

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HESAI TECHNOLOGY CO., LTD.,
Petitioner,

v.

OUSTER, INC.,
Patent Owner.

IPR2023-01422
Patent 11,287,515 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 1–2, 4–9, 11–14, 16–17, and 19–25 of U.S. Patent 11,287,515 B2 (Ex. 1001, “the ’515 patent”). Ouster, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 8, “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. 2. Patent Owner identifies itself as the real party in interest. Paper 4, 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).

C. The '515 Patent (Ex. 1001)

The '515 patent is titled “Rotating Compact Light Ranging System Comprising a Stator Driver Circuit Imparting an Electromagnetic Force on a Rotor Assembly.” Ex. 1001, code (54). Figure 1A of the '515 patent is shown below.

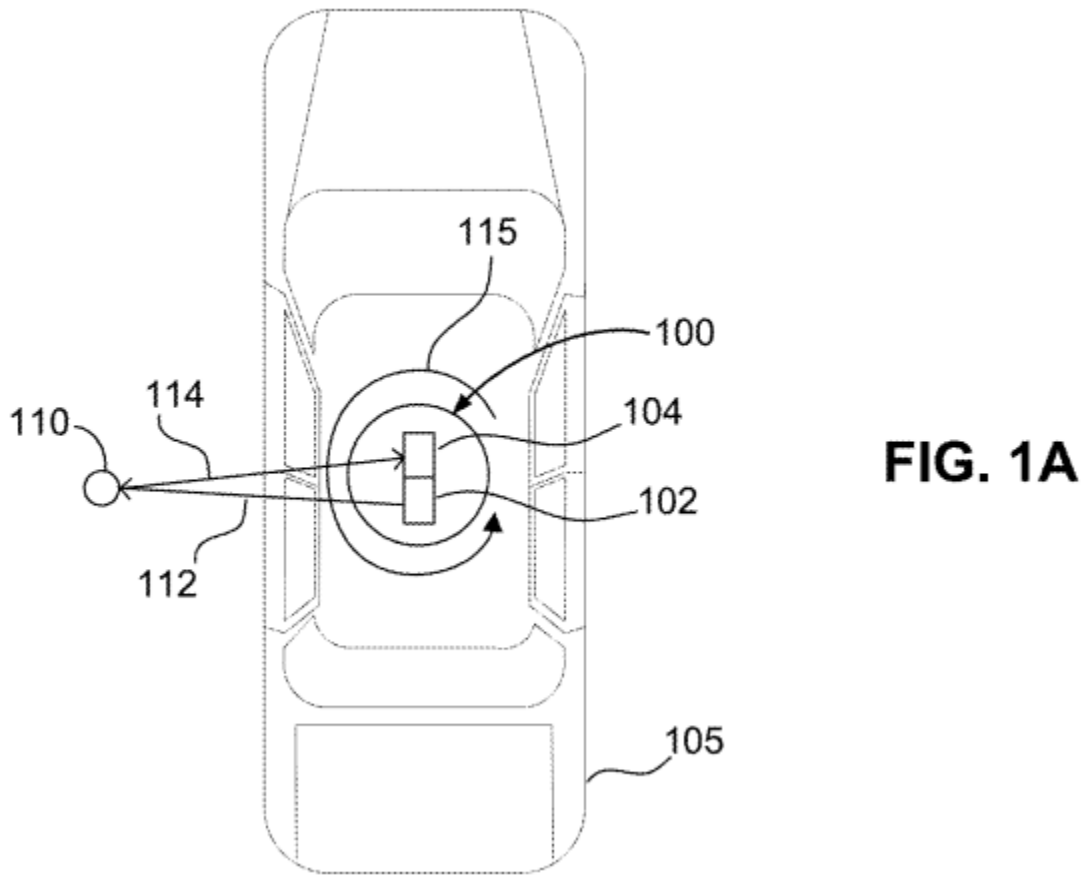


Figure 1A shows a rotating light ranging system, also referred to as a LIDAR¹ system, that can be used in automotive or other applications. *Id.* at 14:1–19. LIDAR system 100 includes a light transmission module 102 for emitting laser pulses 112, and a light sensing module 104 for detecting reflected pulses 114 from an object to determine its distance. *Id.* at

¹ Acronym for “Light Imaging, Detection And Ranging” system. Ex. 1001, 1:31.

14:20–29. The LIDAR system 100 rotates to scan objects in an environment, and produces a three-dimensional (3D) image. *Id.* at 14:1–12.

Figure 2A of the '515 patent is shown below.

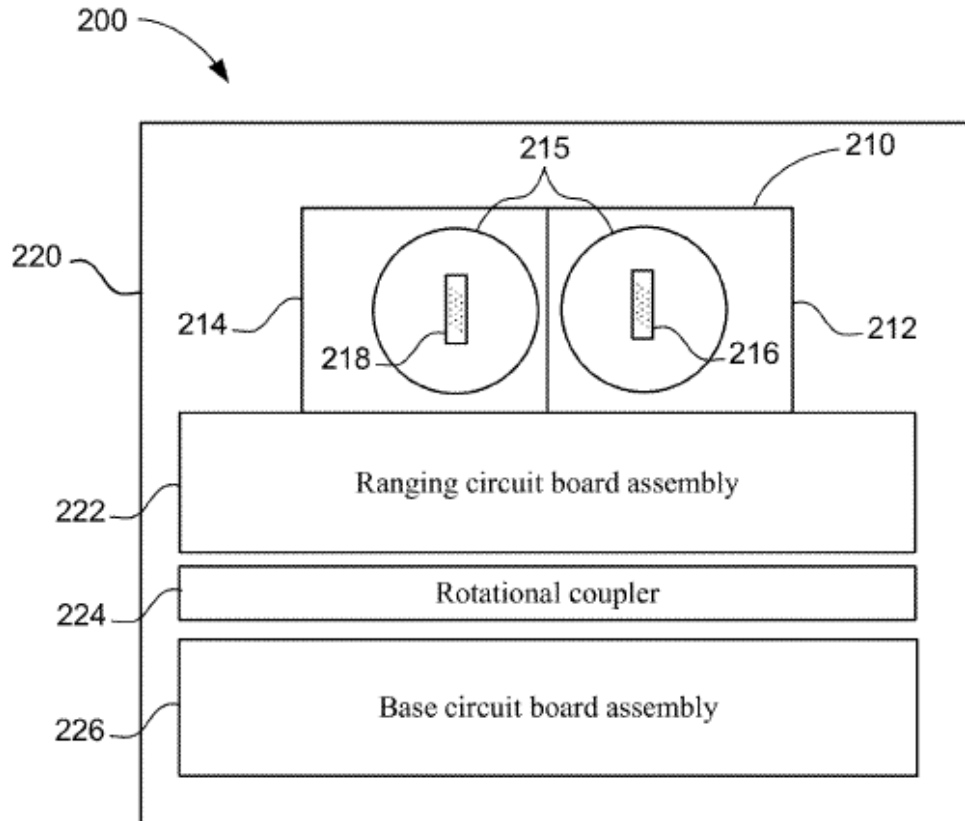


FIG. 2A

Figure 2A shows rotational LIDAR system 200. *Id.* at 15:4–6. Lidar system 200 has a light ranging device 210 that includes a light transmission module 212 and light sensing module 214. *Id.* at 15:7–9. Light ranging device 210 connects to ranging circuit board assembly 222. *Id.* at 15:31–36. Turret circuit board assembly 222 rotationally couples to base circuit board assembly 226 through a rotational coupler 224. *Id.* at 15:61–63.

Figure 6A is shown below.

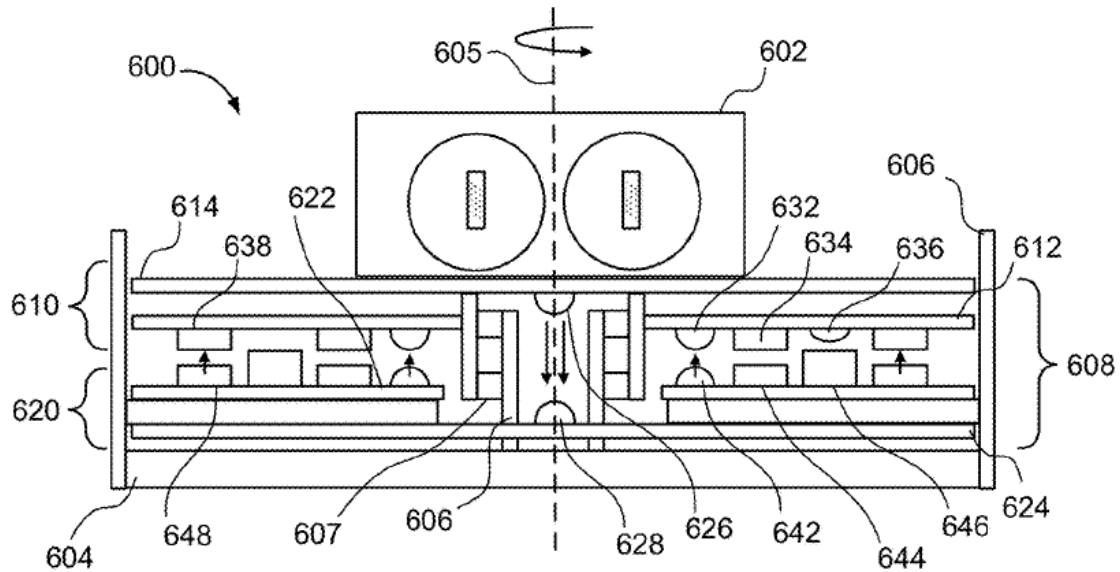


FIG. 6A

Figure 6A shows LIDAR system 600 includes light ranging device 602 and upper and lower circuit board assemblies 610 and 620. *Id.* at 26:19–22.

Upper board assembly 610 rotates with respect to lower board assembly 620 around axis 605 perpendicular to the board assemblies. *Id.* at 26:22–25.

The '515 patent states that the two-piece design of LIDAR system 600 reduces size, increases reliability, and enables the system to be manufactured at reduced cost. *Id.* at 26:28–31.

Light ranging device 602 can be mounted to one of the circuit boards of the upper board assembly 601 enabling the device to rotate with upper board assembly 601. *Id.* at 26:32–34. Lower board assembly 620 can be mounted to base 604 or sidewall 606 of the stationary base of LIDAR system 600. *Id.* at 26:35–37. Rotation of upper circuit board assembly 610 and light ranging device 602 is enabled by bearing system 607 located on hollow shaft 606 centered on rotational axis 605. *Id.* at 26:37–40.

Each of the assemblies 610, 620 can include two or more stacked circuit boards arranged in a parallel relationship. *Id.* at 26:41–43. As shown in Figure 6A, the upper assembly 610 may include rotor communication board 612 and rotor control board 614, and the lower assembly 620 may include stator communication board 622 and stator control board 624. *Id.* at 26:41–47. An electric motor can be integrated on the board assemblies, along with an encoder, a wireless power system, and an optical communication system. *Id.* at 26:47–50. The wireless power system includes wireless power transmitter 648 which can be attached to lower assembly 620, and wireless power receiver 638 which can be attached to upper assembly 610, and each may be composed of a single or multiple coils. *Id.* at 31:20–37.

Figure 6D of the '515 patent is shown below.

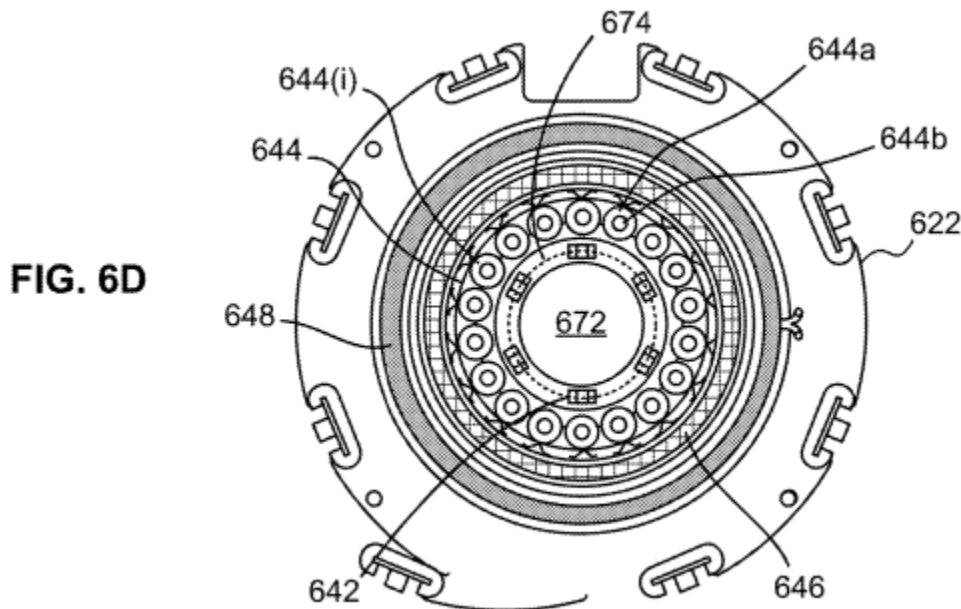


Figure 6D shows a top view of a stator board of the lower circuit board assembly 620. *Id.* at 9:39–40. The stator board includes a stator assembly 644 with an annular arrangement of multiple stator elements 644(i), e.g.,

vertically oriented solenoids, affixed to lower circuit board assembly 620, or to a soft magnetic core that is affixed to the lower assembly. *Id.* at 30:15–22. Each stator element 644(i) can include a solenoid coil 644a wound around a core 644b of magnetic material, e.g., ferrite or the like. *Id.* at 30:24–26. The solenoid coils are oriented so that the magnetic fields produced thereby are perpendicular to the plane of the circuit board. *Id.* at 30:26–29.

Figure 6E of the '515 patent is shown below.

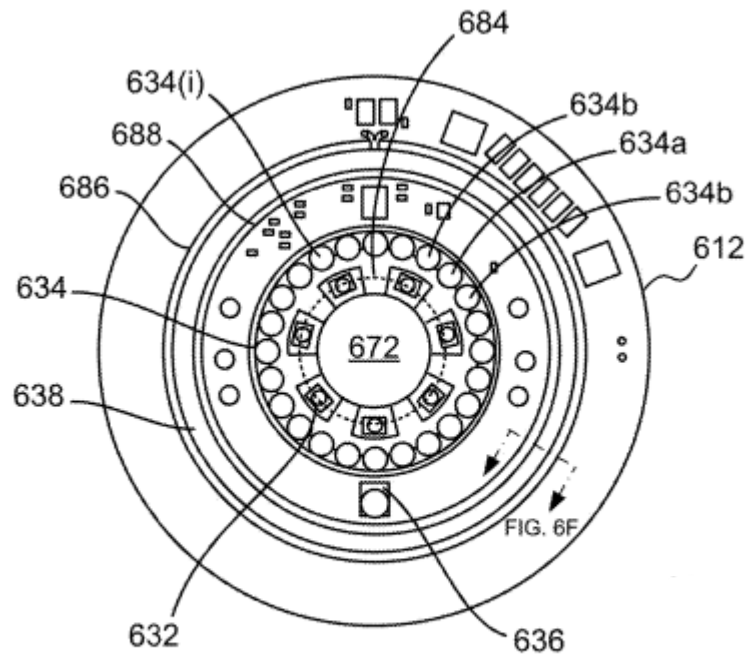


FIG. 6E

Figure 6E is a bottom view of a rotor board of the upper circuit board assembly 610. *Id.* at 9:41–42. A motor rotor assembly 634 is attached to the upper circuit board assembly 610. *Id.* at 30:44–46. Motor rotor assembly 634 includes permanent magnets 634(i) with magnets 634a arranged adjacent to magnets 634b with opposite poles. *Id.* at 30:46–56.

As shown in Figures 6D and 6E, the motor stator assembly 644 and motor rotor assembly 634 form an electric motor with a circular ring shape with both stator and rotor circles having the same radius and center positions centered on the shaft. *Id.* at 30:62–67.

D. Illustrative Claim

Of the challenged claims, claims 1, 14, and 22 of the '515 patent are independent, and the remaining claims depend directly or indirectly from one of these claims. Claim 14 is shown below with Petitioner's identifiers in brackets.

[14(a)] A light ranging system comprising:

[14(b)] an enclosure having a base, a top cover and an optically transparent window disposed between the base and the top cover and extending fully around a periphery of the enclosure;

[14(c)] a shaft disposed within the enclosure and defining an axis of rotation;

[14(d)] a stator circuit board disposed within the enclosure along a first plane perpendicular to the axis of rotation and fixedly coupled to the base of the enclosure;

[14(e)] a support component comprising a sleeve fitted over the shaft and a plurality of arms extending away from the sleeve;

[14(f)] one or more bearings coupled between the shaft and the support component allowing the support component to rotate around the axis of rotation;

[14(g)] a rotor circuit board coupled to rotate with the support component and disposed within the enclosure along a

second plane parallel to the first plane and between the first plane and the top cover;

[14(h)] a stator assembly coupled to the stator circuit board and comprising a plurality of stator elements arranged annularly about the axis of rotation, each of the plurality of stator elements including a coil;

[14(i)] a rotor assembly coupled to the rotor circuit board, the rotor assembly including an annular arrangement in which a plurality of magnetic poles surround the axis of rotation in an alternating pattern such that each magnetic pole has a polarity opposite a polarity of its adjacent magnetic poles; and

[14(j)] a light ranging device coupled to rotate with the rotor circuit board within the enclosure, the light ranging device comprising a transmit module comprising a bulk transmitting optic and an illumination source operable to transmit pulses of electromagnetic radiation through the bulk transmitting optic and through the window to objects in a surrounding environment, and an receive module comprising a bulk receiver optic and detector circuitry operable to detect reflected portions of the electromagnetic radiation pulses received through the window that are reflected from the objects in the surrounding environment; and

[14(k)] a stator driver circuit disposed within the enclosure and configured to provide a drive signal to the plurality of stator elements, thereby imparting an electromagnetic force on rotor assembly to drive a rotation of the rotor circuit board and the light ranging device about the shaft.

Ex. 1001, 50:1–48.

E. Prior Art and Asserted Challenges to Patentability

Petitioner asserts that claims 1–2, 4–9, 11–14, 16–17, and 19–25 are

unpatentable on the following challenges (Pet. 4):

Ground	Claim(s) Challenged	35 U.S.C. § ²	Basis/Reference(s)
1	1–2, 4–9, 11, 14, 16–17, 19	103	Pacala ³ , Johnson ⁴ , Pardhan ⁵ , Zhang ⁶
2	2, 4–6, 17	103	Pacala, Johnson, Pardhan, Zhang, Cai ⁷
3	5–6	103	Pacala, Johnson, Pardhan, Zhang, Cai, Hall ⁸
4	12, 20	103	Pacala, Johnson, Pardhan, Zhang, Spector ⁹

² Because the '515 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).

³ Pacala et al., U.S. Patent Pub. 2014/0211194 A1, published July 31, 2014 (Ex. 1004). Petitioner contends that Pacala is prior art under § 102(a)(1)–(2). Pet. 10.

⁴ Johnson et al., U.S. Patent 10,790,077 B2, issued Sept. 29, 2020 (Ex. 1005). Petitioner contends that Johnson is prior art under § 102(a)(1)–(2). Pet. 11.

⁵ Pardhan et al., U.S. Patent 10, 749,308 B2, issued Aug. 18, 2020 (Ex. 1006). Petitioner contends that Pardhan is prior art under § 102(a)(1)–(2). Pet. 14.

⁶ Zhang et al., International Application WO 2018/201567 A1, published Nov. 8, 2018 (Ex. 1007). Petitioner contends that Zhang is prior art under § 102(a)(1)–(2). Pet. 15.

⁷ Cai et al., China Patent CN 205027903 U, issued Feb. 2, 2016 (Ex. 1008). Petitioner contends that Cai is prior art under § 102(a)(1)–(2). Pet. 56.

⁸ Hall et al., U.S. Patent 11,723,762 B2, issued Aug. 15, 2023 (Ex. 1009). Petitioner contends that Hall is prior art under § 102(a)(2). Pet. 66.

⁹ Spector, U.S. Patent 10, 473,766 B2, issued Nov. 12, 2019 (Ex. 1010). Petitioner contends that Spector is prior art under § 102(a)(2). Pet. 74.

Ground	Claim(s) Challenged	35 U.S.C. § ²	Basis/Reference(s)
5	13, 21	103	Pacala, Johnson, Pardhan, Zhang, Spector, Droz ¹⁰
6	22–24	103	Pacala, Johnson, Pardhan, Zhang, Droz, Cai, Yan ¹¹
7	25	103	Pacala, Johnson, Pardhan, Zhang, Droz, Cai, Yan, Spector
8	1–2, 3–9, 11–14, 16–17, 19–21	103	Pacala-2017 ¹² , Johnson, Pardhan, Zhang
9	22–25	103	Pacala-2017, Johnson, Pardhan, Zhang, Cai, Yan

In support of its proposed challenges, Petitioner relies on the Declaration of Michael Lebby, 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

¹⁰ Droz et al., U.S. Patent 10,605,984 B2, issued Mar. 31, 2020 (Ex. 1011). Petitioner contends that Droz is prior art under § 102(a)(1)–(2). Pet. 78.

¹¹ Yan, U.S. Patent Pub. US 2018/0003823 A1, published Jan. 4, 2018 (Ex. 1012). Petitioner contends that Yan is prior art under § 102(a)(1). Pet. 81.

¹² Pacala et al., U.S. Patent Pub. 2017/0289524 A1, published Oct. 5, 2017 (Ex. 1013). Petitioner contends that Pacala-2017 is prior art under § 102(a)(1)–(2). Pet. 97.

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 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.¹³ *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,

¹³ Neither Petitioner nor Patent Owner have presented any objective evidence of obviousness or nonobviousness in the record.

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. 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 and two to three years of work experience with electro-optical and electro-mechanical devices or systems. Less work experience may be compensated by a higher level of education or vice versa.

Pet. 9 (citing Ex. 1003 ¶¶ 39–41).

Patent Owner adopts Petitioner’s definition of a person of ordinary skill in the art for the limited purpose of its Preliminary Response. Prelim. Resp. 10.

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 ’515 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 and Patent Owner each contend that no claim construction is necessary to resolve the patentability disputes in this case. Pet. 9; Prelim. Resp. 11.

For purposes of this decision, given that no claim terms are in controversy on the current record, we determine that no express claim construction is necessary. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368,

1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Alleged Obviousness Over Pacala, Johnson, Pardhan, and Zhang (Ground 1)

Petitioner contends claims 1–2, 4–9, 11, 14, 16–17, and 19 would have been obvious over the combination of Pacala, Johnson, Pardhan, and Zhang. Pet. 10–56.

1. Pacala (Ex. 1004)

Pacala is titled “Cost-Effective LIDAR Sensor for Multi-Signal Detection, Weak Signal Detection and Signal Disambiguation and Method of Using Same.” Ex. 1004, code (54). Pacala’s Figure 1 is shown below.

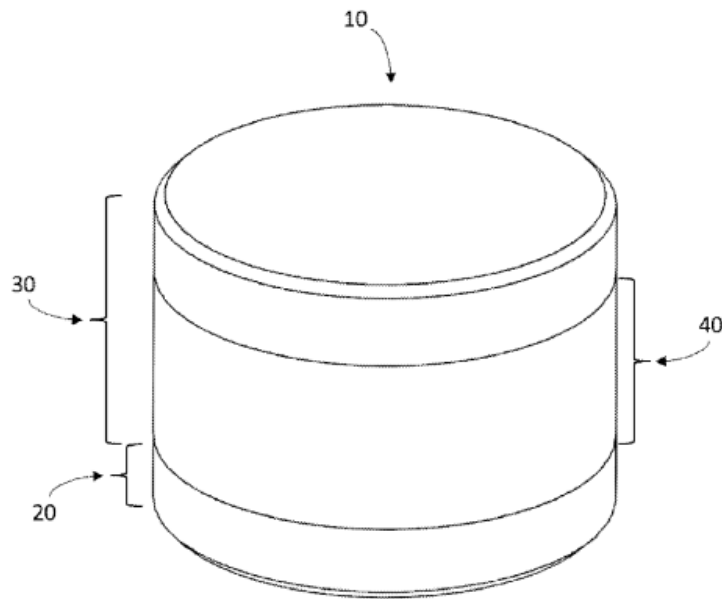


Fig. 1

Figure 1 shows a lidar sensor 10 with static base 20 and static head assembly

30 including window 40 that is transparent to the laser wavelength used in each transmitter. *Id.* ¶ 12.

Pacala's Figure 2 is shown below.

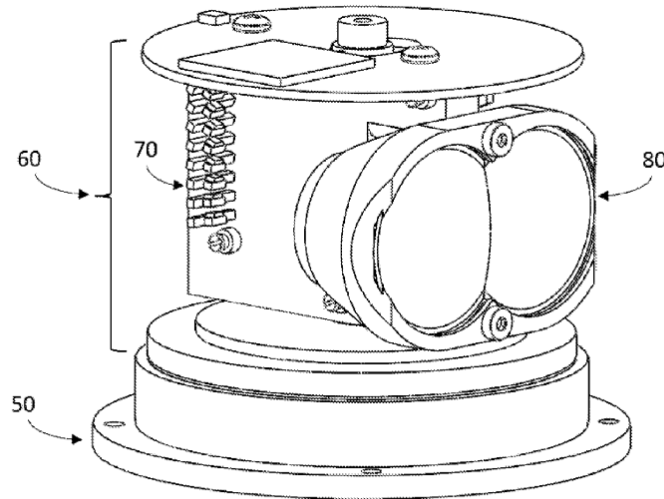


Fig. 2

Figure 2 shows an internal view of the lidar sensor with static base 50 including a motor and distributed electronics, and a spinning turret 60 that contains optoelectronic components 70 including optical transmitters and receivers, collimation and focusing lenses 80, and distributed electronics. *Id.* ¶ 13.

2. *Johnson (Ex. 1005)*

Johnson is titled “Device and Methods for an Electromagnetic Coil.” Ex. 1005, code (54). Johnson discloses a rotary joint device for sensor applications such as LIDAR. *Id.* at 6:51–57, 7:22–27. The rotary joint device rotates a rotor relative to a fixed stator. *Id.* at 6:51–53.

Johnson's Figure 2 is shown below.

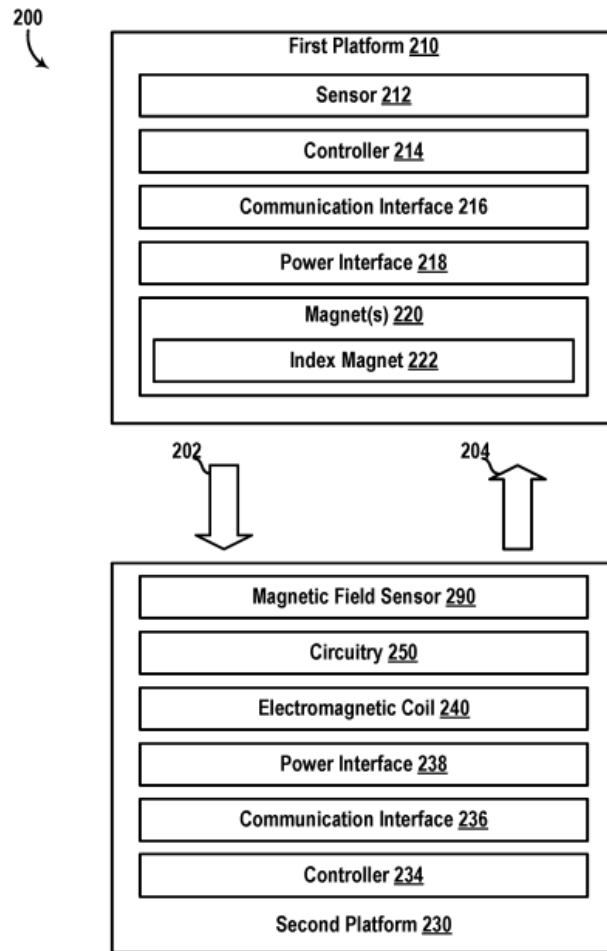


FIG. 2

Figure 2 shows a device 200 with a rotary joint, that includes first platform 210 and second platform 230. *Id.* at 6:60–63. First platform 210 includes a rotor and is configured to rotate relative to second platform 230. *Id.* at 6:64–67. First platform 210 includes sensor 212, controller 214, communication interface 216, power interface 218, and magnets 220. *Id.* at 7:1–5. First platform 210 may include a printed circuit board (PCB) with components mounted thereon. *Id.* at 7:6–15.

Sensor 212 may include a LIDAR sensor. *Id.* at 7:22–27. Controller 214 operates one or more components of first platform 210, and can receive and provide sensor data to communication interface 216. *Id.* at 7:40–46.

Communication interface 216 can be an optical interface that emits modulated light signal 202 for receipt by a light detector of second platform 230. *Id.* at 7:51–55. Power interface 218 may include transformer coils arranged to receive magnetic flux through transformer coils to power components of the first platform 210. *Id.* at 7:64–8:4. The transformer coils of first platform 210 are arranged opposite to corresponding transformer coils of second platform 230. *Id.* at 8:4–7. Magnets 220 can be arranged in a circular arrangement around the axis of rotation of first platform 210, and adjacent magnets may be magnetized in opposite directions. *Id.* at 8:20–30. Magnets 220 can include index magnet 222. *Id.* at 8:49–53.

Second platform 230 includes a controller 234, a communication interface 236, a power interface 238, electromagnetic coil 240, circuitry 250, and magnetic field sensor 290. *Id.* at 8:58–62. Platform 230 may comprise a circuit board that mounts components of device 200. *Id.* at 8:65–67. Controller 234 can operate communication interface 236 to transmit signal 204 indicating transmission of data or instructions to components of first platform 210, or receive a signal therefrom. *Id.* at 9:3–15. Power interface 238 operates in conjunction with power interface 218 to transmit power between platforms 210 and 230, and may comprise a transformer coil to induce current in corresponding transformer coil of power interface 218. *Id.* at 9:19–31. Circuitry 250 causes electrical current to flow through electromagnetic coil 240 to produce a magnetic field that interacts with the magnetic field of first platform 210, resulting in torque that rotates the first platform 210 relative to the second platform 230. *Id.* at 9:35–42. Circuitry 250 may adjust the current to control direction or rate of rotation of first platform 210. *Id.* at 9:45–47. Magnetic field sensor 290 measures the

magnetic field of magnets 220 of first platform 210. *Id.* at 9:48–51. Device 200 can use the output from sensor 290 to determine the orientation or position of platform 210 about its axis of rotation. *Id.* at 10:1–3.

Johnson's Figure 3A is shown below.

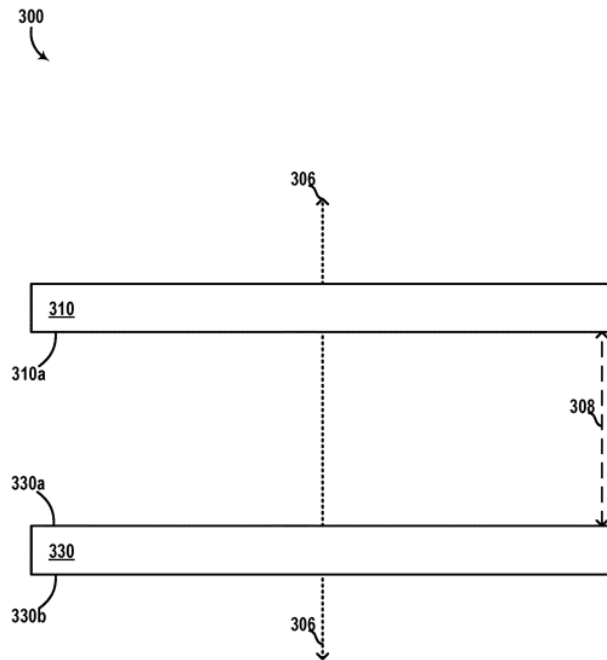


FIG. 3A

Figure 3A shows a side view of device 300 that includes a rotary joint with rotor platform 310 and stator platform 330 that may be similar to platforms 210 and 230. *Id.* at 10:48–52. Sides 310a and 330a of platforms 310 and 330 are spaced by distance 308. *Id.* at 10:52–54. Rotor platform 310 rotates relative to stator platform 330 about axis of rotation 306. *Id.* at 10:55–58.

Johnson's Figure 3B is shown below.

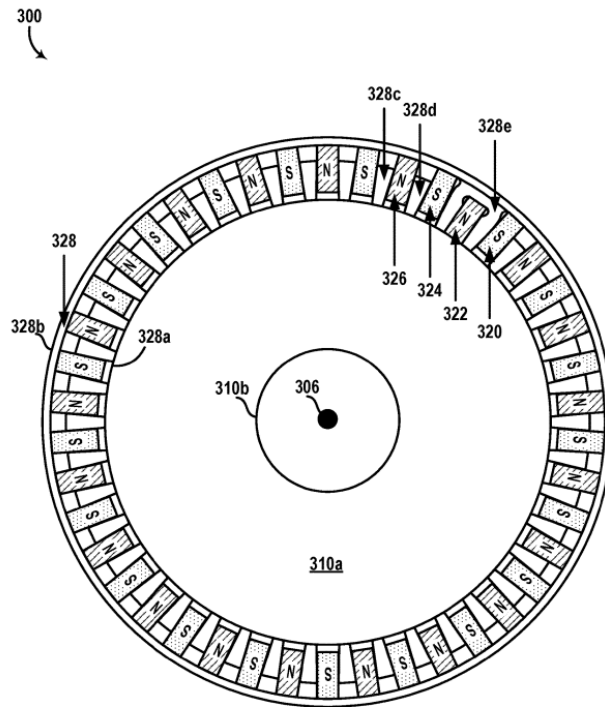


FIG. 3B

Figure 3B shows a cross-section of device 300 with axis of rotation 306 extending through the page. *Id.* at 10:63–64. As shown, device 300 includes a mount 328 on platform 310 to support a plurality of magnets exemplified by magnets 320, 322, 324, 326. *Id.* at 10:64–67, 11:16–21. The magnets are mounted in a circular arrangement, and adjacent magnets are magnetized in opposite directions indicated by “N” and “S” designations. *Id.* at 11:1–5.

Johnson’s Figure 3C is shown below.

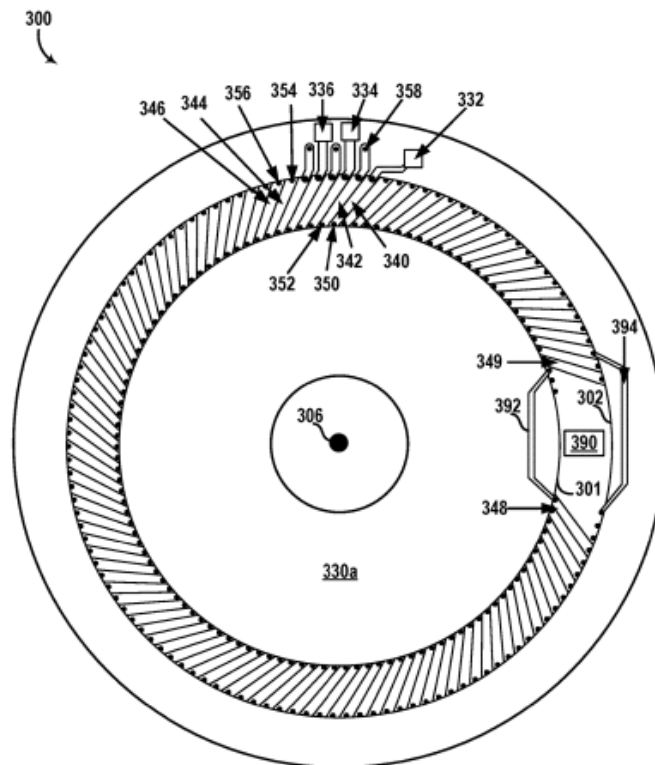


FIG. 3C

Johnson's Figure 3C depicts a cross-section of device 300 showing a side 330a of lower platform 330. *Id.* at 11:66–12:3. In Figure 3C, device 300 includes conductive structures 340, 342, 344, 346, 348, 349, and interconnects 350, 352, 354, 356, 358, among other components. *Id.* at 12:18–25. The interconnects extend through lower platform 330 to connect to corresponding conductive structures on the other side of lower platform 330 (*see* Figure 3D). *Id.* at 13:14–25. Contacts 332, 334, 336 electrically couple the conductive structures to circuitry 350 and may receive a 2- or 3-phase AC signal to control the magnetic field of lower platform 330. *Id.* at 12:28–43.

3. *Pardhan (Ex. 1006)*

Pardhan is titled “Thermal Rotary Link.” Ex. 1006, code (54).
Pardhan’s Figure 4 is shown below.

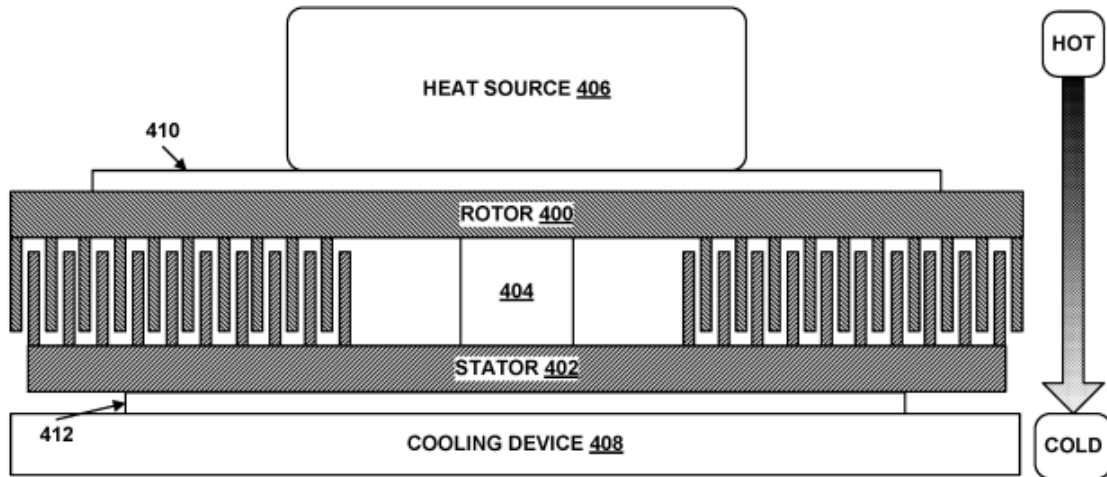


FIG. 4

Figure 4 shows a cross-section of a thermal rotary link for transferring heat from a heat source 406 to a cooling device 408. *Id.* at 16:49–51. The thermal rotary link includes rotor 400 and stator 402 with rotational joint 404 to provide rotation of rotor 400 relative to stator 402. *Id.* at 16:51–54. Heat source 406 (e.g., a LIDAR device) is coupled to rotor 400 by coupling 410, and stator 402 is coupled to cooling device 408 (e.g., cold plate) by coupling 412. *Id.* at 16:65–17:5. Rotor 400 and stator 402 have interposed fins that transfer heat from heat source 406 to cooling device 408. *Id.* at 16:60–64.

Pardhan’s Figure 7A is shown below.

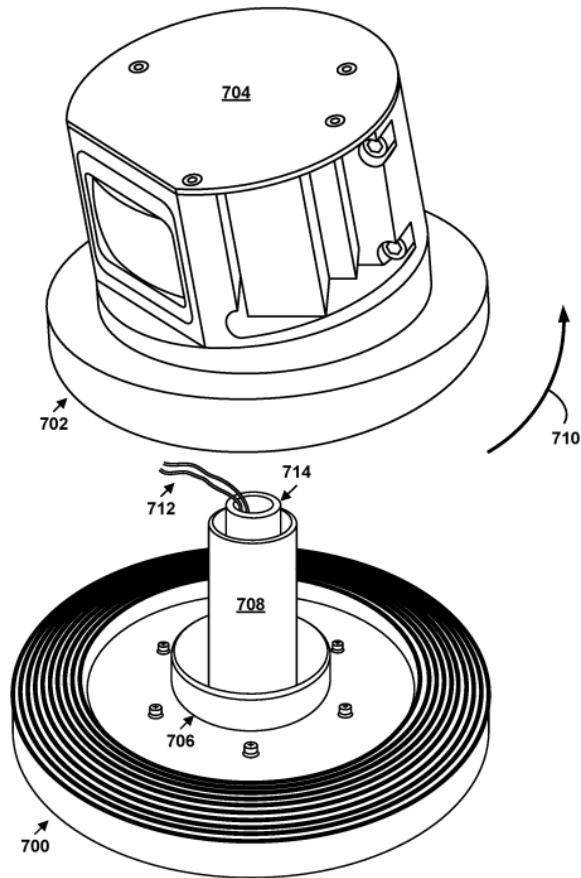


FIG. 7A

Figure 7A shows rods/shafts 708 and 714 extending through stator 700 with wires for power and data connections 712 to connect the LIDAR device to a power source and computing device. *Id.* at 20:30–35. One or more bearings may be used to rotatably mount rod 714 inside rod 708. *Id.* at 20:24–25. A motor may be connected to rod 714 to rotate rod 714 relative to rod 708, and hence LIDAR device 704, relative to stator 700. *Id.* at 20:25–27.

4. *Zhang (Ex. 1007)*

Zhang is titled “Rotating Structure for Laser Radar.” Ex. 1007, 2 (code (54)). Zhang’s Figure 1 is shown below.

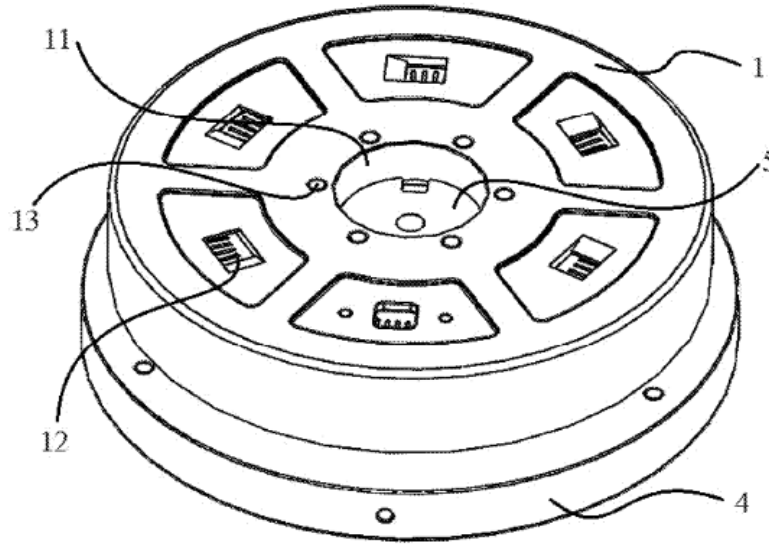


Figure 1

Figure 1 shows rotor 1 connected to stator 4. *Id.* at 4. One or more bearings support the rotation of the rotor 1. *Id.* The rotor 1 is configured with heat dissipation holes 12 with a fan structure to “increas[e] the operating life of the rotating structure.” *Id.* at 6.

5. Analysis of Independent Claim 14

We analyze Petitioner’s and Patent Owner’s contentions concerning claim 14 below using Petitioner’s identifiers to indicate the limitations under discussion.

a) Motivation to Combine

(1) Petitioner’s Contentions

Petitioner contends that Pacala teaches “the overall structure of a rotating LiDAR system, including an enclosure with a 360-degree window that encloses a rotating platform on which a LiDAR sensor is mounted, as well as optoelectronic components detailed in Pacala, such as bulk transmitter and receiver optics, illumination sources, and detector circuitry.”

Pet. 16 (citing § IX.A; Ex. 1003 ¶¶ 135–136). Petitioner asserts that Pacala does not disclose details of its rotating structure, and turns to Johnson and Pardhan for those details. *Id.* at 17 (citing Ex. 1003 ¶¶ 137–140).

Specifically, Petitioner contends that Johnson details the arrangement of rotor and stator elements and electronics, and Pardhan discloses a support component for assembling the rotating structure that comprises a rotor plate, stator plate, and sleeve fitted over a hollow shaft with bearings to support rotation. *Id.* (citing § IX.C).

Petitioner further asserts the combined system would be further improved by implementing Zhang’s teaching of a support component that extends away from the sleeve with heat dissipation holes positioned between each arm. *Id.* (citing § IX.D). Petitioner argues that “the support component is better able to transfer heat away from a LiDAR device and prevent overheating.” *Id.* (citing Ex. 1003 ¶ 142).

Petitioner sets forth several reasons in support of its contention that one of ordinary skill in the art would have combined Pacala, Johnson, Pardhan, and Zhang with a reasonable expectation of success. *Id.* at 51–56.

First, Petitioner contends that Pacala teaches a LIDAR device with spinning turret, but does not disclose details of the rotation structures, and asserts that a person of ordinary skill in the art would have looked to references describing those structures, including Johnson, Pardhan, and Zhang. *Id.* at 51 (citing Ex. 1004 ¶ 13; Ex. 1003 ¶ 249).

Second, Petitioner contends that the Johnson-Pardhan rotor-stator structure within Pacala’s enclosure constitutes use of a well-known technique to improve similar devices in the same way. *Id.* at 51. Petitioner asserts that rotor-stator structures were well known and widely used within

the enclosure of a LIDAR device by the priority date of the '515 patent, and that integration of Johnson-Pardhan's motor and distributed electronics would improve Pacala by providing "a more compact design and/or efficient use of space." *Id.* at 51–52 (citing Ex. 1003 ¶ 250; Ex. 1005; Ex. 1006; Ex. 1009, 4:53-64; quoting Ex. 1045, 4:1–6). Petitioner acknowledges that Johnson does not disclose details of the shaft and support structure coupling the rotor and stator, but argues that it would be a predictable improvement to integrate Pardhan's known structural elements. *Id.* at 52.

Third, Petitioner contends that its proposed combination "would have involved simple substitution of one known element (the rotation structure of Pacala) for another (the rotation structure of Johnson-Pardhan) to obtain predictable results (a LiDAR device configured to rotate on the rotational structure)." *Id.* (citing Ex. 1003 ¶ 251).

Fourth, Petitioner contends that "the prior art includes motivations to further combine the teachings of Pardhan and Zhang regarding a support structure with arms to Johnson." *Id.* at 52. According to Petitioner, a LIDAR device generates excess heat that makes it difficult to operate in a safe range without techniques for transferring excess heat away from the rotating LIDAR device. *Id.* at 52–53 (citing Ex. 1006, 4:54–5:80, 19:2–6). Petitioner also argues that Pardhan and Zhang teach known techniques for addressing thermal issues, and are complementary to Johnson and can be implemented via a support structure on Johnson's rotor. *Id.* at 53. Specifically, Petitioner contends that a person of ordinary skill in the art would have been motivated to incorporate Pardhan's fins of metallic material with high thermal conductivity, and Zhang's heat dissipation holes, into Johnson's rotor-stator structure "to improve heat dissipation and

ventilation and increase operating life.” *Id.* at 53 (citing Ex. 1006, 18:6–19; Ex. 1003 ¶ 252).

Fifth, Petitioner contends that a person of ordinary skill in the art “would have also been motivated to modify Pardhan’s support structure to use a bearing housing with arms.” *Id.* at 53 (citing Ex. 1003 ¶ 253). Petitioner argues that while Pardhan discloses one exemplary type of bearing housing, bearing housings were well known and could be used interchangeably. *Id.* at 53–54 (citing Ex. 1003 ¶¶ 253, 60–62; *Almirall, LLC v. Amneal Pharmaceuticals LLC*, 28 F.4th 265, 272–75 (Fed. Cir. 2022)). Petitioner contends that, when mounting a LIDAR device to a rotor platform, “it is desirable to minimize vibration, and employing a bearing housing with arms furthers this goal by strengthening the attachment of the shaft to the rotor.” *Id.* at 54 (citing Ex. 1031, 329–331). Petitioner contends this is a simple substitution that results in “an improved structure that benefits from additional support provided by the arms.” *Id.* (citing Ex. 1003 ¶ 253).

Sixth, Petitioner contends that a person of ordinary skill in the art “would have been motivated to position the transformer coils outside of the stator and rotor elements.” *Id.* at 54 (citing Ex. 1003 ¶ 254). Petitioner argues that “Johnson discloses its configuration is exemplary and others are possible.” *Id.* (citing Ex. 1005, 7:64–8:15). Petitioner asserts “[t]here are only a small number of possible arrangements for the transformer coils relative to the rotor and stator elements (e.g., inside or outside) each of which yields predictable results.” *Id.* (citing Ex. 1003 ¶ 254). Petitioner further contends that the relative position of the transformer coils is a straightforward design choice, and that the perimeter of the motor magnets

and windings depends on the size of the motor, and a smaller motor has less space in the center of the circuit board. *Id.* (citing Ex. 1003 ¶ 255).

Petitioner further asserts that larger transformer coils may be needed to increase the power transfer distance in some applications, and that the transformer coils may be too large for the limited center region space. *Id.* at 54–55 (citing Ex. 1003 ¶ 255). Petitioner contends that a person of ordinary skill in the art “would thus have understood that the position of the transformer coils relative to the rotor and stator elements is a simple design choice with no novel or unexpected results.” *Id.* at 55.

Seventh, Petitioner argues that a person of ordinary skill in the art would have been motivated to combine Pacala, Johnson, Pardhan, and Zhang as merely the combination of prior art elements according to known methods. *Id.* (citing Ex. 1003 ¶ 256). Petitioner asserts that Pacala’s LIDAR system, Johnson’s rotor-stator components, and Pardhan’s and Zhang’s support structures and shafts could be combined using “known engineering and assembly techniques” and “would have yielded predictable results, with each element continuing to perform the same function as it does separately.” *Id.* Petitioner further contends a person of ordinary skill in the art would have had a reasonable expectation of success because light ranging devices were widely studied before the ’515 patent and “basic electrical engineering designs and principles can be applied to predictably integrate a light ranging device with the stator and rotor platforms and their associated support structure and electronics.” *Id.* at 55–56 (citing Ex. 1003 ¶¶ 257–259; Ex. 1001, 1:30–41, 1:42–48).

(2) *Patent Owner's Contentions*

Patent Owner contends that Petitioner failed to provide adequate motivation to combine Pacala, Johnson, Pardhan, and Zhang for two reasons. Prelim. Resp. 22–31.

First, Patent Owner contends that a person of ordinary skill in the art would not have combined Johnson's compact design with Pardhan's bulky design (due to the rotor and stator fins) as this would negate the perceived benefit of using Johnson's compact design. *Id.* at 23–24, 26–31.

Accordingly, Patent Owner alleges the only reason to combine Pacala, Johnson, and Pardhan is improper hindsight reconstruction of the claimed invention. *Id.* at 30.

Second, Patent Owner argues that “even if Zhang *had* disclosed a plurality of arms extending away from a sleeve by way of its heat dissipation structures, combining Pardhan and Zhang would destroy the basic objective of those heat dissipation structures: cooling the rotor and stator to increase the operating life of those mechanical components.” *Id.* at 24.

(3) *Analysis of Motivation to Combine*

In its first contention, Patent Owner argues that combining Pardhan's fins with Johnson's rotor-stator structure would defeat Johnson's objective of achieving compactness. Prelim. Resp. 23–24, 26–31. However, Petitioner contended that Pardhan's fins would dissipate heat in the combination, thereby increasing the operating life of the LIDAR device. Pet. 53 (citing Ex. 1003 ¶ 252). Patent Owner's argument does not address Petitioner's evidence that the LIDAR device resulting from Petitioner's combination would have increased operating life, even if some compactness is sacrificed. That there are simultaneous advantages and disadvantages in

making the proposed combination does not necessarily negate the motivation to combine. *See Allied Erecting and Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016).

As to its second contention, Patent Owner argues that Zhang's heat dissipation structures release heat generated inside the rotating structure including the rotor and stator while Pardhan transfers heat generated outside of the LIDAR device through the rotor and stator to a cooling device. Prelim. Resp. 35–37 (citing Ex. 1006, Fig. 4; Ex. 1007, 9). Accordingly, Patent Owner argues that the proposed combination would prevent Zhang's heat dissipation structures on the face of the rotor from releasing heat generated inside the rotor and stator and thus destroy the basic objective of Zhang's heat dissipation structures, as well as teach away from the proposed combination with Pardhan. *Id.* at 37 (citing *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068–69 (Fed. Cir. 2016)).

Petitioner's evidence, however, contradicts Patent Owner's assertions. Pet. 17 (citing Ex. 1003 ¶ 142). Specifically, Petitioner's declarant, Dr. Lebby, states that a person of ordinary skill in the art “would have found it particularly obvious to apply Zhang's teaching of a support component with arms and heat dissipation passages to the Pacala-Johnson-Pardhan combination to further improve the heat dissipation properties of the support component.” Ex. 1003 ¶ 142.

Patent Owner's argument assumes that Zhang's heat dissipation structures could not be used simultaneously with Pardhan's fins because the heat flow in these two mechanisms is at least to some extent in opposing directions. Prelim. Resp. 36–37. However, Patent Owner does not provide sufficient evidence to support that Zhang's heat dissipation structures, which

release heat from between the rotor and stator, could not be used simultaneously with Pardhan’s fins, which employ thermal conductivity of metal and air gaps between interposed fins of the rotor and stator to conduct heat away from a LIDAR device, even if the heat flow of those two mechanisms is at least to some extent in opposing directions. Petitioner need not show that the combination is the optimal option, only that it is a suitable one. *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021). Furthermore, Patent Owner’s argument relies heavily on unsubstantiated attorney argument, which does not sufficiently negate 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, 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 Pacala, Johnson, Pardhan, and Zhang.

b) Reasonable Expectation of Success

Patent Owner argues that the Petition fails to explain how a person of ordinary skill in the art would have had a reasonable expectation of success in combining the references. Prelim. Resp. 61–62. Specifically, Patent Owner contends that Pardhan’s and Zhang’s heat transfer mechanisms are incompatible, and that Petitioner’s contentions relying on “basic electrical engineering designs and principles” are conclusory. *Id.* at 62.

For the reasons just explained herein (*see* § III.D.5.a.3), Patent Owner’s attorney argument does not negate sufficiently Petitioner’s evidence that Pardhan’s and Zhang’s heat transfer mechanisms could be used together. *See* Pet. 17 (citing Ex. 1003 ¶ 142; *see also id.* ¶¶ 257–259); *Icon Health*, 849 F.3d at 1043. Specifically, Petitioner contended that a

person of ordinary skill in the art “would have found it particularly obvious to apply Zhang’s teaching of a support component with arms and heat dissipation passages to the Pacala-Johnson-Pardhan combination to further improve the heat dissipation properties of the support component.” Ex. 1003 ¶ 142.

Accordingly, at this stage, Petitioner has shown sufficiently that a person of ordinary skill in the art would have had a reasonable expectation of success in making the combination of Pacala, Johnson, Pardhan, and Zhang.

c) Preamble – Light Ranging System (14(a))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses the light ranging system in the preamble of claim 14 of the ’515 patent. Pet. 18 (citing Ex. 1003 ¶¶ 144–146). Specifically, Petitioner contends that Pacala’s LIDAR device, including its spinning turret with LIDAR sensor, and static base, is a light ranging system. Ex. 1003 ¶ 146.

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.¹⁴

d) Enclosure (14(b))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang

¹⁴ Since we determine that Petitioner adequately shows that claim 14’s preamble is taught by Pacala, we need not and do not 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).

combination discloses an enclosure according to limitation 14(b) of claim 14. Pet. 18–19 (citing Ex. 1003 ¶¶ 147–149; Ex. 1004 ¶ 12, Fig. 1). Petitioner asserts that Pacala teaches an enclosure with base, top cover, and a window disposed between the base and top cover, that is transparent to the wavelength of light used in each transmitter, and extends entirely around the enclosure. *Id.*

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

We determine that Petitioner has adequately shown that the Pacala-Johnson-Pardhan-Zhang combination teaches an enclosure as recited in limitation 14(b).

e) Shaft (14(c))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(c) of claim 14. Pet. 19–21 (citing Ex. 1003 ¶¶ 151–155). Petitioner asserts that Johnson teaches a rotor-stator structure with a rotor platform which rotates about an axis of rotation relative to a stator platform. *Id.* at 19–20 (citing Ex. 1005, 10:48–62, Fig. 3A). Petitioner further argues that Pardhan discloses a rotor-stator structure where the stator plate couples to a hollow shaft extending along the axis of rotation, and the rotor plate fits over the shaft and rotates about the shaft via bearings. *Id.* at 20–21 (citing Ex. 1006, 20:40–63, 21:42–45, Fig. 7B).

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

We determine that Petitioner has adequately shown that the Pacala-Johnson-Pardhan-Zhang combination teaches a shaft as recited in limitation 14(c).

f) Stator Circuit Board (14(d))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(d) of claim 14. Pet. 21–23 (citing Ex. 1003 ¶¶ 157–159). Petitioner asserts that Johnson discloses a stator circuit board disposed along a plane perpendicular to the axis of rotation. *Id.* at 22–23 (citing Ex. 1005, 10:48-62, Fig. 3A). Petitioner further argues that a person of ordinary skill in the art would have understood that Pacala’s static base is a logical place to mount the stator platform and circuit board, as reinforced by Pardhan, which illustrates the stator platform mounted to the enclosure base. *Id.* at 23 (citing Ex. 1003 ¶ 159; Ex. 1006, Figs. 7A–7B).

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

We determine that Petitioner has adequately shown that the Pacala-Johnson-Pardhan-Zhang combination teaches a stator circuit board as recited in limitation 14(d).

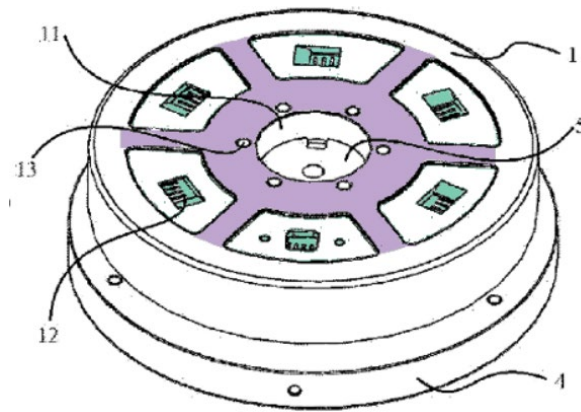
g) Support Component (14(e))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(e) of claim 14. Pet. 24–27 (citing Ex. 1003 ¶¶ 160–166). Specifically, Petitioner asserts that Pardhan discloses a support component that comprises a rotor plate 720 and sleeve 728 fitted over a shaft 734. *Id.* at 24 (citing Ex. 1006, Fig. 7B). Petitioner alleges that the sleeve is a cylindrical tube. *Id.* (citing Ex. 1003 ¶ 161).

Petitioner further contends that Pardhan’s support component includes an upper collar that extends outwardly from the sleeve and rests on the rotor plate 72, but does not include arms. *Id.* at 24–25 (citing Ex. 1006, Fig. 7B). However, Petitioner argues, a person of ordinary skill in the art would have

found it obvious to modify Pardhan to include arms. *Id.* at 25 (citing Ex. 1003 ¶¶ 164–166). Petitioner contends that this modification would strengthen the attachment of the sleeve to the rotor plate, and prevent the LIDAR device from overheating by providing heat dissipation passages between the arms. *Id.* at 25–27 (citing Ex. 1003 ¶¶ 164–165; Ex. 1006, 20:40–63, Fig. 7B; Ex. 1007, 6, Fig. 1).

Zhang’s Figure 1, with Petitioner’s color markings, is reproduced below.



Id. at 27 (citing Ex. 1007, 6, Fig. 1; Ex. 1003 ¶ 165). In Figure 1 above, Petitioner colors Zhang’s alleged arms in purple, and its heat dissipation structures in green. *Id.* at 26–27 (citing Ex. 1003 ¶ 165).

Patent Owner argues that Zhang does not teach or suggest arms extending away from a sleeve. Prelim. Resp. 25. Patent Owner contends that the only support for Petitioner’s contention is its selective coloring of Zhang’s Figure 1 to make it appear as though arms are present when actually the heat dissipation structures are configured by thinning the end face of the rotor. *Id.* at 35 (citing Ex. 1007, 9, Fig. 1).

At this stage, we determine that Petitioner’s evidence outweighs Patent Owner’s attorney argument on this issue. *See Icon Health*, 849 F.3d

at 1043. Petitioner contended that the alleged arms would strengthen the attachment of Pardhan's sleeve to its rotor plate. Pet. 25 (citing Ex. 1003 ¶ 164). From Zhang's Figure 1, the alleged arms appear thicker, and thus stronger, than the areas defining the heat dissipation structures.

Accordingly, Petitioner's and its declarant's contentions have some support on this record which are not sufficiently negated by Patent Owner's attorney argument.

Thus, for purposes of institution, we determine that Petitioner has shown sufficiently that the Pacala-Johnson-Pardhan-Zhang combination teaches a support component as recited in limitation 14(e).

h) Bearing(s) (14(f))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses one or more bearings as recited in limitation 14(f) of claim 14. Pet. 27 (citing Ex. 1003 ¶¶ 167–168). Specifically, Petitioner contends that Pardhan's bearings 730/732 are coupled between the shaft and sleeve of the support component, and allow rotation about the shaft 734 along the axis of rotation. *Id.* (citing Ex. 1006, 20:51–64).

Patent Owner does not dispute Petitioner's contention that the proposed combination discloses limitation 14(f).

We determine that Petitioner has shown sufficiently that the proposed combination discloses limitation 14(f).

i) Rotor Circuit Board (14(g))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses the rotor circuit board recited in limitation 14(g) of claim 14. Pet. 28–31 (citing Ex. 1003 ¶¶ 169–174).

Specifically, Petitioner contends that Johnson discloses a rotor circuit board with rotor platform 310 with a side 310a that is an “outer layer of a circuit board.” *Id.* at 28 (citing Ex. 1005, 10:58–11:65, Fig. 3B). Petitioner asserts that Johnson teaches that its rotor platform 310 is disposed along a plane parallel to its stator platform 330. *Id.* at 28–29 (citing Ex. 1005, 10:47–63, Fig. 3A).

Petitioner argues that Johnson and Pardhan render obvious that the rotor circuit board is coupled to rotate about a shaft. *Id.* at 29 (citing Ex. 1005, 10:47–63, Fig. 3A; Ex. 1003 ¶¶ 172–174).

Petitioner further asserts that “because the LIDAR devices” of Johnson and Pardhan “are mounted atop the rotor platform, the resulting structure will have the plane of the rotor circuit board between the first plane (the stator circuit board) and the top of the enclosure.” *Id.* at 31 (citing Ex. 1005, 7:22–27, Fig. 2; Ex. 1006, 1:41–43, 16:51–64, Fig. 4; Ex. 1003 ¶ 174).

Patent Owner does not offer any arguments at this time against Petitioner’s contention that its proposed combination discloses limitation 14(g).

Petitioner has shown sufficiently that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(g).

j) Stator Assembly (14(h))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(h). Pet. 31–33 (citing Ex. 1003 ¶¶ 175–180).

Specifically, Petitioner contends that Johnson’s stator circuit board is coupled to a stator assembly with stator elements arranged annularly about

the rotation axis. *Id.* at 32. Petitioner asserts that Johnson’s Figures 3C–3D are layers of Johnson’s stator circuit board that include conductive structures 340 in a circular arrangement around the rotational axis 306, contacts 332, interconnects 350, and Hall sensor 390. *Id.* (citing Ex. 1005, 3:40–64, 11:66–12:13, Figs. 3C–3D). Petitioner argues that the stator elements are mounted to the stator circuit board such that they are “coupled to” the circuit board. *Id.* (citing Ex. 1005, 8:62–68, 11:66–12:18, 15:34–42; Ex. 1003 ¶ 182).

Petitioner further contends that Johnson’s conductive structures are coupled to one another to form a plurality of coil windings around the rotational axis. *Id.* (citing Ex. 1004, 4:56–5:8; 13:14–50). According to Petitioner, each stator element includes a coil. Ex. 1003 ¶ 179. Specifically, Petitioner asserts that a first coil winding comprises structure 340, interconnect 350, structure 360, interconnect 354, structure 344, etc., through structure 364, and a second coil winding comprises structure 342, interconnect 352, structure 362, interconnect 356, structure 346, etc., through structure 366. *Id.* at 32–33 (citing Ex. 1005, 13:26–40).

Patent Owner argues that Johnson does not disclose limitation 14(h). Prelim. Resp. 24–25, 31–34. First, Patent Owner argues that “each of the claimed stator elements must include a coil, not merely multiple coil windings,” and “Johnson instead teaches a single coil wound around a single core.” *Id.* at 24–25; *see also id.* at 31–32.

We disagree with Patent Owner’s argument. Johnson discloses that it has multiple coils configured for 2-phase or 3-phase AC signal to control the stator-platform magnetic field. Ex. 1005, 12:37–43, 13:26–57. In other words, Johnson has two or three coils for a 2-phase or 3-phase signal,

respectively. Accordingly, we find no error in Petitioner’s reliance on Johnson’s multiple coils as meeting the “plurality of stator elements” in limitation 14(h).

Second, Patent Owner argues that Johnson states that a single coil includes multiple coil windings, but “the claim language plainly requires *each* stator element includes a *coil*—not merely a coil *winding*.” Prelim. Resp. 33–34 (citing Ex. 1004, 1:21–36). Petitioner has shown, however, that Johnson’s stator has multiple coils each with multiple windings. Pet. 32 (citing 13:14–50). Thus, Patent Owner’s argument does not undermine Petitioner’s contentions.

Third, Patent Owner asserts that Johnson’s coil windings are interleaved with one another and not “arranged annularly about the axis of rotation” (i.e., “evenly spaced apart from each other” in a ring) as allegedly required by limitation 14(h). Prelim. Resp. 33–34 (citing Ex. 1001, 30:29–35). To the extent that Patent Owner argues that the coils of the stator elements cannot be interleaved, we find no such restriction in limitation 14(h). And we do not agree that “arranged annularly about the axis of rotation,” as recited in limitation 14(h), has the same meaning as “evenly spaced apart from each other” in a ring, nor do we find that the cited excerpt of the ’515 patent supports this alleged equivalence. We further note that, in the case of Johnson’s two-coil embodiment, each coil would be evenly spaced apart, even though interleaved, because the distances between adjacent conductive structures and interconnects of the two coils would be the same. Accordingly, Patent Owner’s argument does not undermine Petitioner’s contentions.

For the purpose of institution, Petitioner has shown sufficiently that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(h).

k) Rotor Assembly (14(i))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(i). Pet. 33–34 (citing Ex. 1003 ¶¶ 181–183).

Specifically, Petitioner contends that Johnson shows a rotor assembly with magnets mounted concentrically on the rotor circuit board around the axis of rotation 306, and the magnetic poles (“N” or “S”) of the magnets form an alternating pattern. *Id.* at 33–34 (citing Ex. 1005, 8:26–30, 11:1–15, Fig. 3B). Petitioner contends that Johnson’s magnets are mounted, and therefore are “coupled” according to the claim language, to the rotor circuit board. *Id.* at 34 (citing Ex. 1005, 7:6–21, 11:15–21, 11:64–65; Ex. 1003 ¶¶ 182–183).

Patent Owner does not dispute Petitioner’s contentions concerning limitation 14(i) at this time.

Petitioner has shown sufficiently that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(i).

l) Light Ranging Device (14(j))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(j). Pet. 34–35 (citing Ex. 1003 ¶¶ 184–190).

Specifically, Petitioner contends that Pacala teaches a LIDAR device mounted on a rotation turret 60 within the enclosure, which rotates about a fixed base, and that Johnson and Pardhan teach similar structures. *Id.* at 34 (citing Ex. 1004 ¶¶ 12–13, Figs. 12; Ex. 1005, 11:20–52; Ex. 1006,

10:1–41). Petitioner argues that a person of ordinary skill in the art “would have thus mounted Pacala’s LIDAR device on the top surface, such that it would rotate with the rotor circuit board mounted on the bottom surface.” *Id.* (citing Ex. 1003 ¶ 190).

Petitioner further contends that “Pacala’s LIDAR device includes a transmit module comprising a bulk transmitting optic 80 (i.e., focusing lens) and illumination source (i.e., laser transmitters) to transmit pulses of electromagnetic radiation (i.e., laser) through window 40 to the surrounding environment.” *Id.* (citing Ex. 1004 ¶¶ 4, 12–13, Fig. 2). According to Petitioner, “Pacala’s light ranging device further includes a receive module comprising a bulk receiver optic 80 (i.e., focusing lens) and detector circuitry (i.e., a SPAD array and TDC circuitry) to detect reflected portions of the radiation pulses received through window 40.” *Id.* at 34–35 (citing Ex. 1004 ¶¶ 4, 12–14, Fig. 2).

Patent Owner does not dispute Petitioner’s contentions regarding limitation 14(j) at this time.

Petitioner has shown sufficiently that the Pacala-Johnson-Pardhan-Zhang combination disclose limitation 14(j).

m) Stator Driver Circuit (14(k))

Petitioner contends that the Pacala-Johnson-Pardhan-Zhang combination discloses limitation 14(k). Pet. 35–36 (citing Ex. 1003 ¶¶ 191–194).

Petitioner contends that “Johnson discloses a stator driver circuit configured to provide a drive signal to the stator elements in the stator assembly.” *Id.* at 35. Specifically, Petitioner asserts that Johnson discloses circuitry 150/250 (and controller 234) on the stator platform that provides a

drive signal, i.e., causes an “electrical current to flow through” the plurality of “coil windings.” *Id.* (citing Ex. 1005, 18:6–24, 9:35–47, 6:35–48, Fig. 1–2). Petitioner contends that the drive signal “causes a torque or force” that rotates the rotor circuit board about axis 406. *Id.* at 35–36 (citing Ex. 1005, 13:51–58). Petitioner further argues that the stator platform on which the stator driver circuit is implemented is within the enclosure of Pacala. *Id.* at 36 (citing § IX.E.12).

Patent Owner does not dispute Petitioner’s contentions concerning limitation 14(k).

Petitioner has shown sufficiently that the Pacala-Johnson-Pardhan-Zhang combination disclose limitation 14(k).

n) Conclusion for Independent Claim 14

On this record, Petitioner has shown a reasonable likelihood that one of ordinary skill in the art would have combined Pacala, Johnson, Pardhan, and Zhang with a reasonable expectation of arriving at claim 14, and that each limitation of claim 14 is taught, or at least suggested, by the combination. Accordingly, Petitioner has presented a reasonable likelihood that claim 14 is unpatentable as obvious over the Pacala-Johnson-Pardhan-Zhang 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) (2022); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018). Because we decide that Petitioner’s showing is sufficient for claim 14 on Ground 1, we do not

address the remaining claims and grounds in any detail beyond providing the following comments.

At this time, we agree with Patent Owner’s argument that the recitation of four circuit boards as reflected in claims 4 and 22, for example, is not disclosed by Johnson. *See, e.g.*, Prelim. Resp. 25–26; Pet. 40–43, 90–94. Whether Johnson’s disclosure of a circuit board with components on its upper and lower sides, or the asserted general knowledge of a person of ordinary skill in the art, renders this feature obvious is a determination best made on a full trial record.

We also agree with Patent Owner’s assertion that Johnson does not disclose transformer coils outside the outer perimeters of the rotor and stator elements, as reflected in claim 17. Prelim. Resp. 26. Petitioner concedes Patent Owner’s assertion, but argues that “[p]ositioning transformer coils outside the stator and rotor elements is one of a limited number of obvious design choices.” Pet. 50–51 (citing Ex. 1003 ¶ 247). A determination of this issue is best made on a fully-developed trial record.

We further note that Patent Owner asserts that it has corrected the priority claim of the ’515 patent such that Pacala-2017 is not prior art. Paper 10, 2. Institution of trial will provide the parties with an opportunity to brief this issue, which may be dispositive for Grounds 8 and 9.

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 ’515 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 1–2, 4–9, 11–14, 16–17, and 19–25 of the ’515 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.

IPR2023-01422
Patent 11,287,515 B2

PETITIONER:

Jared W. Newton
James M. Glass
Nima Hefazi
QUINN EMANUEL URQUHART & SULLIVAN, LLP
jarednewton@quinnemanuel.com
jimglass@quinnemanuel.com
nimahefazi@quinnemanuel.com

PATENT OWNER:

Megan Bussey
Nicoletta Kennedy
Matthew Meyer
KILPATRICK TOWNSEND & STOCKTON LLP
mbussey@kilpatricktownsend.com
nkennedy@kilpatricktownsend.com
mmeyer@kilpatricktownsend.com

Phillip Morton
Eamonn Gardner
COOLEY LLP
pmorton@cooley.com
egardner@cooley.com