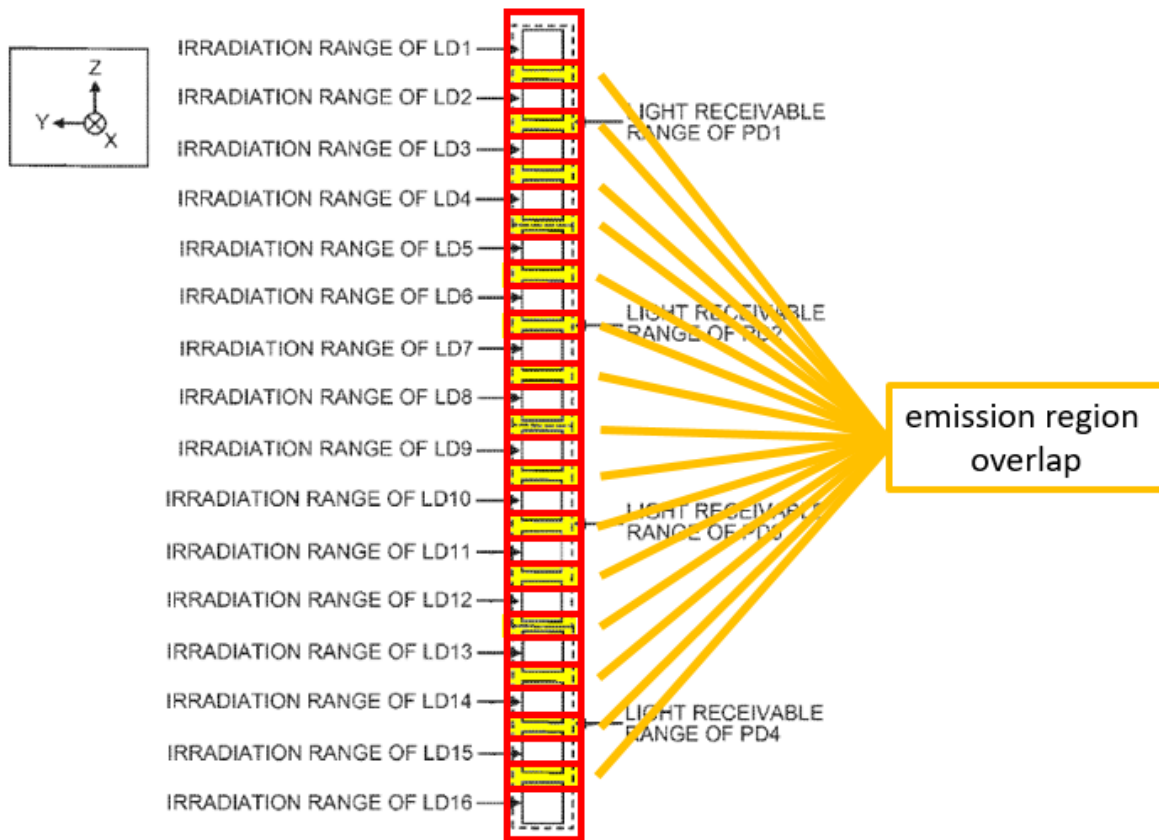
Imai indicates that the emission regions for the embodiment shown in Figures 4 and 5 with *more LDs than PDs* has emission regions that are unrepresentative of

those for other embodiments. Imai discloses that for this embodiment, “[t]he light receivable range of each PD is set to be slightly larger than the corresponding irradiation ranges of the four LDs . . . so that a light quantity in the light receivable range may be increased and the detection accuracy and the detection distance may be improved.” (*Id.*, [0065].)

However, Imai indicates *precisely the opposite* spatial arrangement for the embodiment shown in Figure 10. Imai indicates that for this embodiment “[t]he irradiation range of each **LD** is set to be slightly larger than corresponding light receiving ranges of the four PDs . . . so that a light reception quantity in the light receivable range may be increased and detection accuracy and a detection distance may be improved.” (*Id.*, [0101] (emphasis added).)

Accordingly, Imai indicates that the emission regions shown in Figure 4 and 5—where the emission regions of LDs 1-16 are smaller than the detection ranges for PDs 1-4—is unrepresentative of other embodiments. In other embodiments, the emission regions of the LDs can be *larger* than the detection ranges for the PDs. The way such an embodiment might look is demonstrated in the below annotated version of Imai’s Figure 5, with emission region overlap highlighted in yellow and indicated by orange lines:

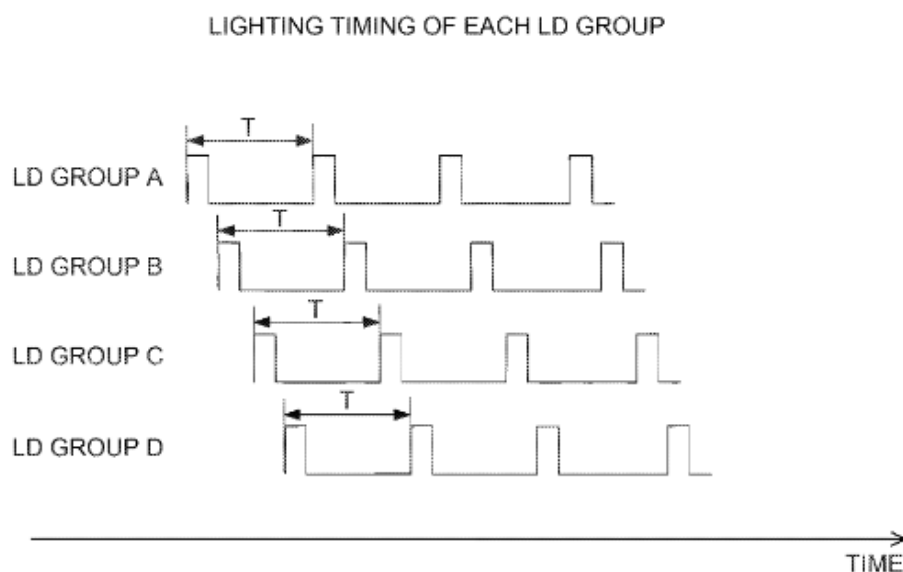
FIG.5



(*Id.*, Fig. 5 (annotated).)

Imai also discusses reasons for why overlap between its emission regions would not be a significant consideration for its system. Imai indicates that the LDs in its system emit light at *different times*. (*Id.*, Fig. 9, [0084], [0093].) For example, Figure 9 of Imai shows a timing diagram for different LDs:

FIG.9



(*Id.*, Fig. 9.) Accordingly, it is unclear—and neither Petitioner nor its expert provide any reason—why a POSITA would implement Imai’s system such that there is no overlap between emission regions.

Petitioner relies on aspects of embodiments of Imai (Figs. 4-5) for limitations 1(c) and 14(c). Further, Petitioner relies on aspects of *other* embodiments of Imai (Figs. 10-11) for limitations 1(e) and 14(e). Since there is evidence that the features of the Figure 4-5 embodiments are not applicable to other embodiments—like the Figure 10-11 embodiments—it is unclear, and Petitioner provides no attempt to clarify, how Imai can satisfy both limitations 1(c)/14(c) and limitations 1(e)/14(e). Accordingly, the Board should decline to institute review as to Grounds 2A to 2C.

VI. CONCLUSION

In light of Petitioner's failure to show a reasonable likelihood of success in showing the unpatentability of any of claims 1-3, 5-8, and 10-17 of the '381 patent, the Board should not institute *inter partes* review as to the challenged claims.

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that Patent Owner's Preliminary Response complies with the type-volume limits of 37 C.F.R. § 42.24(a)(1)(i) because it contains 8,855 words, according to the word-processing system used to prepare Patent Owner's Preliminary Response, excluding the parts of Patent Owner's Preliminary Response that are exempted by 37 C.F.R. § 42.24(a) (including the table of contents, a table of authorities, mandatory notices, a certificate of service or this certificate word count, appendix of exhibits, and claim listings).

DATED: January 3, 2024

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CERTIFICATE OF SERVICE

I hereby certify, pursuant to 37 C.F.R. Sections 42.6 and 42.105, that a complete copy of the attached **PATENT OWNER'S PRELIMINARY RESPONSE**, including all exhibits (**Nos. 2001-2006**) and related documents, are being served via electronic mail on the 3rd day of January 2024, upon Petitioner by serving Petitioner's counsel of record as follows:

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