

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS
AMERICA, INC., FOSSIL GROUP, INC., FOSSIL STORES I, INC., FOSSIL
PARTNERS, L.P., OURA HEALTH OY, AND ONEPLUS TECHNOLOGY
(SHENZHEN) CO., LTD.,

Petitioners,

v.

OMNI MEDSCI, INC.,
Patent Owner.

U.S. Patent No. 11,160,455

Case No. IPR2025-01252

PATENT OWNER'S PRELIMINARY RESPONSE

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<i>Tesla, Inc. v. Intellectual Ventures II LLC</i> , IPR2025-00340, Paper 18 (PTAB Nov. 5, 2025)	12
<i>TQ Delta, LLC v. CISCO Sys., Inc.</i> , 942 F.3d 1352 (Fed. Cir. 2019)	24, 35, 49
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<i>Xerox Corp. v. Bytemark, Inc.</i> , IPR2022-00624, Paper 9 (PTAB Aug. 24, 2022)	24, 34, 49
<i>Zhuhai CosMX Battery Co., Ltd. v. Ningde Ampere Tech. Ltd.</i> , IPR2025-00405, Paper 24 (PTAB Oct. 15, 2025)	14, 57

Other Authorities

37 C.F.R. § 42.65(a).....	24, 35, 49
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LISTING OF EXHIBITS

Exhibit No.	Description
2001	Complaint, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (Dec. 20, 2024)
2002	Samsung, Fossil, and Oura's Invalidation Contentions Cover Document and Charts for the '455 Patent, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (June 3, 2025)
2003	OnePlus's Invalidation Contentions Cover Document and Charts for the '455 Patent, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (Sept. 30, 2025)
2004	Omni MedSci's Infringement Contentions Cover Document, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (Mar. 12, 2025)
2005	Samsung, Fossil, and Oura's Motion to Stay, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (Aug. 27, 2025)
2006	Order Denying Motion to Stay, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (Aug. 29, 2025)
2007	Docket Navigator Statistics for District Judge James Rodney Gilstrap
2008	Lex Machina Statistics for District Judge James Rodney Gilstrap
2009	Model Order Focusing Patent Claims and Prior Art to Reduce Costs (E.D. Tex.)
2010	<i>Samsung Elecs. Co., Ltd. v. Headwater Rsch. LLC</i> , IPR2025-00482, Paper 13 (PTAB May 28, 2025)
2011	Patent Assignment Record for U.S. Patent No. 8,108,036
2012	Reserved
2013	Reserved
2014	Reserved

Exhibit No.	Description
2015	Reserved
2016	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00912, Paper 1 (PTAB Apr. 10, 2019)
2017	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00913, Paper 1 (PTAB Apr. 10, 2019)
2018	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00914, Paper 1 (PTAB Apr. 10, 2019)
2019	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00915, Paper 1 (PTAB Apr. 10, 2019)
2020	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2020-00029, Paper 1 (PTAB Oct. 17, 2019)
2021	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2020-00175, Paper 1 (PTAB Dec. 11, 2019)
2022	Defendant's Invalidity Contentions, <i>Omni MedSci, Inc. vs. Apple Inc.</i> , Case No. 2:18-cv-00134 (E.D. Tex.) (Aug. 28, 2018)
2023	Defendant's Invalidity Contentions - Exhibit A, <i>Omni MedSci, Inc. V. Apple Inc.</i> , Case No. 2:18-cv-134-RWS (E.D. Tex.) (Aug. 28, 2018)
2024	Defendant's Invalidity Contentions - Exhibit N, <i>Omni MedSci, Inc. V. Apple Inc.</i> , Case No. 2:18-cv-134-RWS (E.D. Tex.) (Aug. 28, 2018)
2025	Defendant's Invalidity Contentions - Exhibit P, <i>Omni MedSci, Inc. V. Apple Inc.</i> , Case No. 2:18-cv-134-RWS (E.D. Tex.) (Aug. 28, 2018)
2026	U.S. Patent No. 12,013,725
2027	Information Disclosure Statement for U.S. Patent No. 12,013,725 (Mar. 5, 2024)
2028	Reserved
2029	File History of U.S. Patent App. No. 16/669,794, issued as U.S. Patent No. 10,874,304

Exhibit No.	Description
2030	Reserved
2031	Declaration of Prof. Igor Efimov, Ph.D
2032	<i>Curriculum vitae</i> of Prof. Igor Efimov, Ph.D
2033	Omni MedSci Inc.'s P.R. 4-2 Disclosure of Preliminary Claim Constructions and Extrinsic Evidence
2034	Samsung Electronics, Co. Ltd., Samsung Electronics America, Inc., Fossil Group, Inc., Fossil Stores I, Inc., and Fossil Partners, L.P., and Oura Health Oy's P.R. 4-2 Disclosure of Preliminary Claim Constructions and Extrinsic Evidence
2035	König, V., et al., "Reflectance Pulse Oximetry – Principles and Obstetric Application in the Zurich System," Journal of Clinical Monitoring, Vol. 14, pp. 403-412 (1998)
2036	"Thermal Management of White LEDs," U.S. DOE Building Technologies Program (Feb. 2007)

Omni MedSci, Inc. ("Patent Owner") submits this Preliminary Response under 37 C.F.R. § 42.107 to the Petition for *Inter Partes* Review ("Petition") of U.S. Patent No. 11,160,455 ("the '455 Patent"), filed by Samsung Electronics Co. Ltd., Samsung Electronics America Inc., Fossil Group, Inc., Fossil Stores I, Inc., Fossil Partners, L.P., Oura Health Oy, and OnePlus Technology (Shenzhen) Co., Ltd. ("Petitioners").

I. INTRODUCTION

Patent Owner respectfully requests that the Director deny institution because Petitioners have not shown that any challenged claim of the '455 Patent is unpatentable in relation to any ground raised in the Petition.

Petitioners fail to show that the "driver" limitation in all independent claims is disclosed or rendered obvious by Lisogurski as alleged. In Petitioners' analysis of this limitation, they assert a modification (i.e., relocating drive circuitry 120 into *light source 130*) and allege support by simply cross-referencing Petition §IX.B.2 ("Motivation to Modify Lisogurski"). But fatally, Petition §IX.B.2 asserts a ***different*** modification (i.e., relocating drive circuitry 120 into *sensor 102*). Indeed, Petition §IX.B.2 relies on a prior Board decision (i.e., '533-FWD) that accepted this different modification. Thus, Petitioners' proposed modification for the "driver" limitation in the independent claims is not supported by both Petitioners' own alleged modification of Lisogurski in Petition §IX.B.2 and the Board's prior finding in the

'533-FWD.

Petitioners also fail to show obviousness of the “arc” and “reflective surface” limitations included in multiple claims, including one independent claim, as Petitioners fail to establish specifically why or how a person of skill would have implemented the particular relied-upon teachings of LeBoeuf in Lisogurski for these limitations. And in fact, a person of skill would not have been motivated to make the alleged combinations.

Additionally, as demonstrated by the breakdown herein of Petitioners' complicated web of grounds and arguments, the Petition presents an unfocused approach and should be denied as a matter of policy. For example, Petitioners challenge independent claim 15 in Ground 3, but claim 15 cannot be unpatentable under Ground 3 because the Petition's only analysis for limitation [15.n] relies on LeBoeuf, which is not asserted in Ground 3.

II. OVERVIEW OF THE '455 PATENT

The '455 Patent discloses systems for measuring physiological parameters and use with a smartphone or tablet. EX1001, Abstract, 8:29-31; EX2031, ¶54. For such systems, the '455 Patent discloses a wearable device that includes a light source comprising a driver and a plurality of semiconductor sources that generate an output light that is delivered to tissue. EX1001, Abstract, 8:29-36. The '455 Patent also discloses that the wearable device includes a detection system comprising a plurality

of detectors, and the detection system receives at least a portion of reflected light and generates an output signal. EX1001, Abstract, 8:39-47; EX2031, ¶54.

An exemplary physiological measurement system is depicted in Figure 24:

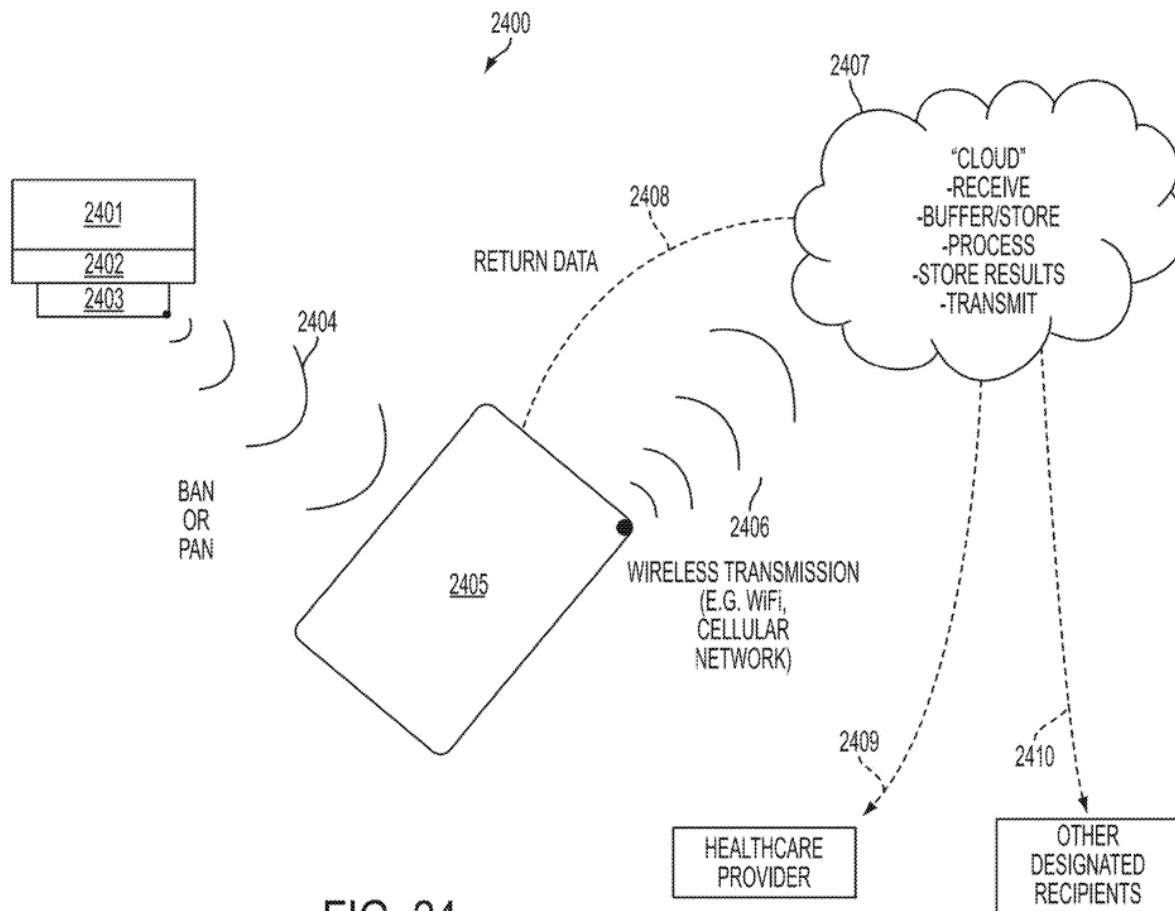


FIG. 24

EX1001, FIG. 24, 12:1-6; EX2031, ¶55. The system includes a measurement device 2401, a personal device 2405 such as a smartphone or tablet, and a cloud server 2407. EX1001, 36:18-56; ; EX2031, ¶55.

The '455 Patent discloses that the plurality of semiconductor sources and the plurality of detectors in the wearable device may be located on one or more arcs.

EX1001, Abstract, 9:47-50; ; EX2031, ¶56. The '455 Patent also discloses that the wearable device may include a reflective surface to receive and redirect at least some of the output optical light from the plurality of semiconductor sources. EX1001, 87:51-54, 88:64-67, 90:23-26; EX2031, ¶56. The wearable device may improve a signal-to-noise ratio via various techniques disclosed in the '455 Patent, resulting in improved accuracy of physiological measurements despite interference from spectral artifacts. EX1001, 59:4-25, 2:66-3:40; EX2031, ¶57.

III. LEVEL OF SKILL IN THE ART

Petitioners propose the following definition for a person of ordinary skill in the art ("POSITA") in relation to the '455 Patent:

on or before the claimed priority date of 12/31/2012, a POSITA would have had a good working knowledge of optical sensing techniques and their applications, and familiarity with optical design and signal processing techniques. A POSITA would have obtained such knowledge through an undergraduate education in engineering (electrical, mechanical, biomedical, or optical) or a related field of study, along with relevant experience studying or developing physiological monitoring devices...in industry or academia.

Pet., 15 (cleaned up and citations omitted). For purposes of this Preliminary Response, Patent Owner adopts Petitioners' proposed definition. EX2031, ¶¶50-53.

IV. SUMMARY OF REFERENCES IN THE PETITION

Petitioners challenge claims 1-20 of the '455 Patent as allegedly obvious in Grounds 1-8, which involve various combinations of the following references: Lisogurski, LeBoeuf, Tran, and Carlson. Pet., 7-8.

A. Lisogurski (EX1025) (Grounds 1-8)

Lisogurski describes a non-invasive system for measuring parameters related to a subject's blood. EX1025, 3:61-4:5; EX2031, ¶80. The system is illustrated in Figures 3 and 1:

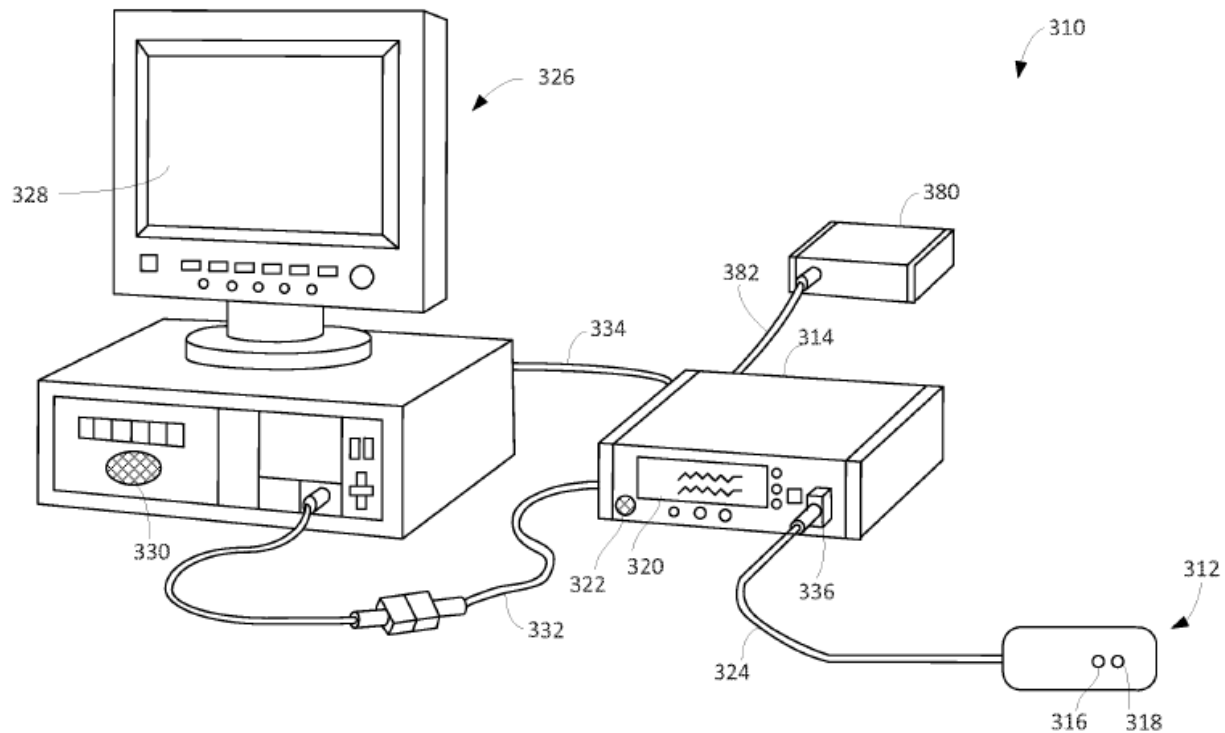


FIG. 3

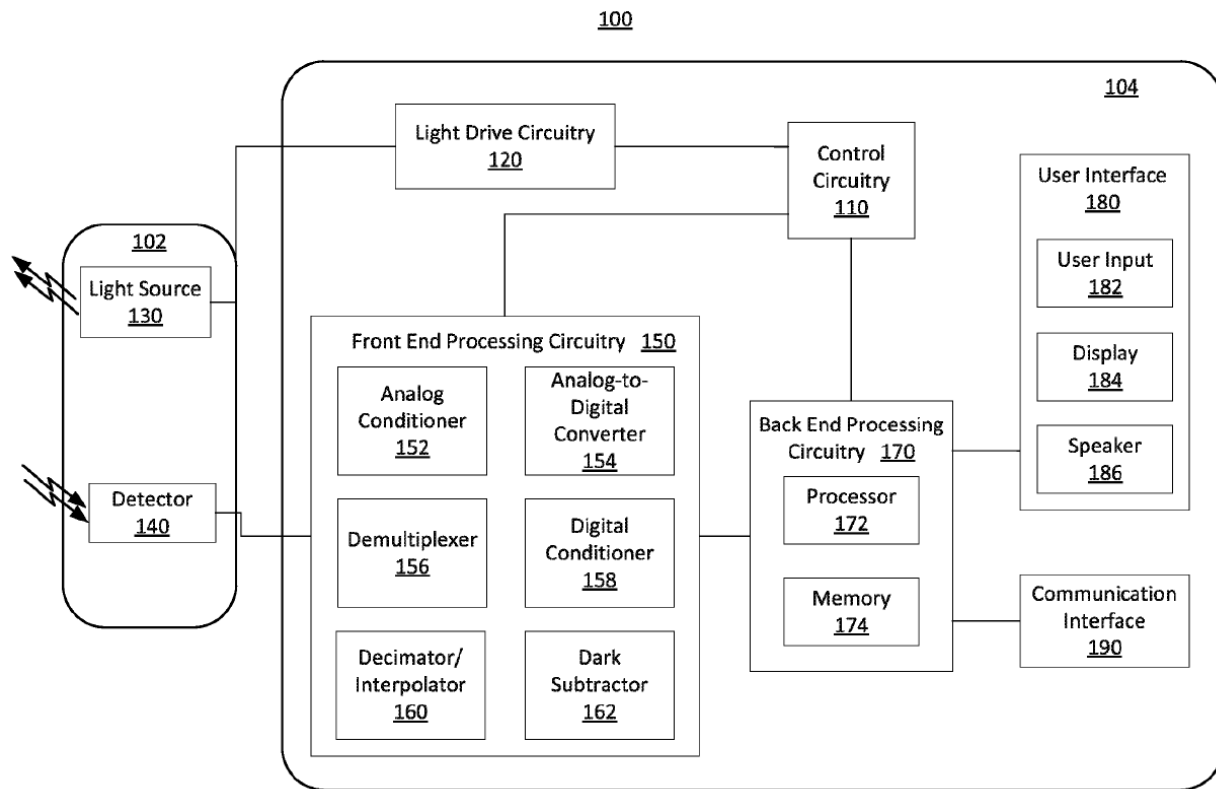


FIG. 1

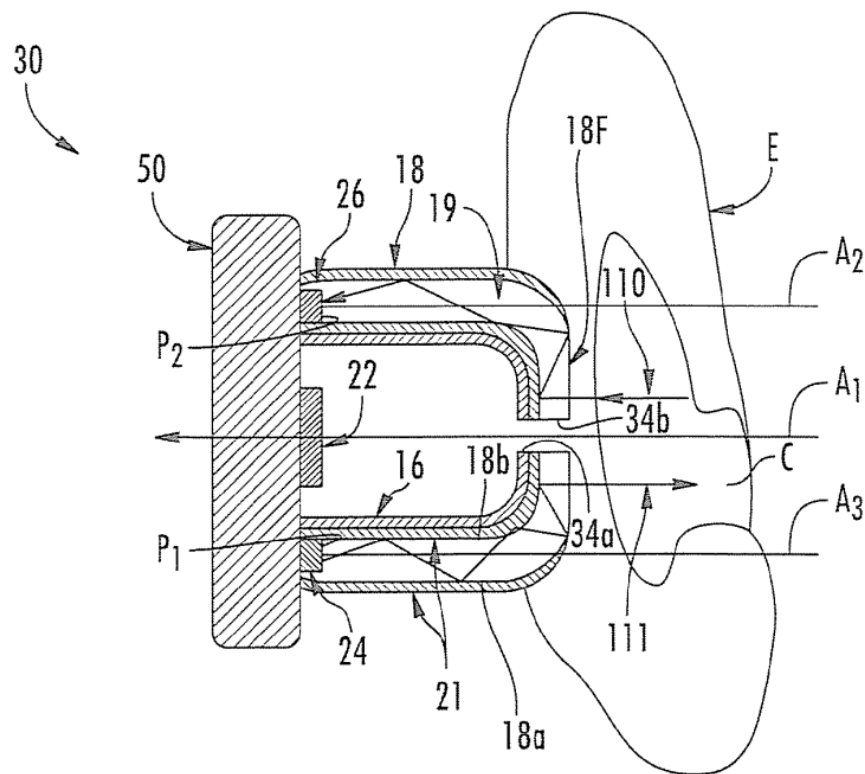
EX1025, FIGS. 3, 1; EX2031, ¶80. A subject wears sensor unit 312, while the other components in the system are included for system calibration, data processing, and displaying information. EX1025, 17:54-18:15, 18:32-67; EX2031, ¶80. The sensor unit 312 includes light emitting diodes for directing light of different wavelengths to the subject's tissue and a detector that detects the light reflected from the tissue and converts it into an electrical signal. EX1025, 4:42-62, 10:48-64; EX2031, ¶80.

Front end processing circuitry 150 processes that signal. EX1025, 12:42-49; EX2031, ¶80. Then, “[p]rocessor 172 may receive and process physiological signals received from front end processing circuitry 150. For example, processor 172 may

determine one or more physiological parameters based on the received physiological signals.” EX1025, 14:60-64; EX2031, ¶80. The system compares the signals to determine parameters such as blood oxygen saturation. EX1025, 24:58-25:5; EX2031, ¶80.

B. LeBoeuf (EX1026) (Grounds 2, 4, 6, 8)

LeBoeuf describes monitoring devices, particularly light-guiding earbuds for positioning within an ear. EX1026, Abstract, ¶¶[0002], [0006], [0009], [0084]; EX2031, ¶81. Figure 3 shows one exemplary light-guiding earbud in Carlson:



EX1026, FIG. 3, ¶[0042]; EX2031, ¶81.

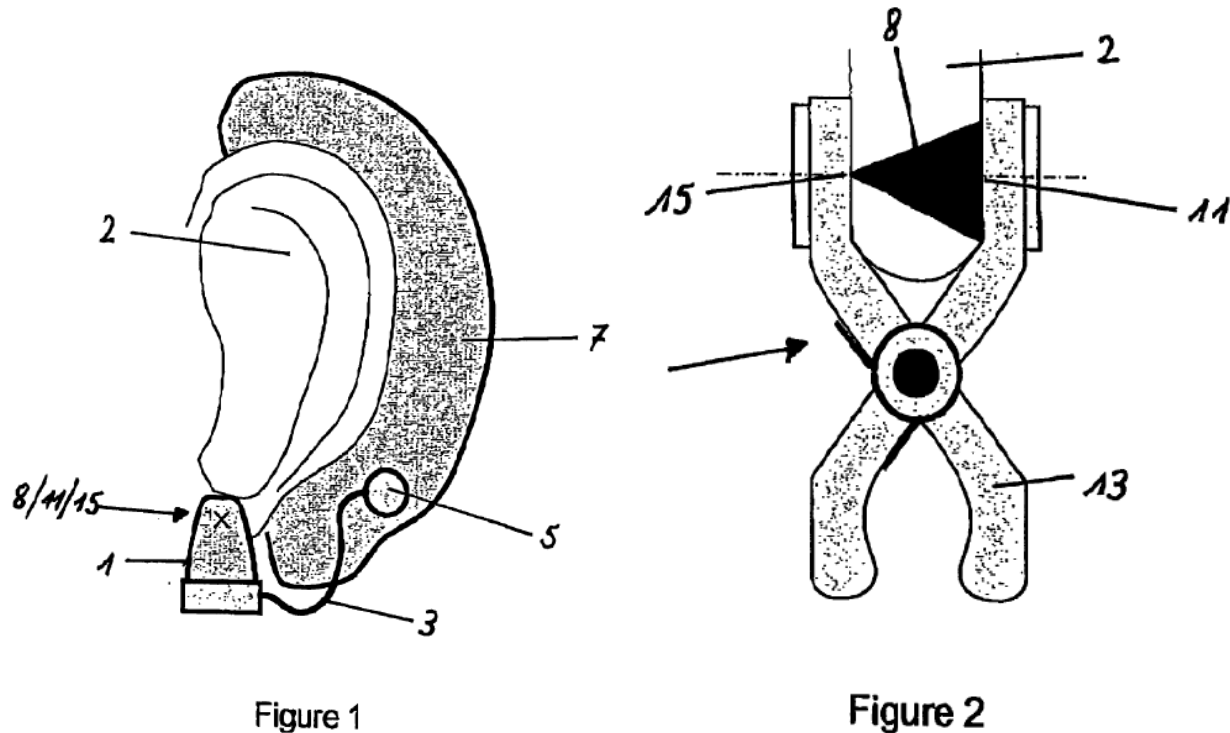
The light-guiding earbuds include a speaker, such as speaker 22 shown in Figure 3, an earbud housing 16 in acoustical communication with the speaker 22, and apertures 34*a*-34*b* through which sound from the speaker 22 can pass. EX1026, ¶¶[0006], [0009], [0102], FIG. 3; EX2031, ¶81. The light-guiding earbuds also include a light-guiding cover to deliver light from an optical emitter into the ear canal and to collect and deliver light from outside the earbud to an optical detector, such as shown by cover 18, optical emitter 24, and optical detector 26 depicted in Figure 3 above. EX1026, Abstract, ¶¶[0006], [0106], FIG. 3; EX2031, ¶81. The light directed into the ear from a light emitter and the subsequent collection of light at a detector may be used for detecting or measuring, for example, body or skin temperature, blood gas levels, heart rate, blood flow, etc. EX1026, ¶[0010]; EX2031, ¶81.

C. Tran (EX1027) (Grounds 3-4, 7-8)

Tran describes a patient heart monitoring system with wireless nodes forming a wireless mesh network. EX1027, Abstract, 3:3-13, 8:29-33; EX2031, ¶82. Tran's system also includes a wearable appliance adapted to communicate with the wireless nodes and a statistical analyzer to determine a heart attack or stroke attack. EX1027, Abstract, 3:3-13; EX2031, ¶82. The wearable appliance may include sensors and may non-invasively measure, for example, blood pressure. EX1027, 4:62-65, 9:23-30; EX2031, ¶82.

D. Carlson (EX1028) (Grounds 5-8)

Carlson describes a non-invasive optical pulse oximeter. EX1028, ¶[0002]; EX2031, ¶83. The oximeter is designed to be clipped onto a user's ear. EX1028, ¶¶[0048]-[0049]; EX2031, ¶83. This is illustrated in Figures 1 and 2:



EX1028, FIGS. 1-2; EX2031, ¶83.

The oximeter relies on various techniques, including beam shaping optical elements, for improving the signal-to-noise ratio and signal-to-background ratio of the signal generated by its photo detecting element when it detects light that has been reflected from bodily tissue. EX1028, ¶¶[0010], [0013]-[0014], [0062]; EX2031, ¶83. Carlson also relies on “optical wavelength filters” which filter the light detected by the photo detecting element to a particular range of wavelengths before it is

detected by the photo detecting element. EX1028, ¶¶[0026], [0062]; EX2031, ¶83.

V. CLAIM CONSTRUCTION

Petitioners note that certain terms in related patents that are “identical to or substantially similar to” language in the challenged claims of the ’455 Patent were construed in prior Board or district court proceedings but otherwise contend that the remaining terms or phrases in the challenged claims of the ’455 Patent do not require construction and can be afforded their plain and ordinary meanings. Pet., 15-18. Petitioners also state that they do not believe that the terms from the prior Board or district court proceedings need to be construed here. *Id.*

Patent Owner agrees that claim construction is not necessary at this time for the Board to find that Petitioners did not meet their burden for institution. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Patent Owner reserves the right to seek constructions in litigation or if institution is granted, and to further respond to any constructions that Petitioners propose.

A. The Petition Does Not Comply with the Board's Claim Construction Rules

The Board's rules require that the petition sets forth “[h]ow the challenged claim is to be construed.” 37 C.F.R. § 42.104(b)(3). “[W]hen a petitioner takes alternative positions before the Board and a district court, that petitioner should, at

a minimum, explain why alternative position are warranted.” *Revvo Techs., Inc. v. Cerebrum Sensor Techs., Inc.*, IPR2025-00632, Paper 20 at 3-4 (PTAB Nov. 3, 2025) (precedential). This rule “ensure[s] that the Board correctly construes claim terms and to minimize inconsistency in claim construction between forums.” *Id.* at 4. In this case, Petitioners’ claim construction positions in the Petition and the Texas Case are inconsistent, which warrants denial of the Petition.

Petitioners acknowledge that “[i]n the Texas Case, [Petitioners] identified certain limitations [of the ’455 Patent]” as indefinite. Pet., 16 n.3 (citing EX1023, 240-41). Specifically, Petitioners assert that the following terms or phrases are indefinite in district court:

- “spatially separated detectors” (claims 1, 2, 8, 9, 15);
- “a plurality of detectors that are spatially separated from each other” (claims 1, 8, 15);
- “wherein the detection system is configured to be synchronized to the light source” (claims 1, 8, 15);
- “increase the signal-to-noise ratio by comparing the first signal and the second signal” (claims 1, 8, 15);
- “the plurality of semiconductor sources configured to generate an output optical light having a plurality of optical wavelengths” (claim 1);

- “the wearable device configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the semiconductor sources from an initial light intensity” (claim 1);
- “the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs” (claims 2, 9, 15);
- “the light emitting diodes configured to generate an output optical light having one or more optical wavelengths” (claims 8 and 15).

EX1023, 240-41. Despite this, Petitioners apply the plain and ordinary meaning for each of these terms in the Petition. Pet., 15-18.

Petitioners’ only explanation for taking inconsistent positions in the Petition and the district court is that “the prior art discloses and renders obvious embodiments within the indisputable scope of these limitations.” Pet., 16 n.3 (citing EX1003, ¶¶67-68). Dr. Anthony similarly fails to explain the inconsistency and merely repeats the same conclusory assertions from the Petition. EX1003, ¶¶67-68. The Board should deny institution because Petitioners fail to justify their inconsistent positions. *Tesla, Inc. v. Intellectual Ventures II LLC*, IPR2025-00340, Paper 18 at 3-5 (PTAB Nov. 5, 2025) (informative) (denying institution where petitioner argued that claim term was indefinite in district court but adopted patent owner’s plain and ordinary meaning construction in its petition).

B. Prior Constructions by the Board

As noted in the Petition, the Board construed the following terms in the prior IPRs for related patents:

Term/Phrase	Board's Construction
“a light source comprising a plurality of semiconductor sources that are light emitting diodes ... configured to increase signal-to-noise ratio by ... increasing a pulse rate of at least one of the plurality of semiconductor sources”	“a light source containing two or more light emitting diodes (semiconductor sources), wherein at least one of the light emitting diodes is capable of having its pulse rate increased to increase a signal-to-noise ratio” (EX1008, 10-12)
“to detect an object”	“to discover or notice the existence or presence of something” (EX1015 at 8-10; EX1016 at 3.)

Patent Owner applies these constructions in its analysis below. EX2031, ¶¶75-77.

VI. INSTITUTION SHOULD BE DENIED BASED ON POLICY

The Director should deny institution because the Petition presents an “unfocused approach,” and “maintaining a trial in this case would require the Board and Patent Owner to expend resources addressing multiple claims and grounds that

do not meet the reasonable likelihood standard, as well as grounds that have not been sufficiently developed,” which “is not an efficient or respectful use of Office or party resources.” *Zhuhai CosMX Battery Co., Ltd. v. Ningde Amperex Tech. Ltd.*, IPR2025-00405, Paper 24 at 2-4 (PTAB Oct. 15, 2025) (Order by Director Squires Granting Director Review, Vacating the Decision Granting Institution, and Denying Institution). In *Zuhai*, the Director recognized that, “as a matter of policy, it is not an efficient use of Office resources to institute and maintain a trial when a petition presents a multitude of unfocused grounds leaving the work to be done by the Office.” *Id.*, at 2.

As in *Zhuhai*, the Petition presents a “multitude of unfocused grounds” where, for example, each ground “presents arguments for [some challenged claims] but does not include separate arguments for [other challenged claims]” and the grounds “refer[] to arguments made in other sections of the Petition to explain the challenge.” *Id.*, at 2-3. This is evident from the breakdown in Section VII below of the Petition’s complicated web of grounds, claims, and arguments. Pet., 8. As an example, Petitioners challenge independent claim 15 in Ground 3 based on Lisogurski and Tran. However, Petitioners only address limitation [15.n] in Ground 2 and do so by referring to their analysis of claim 2 that relies on LeBoeuf, which is not asserted in Ground 3. Pet., 60-73 (Ground 3 challenging claim 15 over Lisogurski and Tran and only addressing limitation [15.pre]), 51-58 (Ground 2 challenging claim 15 and for

limitation [15.n] referring to the analysis of claim 2, which relies on LeBoeuf); *see* Section VII.C.1 *infra*.

VII. PETITIONERS FAILED TO MEET THEIR BURDEN

The Director should deny institution because Petitioners have not met their burden of showing a reasonable likelihood that any claim of the '455 Patent is unpatentable for any of the grounds in the Petition.

A. Ground 1: Alleged Obviousness Based on Lisogurski (Claims 1, 8, 11)

In Ground 1, Petitioners argue that claims 1, 8 and 11 of the '455 Patent are obvious over Lisogurski. Pet., 8, 20-51. For at least the reasons discussed below, Petitioners failed to meet their burden. EX2031, ¶¶85-125.

1. Independent Claim 1: Lisogurski Does Not Disclose or Render Obvious the Driver Limitation

Limitation [1.b]¹ recites “a light source *comprising* a driver” (hereinafter, the

¹ Claim limitations of the '455 Patent are identified herein using the same alphanumeric identifiers as the Petition. Pet., viii-xvii.

“driver limitation”).² EX1001, 86:46-47.³ Petitioners rely on Lisogurski's light source 130 as the claimed “light source” and light drive circuitry 120 as the claimed “driver.” Pet., 29-31. However, Lisogurski neither discloses nor renders obvious that the light source 130 *comprises* the light drive circuitry 120. EX2031, ¶¶86-118. Thus, Petitioners cannot meet their burden for the driver limitation. *Id.*

a) Lisogurski Does Not Disclose “a light source comprising a driver”

Lisogurski does not disclose that drive circuitry 120 (the alleged “driver”) is included in light source 130 (the alleged “light source”) as required in claim 1. EX2031, ¶¶92-96. Rather, as depicted in the annotated version of Figure 1 below, drive circuitry 120 (blue) in monitor 104 (green) is separate and distinct from light source 130 (red) in sensor 102 (purple):

² Collateral estoppel does not apply for the driver limitation, which is not included in claims addressed in prior Board decisions, and Petitioners recognize this. Pet., 3 (“Additional limitations in the ’455 Claims ... recite ... a [] driver”); EX1003, ¶¶122-123.

³ All emphasis in case and evidence citations herein is added unless otherwise noted.

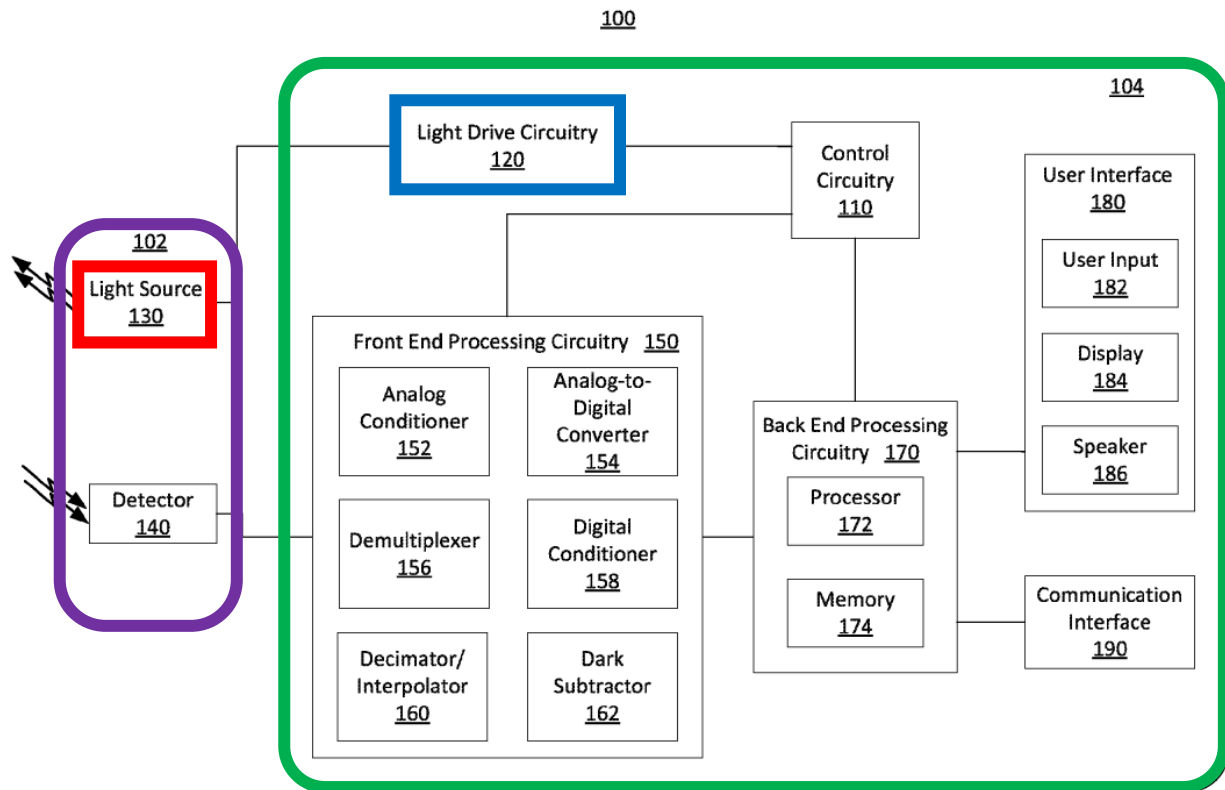


FIG. 1

EX1025, FIG. 1 (annotated), 10:42-49, 11:28-66; EX2031, ¶¶92-96. Accordingly, Petitioners must show that a POSITA would have modified Lisogurski to include the claimed arrangement.

b) Petitioners Do Not Establish Motivation to Modify Lisogurski

Petitioners fail to establish that a POSITA would have modified Lisogurski to meet the driver limitation. Petitioners' analysis constitutes only a single paragraph, which offers a conclusory assertion that one would have modified Lisogurski to relocate drive circuitry 120 "to be within" light source 130. Pet., 31. The only alleged support Petitioners point to for this conclusory assertion is that "the Board agreed"

in a prior IPR and a cross-reference to “§IX.B.2” of the Petition. *Id.* However, neither §IX.B.2 of the Petition nor Board in the prior IPR decision address relocating drive circuitry 120 within the light source 130. EX2031, ¶¶97-105.

Petition §IX.B.2 argues: “a POSITA would have been motivated to modify Lisogurski[] ... to ‘relocat[e] ... drive circuitry 120 ... **to sensor 102**’”; “[a]s to ... drive circuitry 120, ... a POSITA would have understood or at least found it obvious to include the circuitry **in the same device as** the light source [130],” i.e., in sensor 102. Pet., 25-26 (citing EX1008 (“’533-FWD”), 22-25). That is, Petition §IX.B.2 merely argues, as depicted in the annotated version of Figure 1 below, that drive circuitry 120 would be relocated within **sensor 102** (purple), not within **light source 130** (red). *Compare* Pet., 25-27 (§IX.B.2: “Motivation to Modify Lisogurski”) *with* Pet., 31; *see* EX2031, ¶¶100-01.

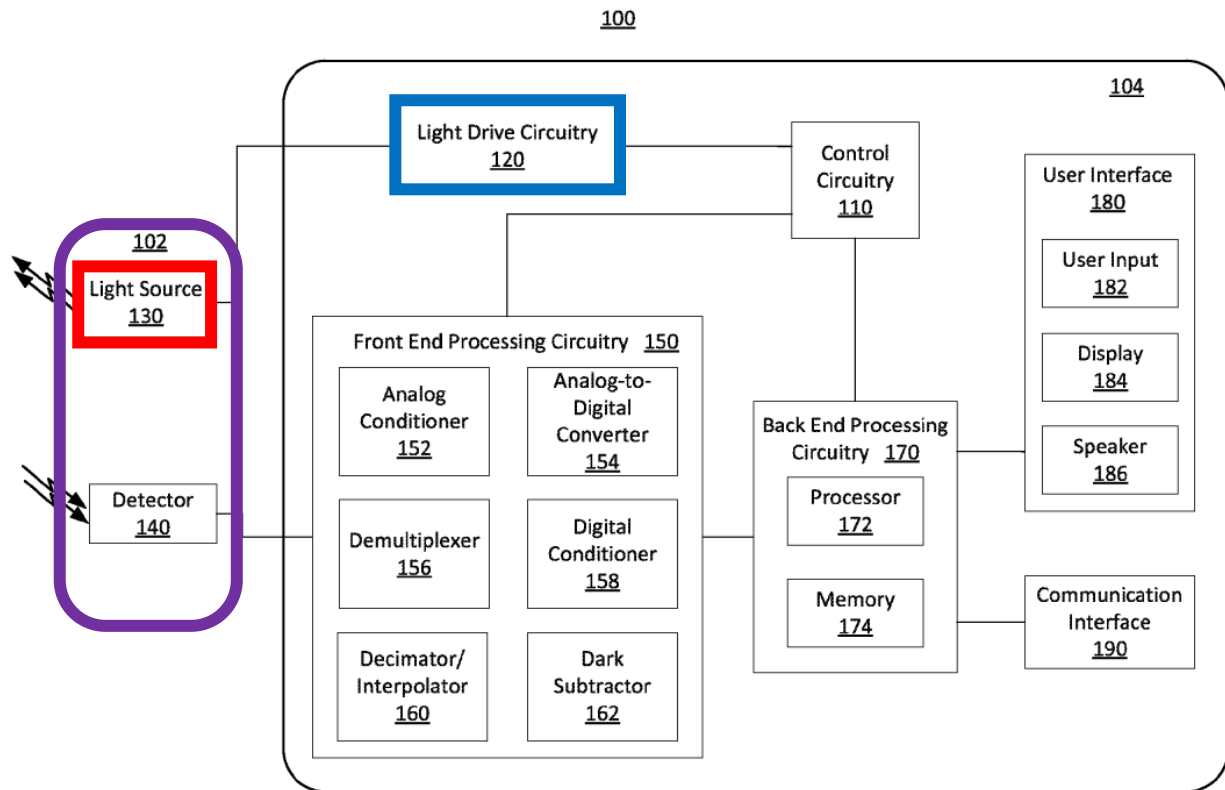


FIG. 1

EX1025, FIG. 1 (annotated)

The Petition later suggests that “it was common for light sources to include light drive circuitry,” but does not assert that a POSITA would have been motivated to relocate Lisogurski’s drive circuitry 120 to within light source 130. Pet., 27 (citing EX1031, EX1033-EX1035); EX2031, ¶102. To the extent this conclusory assertion was meant to address relocating the drive circuitry 120 to be light source 130, this argument fails for two reasons. First, Petitioners’ conclusory assertion is unsupported by Petitioners’ cited exhibits, as Exhibits 1033-1035 relate to processing circuitry rather than drive circuitry and EX1031 only teaches locating

“light driver circuit in [a] probe,” not specifically within a light source, according to Petitioners’ own parentheticals for those exhibits. Pet., 27 (citing EX1031, EX1033-35); EX2031, ¶102. Second, Petitioners’ conclusory assertion is unsupported by Petitioners’ argument in Petition §IX.B.2 that the driver circuitry 120 would be relocated within the sensor 102. *See* Pet., 25-27; EX2031, ¶102.

Petitioners’ reliance on the ’533-FWD is also misplaced because the proposed modification of Lisogurski in the ’533-IPR, as Petition §IX.B.2 recognizes, was to relocate drive circuitry 120 to within sensor 102, but *not* within light source 130. EX1008, 22-23 (“Petitioner’s proposed combination relocates some components of Lisogurski’s monitor 104/314 *to sensor 102/312*”; “Petitioner’s proposed combination ... involves relocating ... light drive circuitry 120 ... *to sensor 102*”; “Petitioner articulates sufficient reasoning ... why a [POSITA] would have modified Lisogurski’s *sensor 102/312*”); Pet., 25-26 (citing the ’533-FWD to support relocating drive circuitry 120 to sensor 102, not light source 130); EX2031, ¶103. The ’533-FWD does not mention light source 130 in discussing the proposed modification to Lisogurski. EX1008, 22-24. In fact, the ’533-FWD discusses drive circuitry 120 sending a drive signal to light source 130 in the modified version of Lisogurski, showing that the Board did not consider a modification where the light source 130 comprises the drive circuitry 120. EX1008, 27, 32-33; EX2031, ¶103.

For comparison, a different modification to Lisogurski asserted in the Petition

and addressed in the '533-FWD involves relocating front end processing circuitry 150 from monitor 104 into sensor 102. Pet., 25-27; EX1008, 22-23. This is consistent with the modification asserted in Petition §IX.B.2 and addressed in the '533-FWD of relocating drive circuitry 120 from monitor 104 to sensor 102, not Petitioners' conclusory assertion to relocate drive circuitry 120 into light source 130 for the driver limitation. See Pet., 25-27, 31; EX1008, 22-23; EX2031, ¶104.

To the extent Petitioners seek to rely on the annotations in the figure below, which is included in the '533-FWD, to suggest that the Board's decision supports relocating drive circuitry 120 into light source 130, this fails because the Board acknowledges the annotations came from the '533-IPR petitioner.

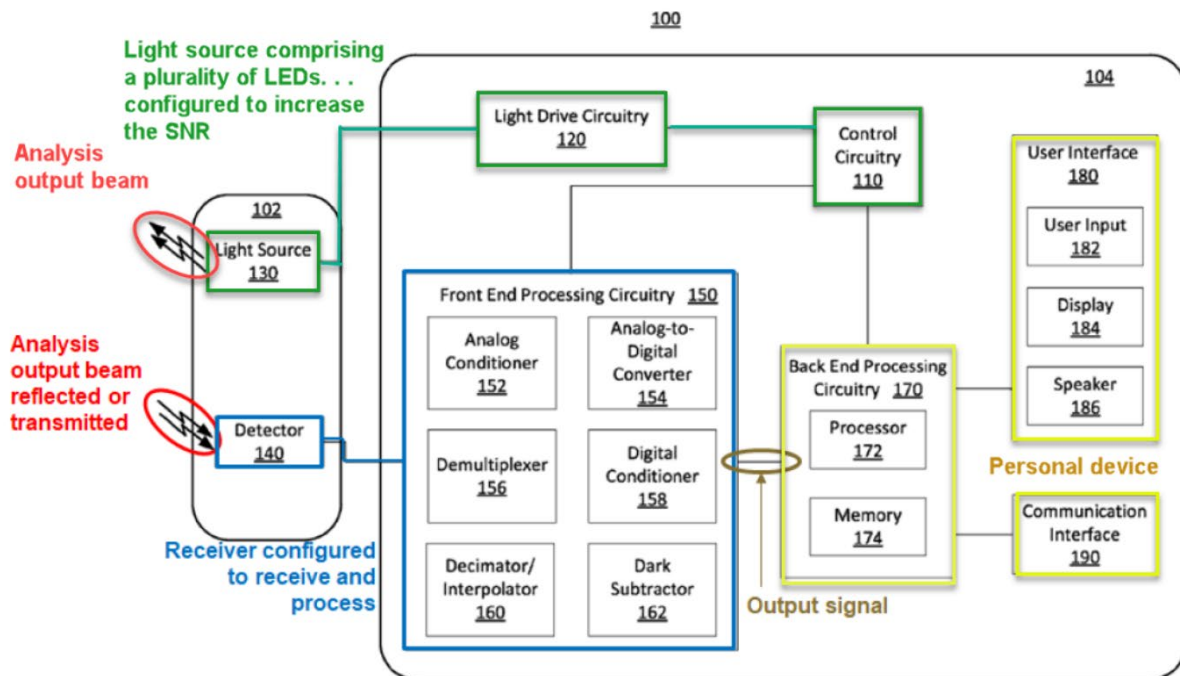


FIG. 1

Pet., 25-26; see EX1008, 22 (explaining the annotated figure “combine[s]” “a series

of [p]etitioner-modified versions of Lisogurski's Figure 1"); EX2031, ¶105. Regardless, as explained above, the '533-FWD's text surrounding this annotated figure clarifies that the "[p]etitioner's propos[al]," and the Board's finding, "involve[d] relocating ... drive circuitry 120 ... to sensor 102," with no mention of light source 130. EX1008, 22-23; EX2031, ¶105.

To the extent Petition §IX.B.2 references the Board's reliance on Lisogurski's statements regarding combining or dividing the "functionality of some of the components," the Board's associated finding only addressed relocating drive circuitry 120 to within sensor 102, not light source 130. Pet., 26 (citing EX1025, 16:2-4, 16:7-9). Also, Lisogurski does not indicate that "some components" include either drive circuitry 120 or light source 130, as that paragraph of Lisogurski does not mention these two components and instead discusses other components in Lisogurski's Figure 1. EX1025, 15:66-16:16; EX2031, ¶106.

Petitioners' only alleged motivation for relocating the drive circuitry 120 into light source 130 is that they "operate together." Pet., 31 (citing only Pet., §IX.B.2). To the extent that Petition §IX.B.2 discusses these components, it does not establish any motivation to relocate drive circuitry 120 into light source 130 because, as explained above, Petition §IX.B.2 instead proposes relocating drive circuitry 120 into sensor 102. Pet., 25-26 (asserting that these two components "work[ing] together" is only motivation "to include [drive circuitry 120] in the same device as

the light source [130],” i.e., merely within sensor 102); EX2031, ¶¶107-09. Petitioners also assert that the “Board agreed” with their alleged motivation regarding the components “operat[ing] together” (Pet., 31), but the Board only addressed relocating drive circuitry 120 into sensor 102, not the light source 130. EX1008, 22-23 (containing no mention of light source 130); EX2031, ¶¶107-08.

Petitioners also assert that “drive circuitry 120 turns on/off the ‘light source 130’ by generating ‘light drive signal[s].’” Pet., 31 (citing EX1025, 10:42-46, 11:28-31, 11:38-41, 11:50-60). But this only mentions drive circuitry 120 “generating” the light drive signal (Pet., 31) and fails to consider Lisogurski’s full teaching that drive circuitry 120 provides or sends this signal “*to*” light source 130. EX1025, 11:28-12:6, FIG. 1; EX2031, ¶¶110, 113; *see Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 (Fed. Cir. 1987) (a reference “must be considered in its entirety, ... including portions that would lead away” from the claimed invention). Based on this full teaching, a POSITA would not have been motivated to relocate drive circuitry 120 into light source 130 as Petitioners assert but rather dissuaded from such modification because it would result in light source 130 effectively sending a signal to itself. EX2031, ¶¶110, 113-14 (citing EX1025, 11:28-12:6, FIG. 1).

Even accepting Petitioners’ alleged motivation as true, it shows a POSITA would at most relocate drive circuitry 120 to sensor 102, not light source 130. EX2031, ¶¶111-13. Petitioners fail to explain why their alleged motivation would

have led a POSITA to further relocate drive circuitry 120 to within light source 130 rather than just relocating it “in the same device as the light source.” Pet., 26.

Moreover, Petitioners' expert declaration is inadequate. The single paragraph in which Dr. Anthony asserts that drive circuitry 120 would have been relocated to within light source 130 for the driver limitation cites zero support for this modification, as the only citation in this paragraph is to “Section IX.A.2,” which—similar to Petition §IX.B.2 and the '533-FWD discussed above—instead only addresses relocation to within sensor 102, not light source 103. EX1003, ¶¶125 (citing only “Section IX.A.2”), 90-107 (Section IX.A.2: “A [POSITA] would have been motivated to ... place ... drive circuitry 120 to sensor 102”; “obvious to include ... drive circuitry 120 in sensor 102”; etc.); EX2031, ¶¶97-113. Dr. Anthony's conclusory and unsupported testimony should be given little or no weight. *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15-17 (PTAB Aug. 24, 2022) (precedential) (denying institution because “declaration testimony is conclusory and unsupported, adds little to the conclusory assertion for which it is offered to support, and is entitled to little weight”); *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1361-63 (Fed. Cir. 2019) (reversing the Board's obviousness finding based on “unsupported and conclusory” expert testimony); 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight”).

c) A POSITA Would Not Have Been Motivated to Modify Lisogurski

Regardless of the deficiencies in the Petition, a POSITA would not have been motivated to relocate Lisogurski's drive circuitry 120 to within light source 130 for at least three reasons.

First, Lisogurski teaches that the purpose of drive circuitry 120 is to provide or send the light drive signal "*to*" light source 130. EX1025, 11:28-12:6, FIG. 1. A POSITA would not have relocated drive circuitry 120 to inside light source 130 because this modification would cause light source 130 to effectively send a signal to itself, creating unnecessary redundancy and inefficiency. EX2031, ¶115.

Second, a POSITA would not have been motivated to relocate drive circuitry 120 to within light source 130 because the heat generated by the light source 130 would potentially damage the driver circuitry 120. EX1025, 1:17-19, 3:58-60, 5:7-9; EX2036; EX1037, 30-31; EX2031, ¶¶116-17. Lisogurski recognizes this concern of heating effects for light emitters such as light source 130 and expresses a desire to reduce these heating effects. EX1025, 1:17-19 (describing desirability of "reduc[ing] heating effects of the emitters"), 3:58-60 (describing a "desir[e] to ... reduce heating effects caused by an emitter"), 5:7-9 (describing desirability of "reduc[ing] the impact of heating effects caused by a light source"); EX2031, ¶116. A POSITA would have understood that relocating drive circuitry 120 into light

source 130 would put drive circuitry 120 at risk of being compromised due to heat generated by light source 130, especially in this situation where Petitioners rely on embodiments in which the light source 130 emits infrared (IR) light for oximetry. Pet., 43-47; EX2031, ¶¶116-17.

Third, the proposed modification would have created unnecessary complications, costs, and design issues for a combined light-source-and-driver. EX2031, ¶118. Based on Lisogurski's teaching that light source 130 and drive circuitry 120 are separate components, a POSITA would have understood them to be standard components that are designed and fabricated separately and that integration of drive circuitry 120 into light source 130 would require more specialized and complicated design and fabrication, including due to the heating concerns discussed above. EX1025, FIG. 1; 10:42-49, 11:28-32; EX2031, ¶118.

2. Independent Claim 8: Lisogurski Does Not Disclose or Render Obvious the Driver Limitation

Limitation [8.b] includes the same driver limitation as limitation [1.b] (i.e., "a light source comprising a driver"); Petitioners rely on their analysis of limitation [1.b] for limitation [8.b], without more. EX1001, 87:62-65, 86:45-49; Pet., xi, viii, 47. Therefore, Lisogurski does not disclose or render obvious limitation [8.b] for the same reasons as limitation [1.b]. EX2031, ¶¶119-22; *supra*, §VII.A.1.

3. Dependent Claim 11

Petitioners' analysis for claim 11, which depends from claim 8, does not address the deficiencies discussed above regarding claim 8. Pet., 49-51. Petitioners therefore failed to meet their burden for claim 11 for at least the same reasons as claim 8. *Supra*, §VII.A.2; EX2031, ¶¶123-25.

B. Ground 2: Alleged Obviousness Based on Lisogurski and LeBoeuf (Claims 2-4, 9-10, 15-17)

In Ground 2, Petitioners argue that claims 2-4, 9-10, and 15-17 of the '455 Patent are obvious over Lisogurski in view of LeBoeuf. Pet., 8, 51-60. For at least the reasons discussed below, Petitioners fail to meet their burden. EX2031, ¶¶126-231.

1. Dependent Claim 2: Lisogurski and LeBoeuf Do Not Render Obvious the Arc Limitation

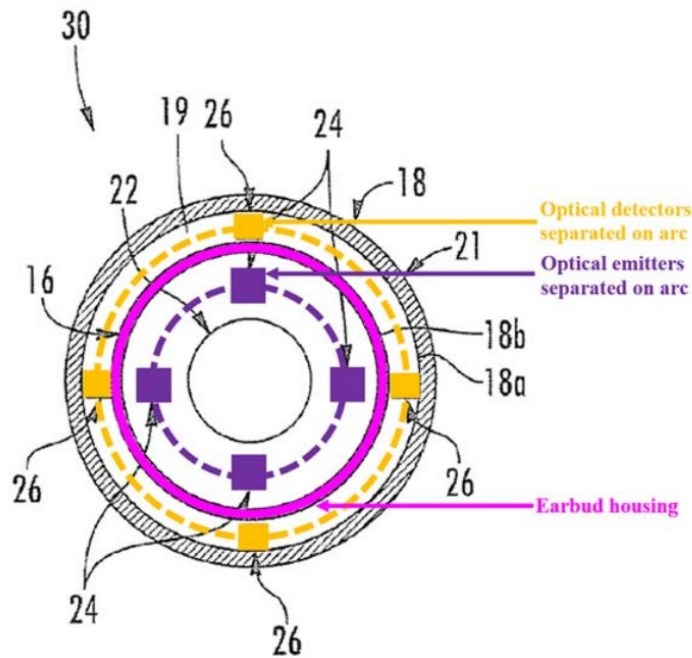
Petitioners' analysis of claim 2, which depends from claim 1, does not address the deficiencies in Lisogurski with respect to claim 1 or rely on LeBoeuf to cure those deficiencies. Pet., 55-57. Therefore, Lisogurski and LeBoeuf do not render obvious claim 2 for at least the same reasons as claim 1. EX2031, ¶¶127-29; *supra*, §VII.A.1.

Additionally, Lisogurski and LeBoeuf do not render obvious claim 2's additional requirement that "the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more *arcs*" (hereinafter, the

“arc limitation”). EX1001, 87:29-31.⁴

Petitioners rely on Lisogurski's sensor's multiple LEDs and detectors as the claimed “semiconductor sources” and “detectors,” respectively. Pet., 55-56, 30-31, 34-35. Because Lisogurski does not disclose any arrangement of its LEDs or detectors, much less “one or more arcs,” Petitioners rely on LeBoeuf's arrangement of optical emitters 24 and optical detectors 26 in Figure 8B (referenced herein as LeBoeuf's “alleged arc arrangement”) and argue that “a POSITA would have been motivated to apply LeBoeuf's arc arrangements to Lisogurski's system.” Pet., 55-57; EX2031, ¶¶130-32. Petitioners rely on the following annotated Figure 8B of LeBoeuf:

⁴ Collateral estoppel does not apply for the arc limitation, which is not included in claims addressed in prior Board decisions, and Petitioners recognize this by not referencing any prior decisions. Pet., 55-57.



Pet., 57.

Petitioners, however, failed to show that a POSITA would have implemented LeBoeuf's alleged arc arrangement in Lisogurski. EX2031, ¶¶127-68.

a) Petitioners Do Not Establish Motivation to Implement LeBoeuf's Alleged Arc Arrangement in Lisogurski

Petitioners entire motivation-to-combine argument for the arc limitation consists of a single sentence that refers back to §IX.C.2, which includes only a single paragraph that arguably discusses a motivation to combine. *See* Pet., 57 (“[a]s discussed (§IX.C.2)”), 52-53 (in §IX.C.2). Petitioners fail to specifically explain, with supporting evidence, why or how LeBoeuf's alleged arc arrangement in Figure 8B would have been implemented in Lisogurski's sensor. EX2031, ¶¶136-57.

(1) Petitioners Fail to Show *Why* a POSITA Would Have Combined Lisogurski and LeBeouf

Petitioners first assert that a POSITA would use LeBeouf's arc arrangement for increased "accuracy and reliability." Pet., 52-53. But neither Lisogurski (which does not include the alleged arc arrangement) nor LeBeouf disclose or suggest that such an arrangement would lead to increased accuracy or reliability. EX2031, ¶¶137-44. Indeed, while LeBeouf shows the alleged arc arrangement in Figure 8B, LeBeouf's text does not discuss this arrangement, let alone suggest this arrangement achieves any benefits related to accuracy/reliability. *See* EX1026, FIG. 8B, ¶¶[0123]-[0124]; EX2031, ¶¶143-44. Petitioners' citations to LeBeouf at [0006], [0010], and [0105] are unavailing because none of these paragraphs address the alleged arc arrangement. Pet., 52-53; EX2031, ¶143. Petitioners cite LeBeouf at [0105] to assert that the alleged arc arrangement would "improve the detection of scattered light ... , and increase the signal-to-noise ratio," but the cited paragraph contains no such teachings or even a discussion of the alleged arc arrangement. Pet., 53 (citing EX1026, ¶[0105]); EX2031, ¶143.

Petitioners' only other cited evidence is Exhibit 1045 ("Mendelson"), which does not relate to the alleged arc arrangement in LeBeouf or the alleged accuracy/reliability thereof. Pet., 52-53 (citing EX1045, 4:14-65); EX2031, ¶145. And regardless, Petitioners only cite Mendelson regarding alleged arrangement of

detectors, not *emitters*, which fails because the arc limitation involves both. Pet., 53 (citing EX1045); EX2031, ¶¶145, 150-51. Additionally, as discussed below, Mendelson does not support Petitioners' assertion regarding angularly scattered light because Mendelson does not discuss angles and Dr. Anthony mischaracterizes Mendelson's disclosures. EX2031, ¶154.

Petitioners also assert that "both Lisogurski and LeBoeuf disclose physiological monitoring devices that can be worn on various parts of the body" and "Lisogurski discloses that '[a]ny suitable configuration ... may be used.'" Pet., 53 (quoting EX1025, 17:42-45). But this fails to establish why a POSITA would have understood LeBoeuf's alleged arc arrangement in Figure 8B to be suitable or would have chosen it opposed to other possible arrangements, such as LeBoeuf's other arrangements involving multiple emitters and/or detectors that are not arranged in an arc. EX1026, FIGS. 6, 7A, 11A, 12A-B, 22B, 23; EX2031, ¶¶146-48; *Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 886-87 (Fed. Cir. 2024) (holding that "mere ... exist[ence]" of "possible arrangements" and knowledge of "alternative arrangements" are insufficient for motivation to combine). For example, Petitioners' assertions do not support or explain why LeBoeuf's alleged arc arrangement would improve accuracy/reliability in Lisogurski as alleged. EX2031, ¶¶146-47. In fact, a POSITA would have understood LeBoeuf's alleged arc arrangement is premised on the multiple related components

depicted in Figure 8B and that without those related components, which Petitioners do not address or argue to implement into Lisogurski, LeBoeuf's alleged arc arrangement would not be suitable for Lisogurski. EX1026, FIGS. 8A-8B, ¶[0123]; Pet., 52-53; EX2031, ¶149.

Petitioners also argue that a POSITA would modify Lisogurski to use LeBeouf's alleged arc arrangement because (1) a POSITA would have understood that "reflected light" in Lisogurski exits tissue "at a wide range of angles" (Pet., 53 (citing EX1025, 11:9-27)) and (2) "[a] POSITA would have recognized that a simply linear or closely grouped detector arrangement would fail to capture much of the angularly scattered light" (*id.* (citing EX1045, 4:14-65)). Critically, however, these issues only relate to *detectors*—not *emitters*. Pet., 53 (addressing a "*detector* arrangement" and then concluding: "a POSITA would have ... appl[ied] LeBoeuf's teaching of ... *detectors* located on one or more arcs"); EX2031, ¶¶150-51. Thus, even if a POSITA had these understandings, as Petitioners allege, this does not address the requirement in claim 2 that the "*semiconductor sources* and ... detectors are located on one or more arcs." EX1001, 87:29-31; EX2031, ¶¶150-51. Further, to the extent that Petitioners' references to angularly scattered light is intended to support their suggestion that the modification would increase accuracy/reliability, it would at most only do so with respect to detectors, not emitters; EX2031, ¶¶150-52.

In any event, Petitioners' arguments regarding angularly scattered light are

unsupported and flawed. EX2031, ¶¶153-54. With respect to “reflected light” at “angles,” the cited portion of Lisogurski does not address angles, and indeed, Lisogurski never mentions an “angle.” Pet., 53 (citing EX1025, 11:9-27); EX2031, ¶153. Similarly, Mendelson does not discuss “angles.” Pet., 53 (citing EX1045, 4:14-65); EX2031, ¶154. Also, Petitioners’ assertion that “linear” arrangements are deficient wrongly assumes the existence of only two arrangements—i.e., linear and arc—and fails to consider the existence of other potential arrangements (e.g., triangle, square, or grid) for capturing angularly scattered light, including the non-linear and non-arc arrangement of detectors in LeBoeuf’s Figure 12A. EX1026, FIG. 12A, ¶[0138]; EX2031, ¶153. Petitioners fail to explain why a POSITA would have chosen an arc arrangement from amongst the wide array of non-arc arrangement options, let alone the alleged arc arrangement in LeBoeuf’s Figure 8B. Pet., 53; EX2031, ¶153; *Virtek*, 97 F.4th at 886-87 (“mere ... exist[ence]” of “possible arrangements” is insufficient for motivation). For example, Petitioners’ own cited portion of Mendelson discusses a non-linear, non-arc arrangement that uses only “a single photodiode [i.e., detector].” Pet., 53 (citing EX1045, 4:14-65); EX2031, ¶154.

Petitioners and Dr. Anthony’s reliance on Mendelson is flawed for several additional reasons. EX2031, ¶154. For example, the arrangements cited in Mendelson are different from LeBoeuf’s alleged arc arrangement. EX1026, FIG. 8B; EX1045, 4:14-65 (referencing, e.g., “Konig” (EX2035, 5-6), which has centralized

LEDs, and another sensor with a “single photodiode”); EX2031, ¶154. Also, Dr. Anthony mischaracterizes Mendelson in asserting that Mendelson “discloses that ‘in order to maximize the fraction of backscattered light collected by [a] sensor,’ its system includes ‘six photodetectors mounted in the center of the sensor *around* the LEDs.’” EX1003, ¶263 (emphasis in original) (quoting EX1045, 4:14-65); EX2031, ¶154. The cited portion of Mendelson is to its Background section, not “its system,” and those two quotes are not related but instead refer to two separate, unrelated publications. EX1045, 4:14-65; EX2031, ¶¶154.

Petitioners fail to establish a specific connection between their alleged motivation regarding detection of angularly scattered light and LeBoeuf's particular arrangement of emitters and detectors in Figure 8B. *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008) (“knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed method”); *see* EX2031, ¶¶136-54.

Moreover, Dr. Anthony's testimony on motivation-to-combine for the arc limitation repeats the same assertions and relies on the same evidence as the Petition, which is flawed for the reasons discussed above. EX1003, ¶¶262-63; EX2031, ¶¶136-54. Dr. Anthony's conclusory testimony is therefore entitled to little or no weight. *Xerox*, IPR2022-00624, Paper 9 at 15-17 (denying institution because “declaration testimony is conclusory and unsupported, adds little to the conclusory

assertion for which it is offered to support, and is entitled to little weight”); *TQ Delta*, 942 F.3d at 1361-63 (reversing the Board’s obviousness finding based on “unsupported and conclusory” expert testimony); 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight”).

(2) Petitioners Fail to Show *How* a POSITA Would Have Combined Lisogurski and LeBeouf

Petitioners also fail to explain specifically *how* LeBoeuf’s alleged arc arrangement would have been implemented in Lisogurski. *See PersonalWeb Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993-94 (Fed. Cir. 2017) (finding the Board failed to explain “*how* the combination of the two references was supposed to work” (emphasis in original)); *Braintree Labs., Inc. v. Novel Labs., Inc.*, 749 F.3d 1349, 1359 (Fed. Cir. 2014) (“[Party] failed to prove ... why the ... references would have worked together” (cleaned up)); *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381-82 (Fed. Cir. 2016) (emphasizing the “need for specificity” in “findings on motivation”).

LeBoeuf’s alleged arc arrangement of emitters 24 and detectors 26 in Figure 8B is based on and involves multiple related components, including base 50, earbud housing 16, cover 18, and speaker 22. EX1026, FIGS. 8A-8B, ¶[0123]; EX2031, ¶156. Petitioners do not address those related components, much less argue to

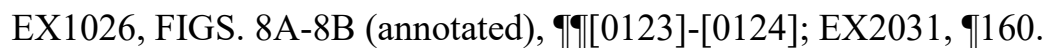
implement those related components into Lisogurski. Pet., 52-53. Petitioners do not explain how LeBoeuf's alleged arc arrangement, which is based on those related components, would purportedly be implemented in Lisogurski's sensor that does not have those related components. EX2031, ¶¶155-56.

Further, Petitioners do not explain how LeBoeuf's alleged arc arrangement of emitters and detectors would work to achieve Petitioners' alleged motivation of accuracy/reliability in Lisogurski without those other related components, and a POSITA would have understood that it would not, as explained below. Pet., 52-53; EX1026, FIGS. 8A-8B, ¶[0123]; EX2031, ¶157.

b) A POSITA Would Not Have Been Motivated to Implement LeBoeuf's Alleged Arc Arrangement in Lisogurski

Regardless of the deficiencies in the Petition, a POSITA would not have been motivated to implement LeBoeuf's alleged arc arrangement into Lisogurski. EX2031, ¶¶158-68.

LeBoeuf is directed extensively to "earbud" devices—including the "light-guiding earbud" in Figure 8B—that are specifically configured to be placed within an ear and transmit light and sound into the ear canal. EX1026, Abstract, ¶¶[0002], [0009], [0048]-[0049], [0123], FIGS. 1-12B; EX2031, ¶¶159-61. Further, as demonstrated by the following annotated Figures 8A-8B, LeBoeuf's alleged arc



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region 19 defined between cover 18 and earbud housing 16. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX2031, ¶160.

A POSITA would have understood, and LeBoeuf teaches, that these related components are earbud-specific and that the configuration shown in Figures 8A-8B—including the alleged arc arrangement and the related components upon which it is premised—is specific to an earbud and dictated by the unique physical aspects of guiding sound and light relative to the ear canal. EX1026, FIGS. 8A-8B, ¶[0123] (“light guiding earbud 30”; “earbud housing 16 ... configured to be positioned within an ear”; “earbud housing 16 is in acoustical communication with a speaker 22 and ... aperture 34a through which sound ... can pass”; “cover 18 includes ... aperture 34b through which sound ... can pass”; “light guiding region 19”; “cover 18 ... delivers light ... into an ear canal” and “delivers ... collected light to the optical detectors”); EX2031, ¶161.

For example, this earbud-specific nature is evident because the alleged arc arrangement involves emitters and detectors positioned relative to “speaker 22,” “earbud housing 16,” and cover 18 that “delivers light from the optical emitters 24 into an ear canal.” EX1026, ¶[0123], FIGS. 8A-8B; EX2031, ¶161. Notably, LeBoeuf's non-earbud embodiments in Figures 22A-23 do not include the alleged arc arrangement of Figure 8B, further demonstrating that this alleged arc arrangement is earbud-specific. *See* EX1026, ¶¶[0070]-[0072], [0157], [0164],

FIGS. 22A-23; EX2031, ¶167; *Panduit*, 810 F.2d at 1568 (reference “must be considered in its entirety, ... including portions that would lead away” from the claimed invention).

A POSITA would have understood that Lisogurski, in contrast, does not teach or suggest an earbud for positioning in an ear and taking measurements from the ear canal, much less teach the related earbud-specific components in LeBoeuf's Figures 8A-8B. EX2031, ¶162. Lisogurski is limited to sensors for a patient's external sites. EX1025, 4:6-20 (describing, at most, placement on an “earlobe” or “around or in front of the ear,” and notably not *within* the ear); EX2031, ¶162. A POSITA would have understood that Lisogurski's non-earbud sensor is comparable, at most, to LeBoeuf's non-earbud embodiments in Figures 22A-23, not the earbud in Figures 8A-8B. *Compare* EX1025, 4:6-20 (fingertip, toe, earlobe, and body) *with* EX1026, ¶¶[0070]-[0071], [0157] (fingers, toes, and earlobes), [0072], [0164] (body), FIGS. 22A-23; EX2031, ¶¶167-68.

While Petitioners assert that “[b]oth Lisogurski and LeBoeuf disclose ... devices that can be worn on various parts of the body including the ear,” this fails to recognize, as explained above, that (i) the configuration in LeBoeuf's Figures 8A-8B is specific to an earbud, (ii) the arrangement of emitters and detectors is premised on related, earbud-specific components, and (iii) Lisogurski does not teach an earbud. Pet., 53; *Panduit*, 810 F.2d at 1568; EX2031, ¶163. Indeed, Petitioners' own

citations support this distinction between the references. Pet., 53 (citing EX1025, 4:6-20 (no description of placement within an ear); EX1026, ¶¶[0006] (“earbud”), [0010] (“Light directed into the ear”); EX2031, ¶163. Moreover, Petitioners’ assertion amounts to attorney argument because it is not supported by Dr. Anthony’s declaration. *See* EX1003, ¶¶262-63.

Because Lisogurski does not teach or suggest an earbud sensor for within an ear, a POSITA would not have been motivated to implement LeBoeuf’s alleged arc arrangement that, as explained above, is premised on earbud-specific components and, together with those components, is specific to an earbud. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX1025, 4:6-20; EX2031, ¶¶161-62, 165. Further, because Lisogurski does not include the related components upon which LeBoeuf’s alleged arc arrangement is premised, a POSITA would have had neither the motivation nor capability to implement LeBoeuf’s alleged arc arrangement in Lisogurski. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; Pet., 52-53; EX2031, ¶¶160-62, 164.

In an attempt to address these differences, Petitioners quote Lisogurski’s statement that “[a]ny suitable configuration ... may be used” (Pet., 53 (quoting EX1025, 17:42-45)), but a POSITA would not have understood LeBoeuf’s alleged arc arrangement in Figure 8B to be suitable for the reasons discussed above, including that the alleged arc arrangement is based on related components not

present in Lisogurski and is earbud-specific, whereas Lisogurski does not include an earbud. EX2031, ¶¶160-166.

2. Dependent Claims 3-4

Claims 3-4 depend from claim 2. Petitioners' analysis of claims 3-4 (which relies on their analysis of claim 11) does not address the deficiencies discussed above regarding claim 1, does not rely upon LeBoeuf to cure those deficiencies regarding claim 1, and does not address the deficiencies discussed above regarding claim 2. Pet., 57-58, 49-51. Therefore, Lisogurski and LeBoeuf do not render obvious claims 3-4 for at least the same reasons discussed above for claims 1 and 2. *Supra*, §§VII.A.1, VII.B.1; EX2031, ¶¶169-71.

3. Dependent Claim 9: Lisogurski and LeBoeuf Do Not Render Obvious the Arc Limitation

Claim 9 depends from independent claim 8. Petitioners' analysis of claim 9 (which relies on their analysis of claim 2) does not address the deficiencies discussed above for claim 8 or rely upon LeBoeuf to cure those deficiencies. Pet., 57-58, 55-57. Therefore, Lisogurski and LeBoeuf do not render obvious claim 9 for at least the same reasons as claim 8. *Supra*, §VII.A.2; EX2031, ¶¶172-74.

Additionally, claim 9 includes the same arc limitation as claim 2 (i.e., “wherein the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs”), and Petitioners rely on their

analysis of claim 2 for claim 9. EX1001, 88:40-42, 87:29-31; Pet., xiii, x, 57-58. Therefore, Lisogurski and LeBoeuf also do not render obvious claim 9 for at least the same reasons as claim 2. *Supra*, §VII.B.1; EX2031, ¶¶175-77.

4. Dependent Claim 10

Claim 10 depends from claim 9 and indirectly from independent claim 8. Petitioners' analysis of claim 10 (which relies on their analysis of limitation [1.m]) does not address the deficiencies discussed above for claims 8 or 9. Pet., 57-58, 45-47. Therefore, Lisogurski and LeBoeuf do not render obvious claim 10 for at least the same reasons as claims 8 and 9. *Supra*, §§VII.A.2, VII.B.3; EX2031, ¶¶178-80.

5. Independent Claim 15: Lisogurski and LeBoeuf Do Not Disclose or Render Obvious the Driver Limitation or Arc Limitation

Limitation [15.b] of independent claim 15 includes the same driver limitation as limitations [1.b] and [8.b] (i.e., "a light source comprising a driver"). EX1001, 89:8-11, 87:62-65, 86:45-49; Pet., xiv, xi, viii. For limitation [15.b], Petitioners rely on their analysis of limitation [8.b] that, in turn, relies upon their analysis of limitation [1.b] in Ground 1 over Lisogurski. Pet., 58, 47. Therefore, Lisogurski and LeBoeuf do not disclose or render obvious limitation [15.b] for the same reasons as limitation [1.b]. *Supra*, §VII.A.1; EX2031, ¶¶181-84.

Additionally, limitation [15.n] includes the same arc limitation as claims 2 and 9 (i.e., "wherein the plurality of semiconductor sources and the plurality of

spatially separated detectors are located on one or more arcs”), and Petitioners rely upon their analysis of claim 2 for limitation [15.n]. EX1001, 90:6-9, 87:29-31, 88:40-42; Pet., xvi, x, xiii, 58. Therefore, Lisogurski and LeBoeuf also do not render obvious limitation [15.n] for at least the same reasons as claim 2. *Supra*, §VII.B.1; EX2031, ¶¶185-87.

6. Dependent Claim 16

Claim 16 depends from independent claim 15. Petitioners’ analysis of claim 16 (which relies on their analysis of limitation [1.m]) does not address the deficiencies discussed above regarding claim 15. Pet., 57-58, 45-47, 49-51. Therefore, Lisogurski and LeBoeuf do not render obvious claim 16 for at least the same reasons as claim 15. *Supra*, §VII.B.5; EX2031, ¶¶188-90.

7. Dependent Claim 17: Lisogurski and LeBoeuf Do Not Render Obvious the Reflective Surface Limitation

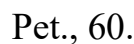
Claim 17 depends indirectly from independent claim 15. Petitioners’ analysis of claim 17 does not address the deficiencies discussed above regarding claim 15. Pet., 59-60. Therefore, Lisogurski and LeBoeuf do not render obvious claim 17 for at least the same reasons as claim 15. *Supra*, §VII.B.5; EX2031, ¶¶191-93.

Additionally, Lisogurski and LeBoeuf do not render obvious claim 17’s requirement that “the wearable device further comprises a reflective surface to receive and redirect at least some of the output optical light from the plurality of

semiconductor sources” (hereinafter, the “reflective-surface limitation”). EX1001, 90:23-26.⁵

Petitioners rely on Lisogurski's sensor's multiple LEDs as the claimed “semiconductor sources.” *See* Pet., 30-31, 47, 58. Because Lisogurski does not teach the claimed “reflective surface,” Petitioners rely instead on LeBoeuf's Figure 8C embodiment, which is substantially similar to LeBoeuf's 8A-8B embodiment (discussed regarding claim 2 above) except that earbud housing 16 is “at least partially reflective to scatter light within the cavity defined by the earbud housing 16” (referenced herein as LeBoeuf's “alleged reflective surface”). EX1026, FIGS. 8A-8C, ¶¶[0123]-[0125]; Pet., 59-60; EX2031, ¶¶194-95. Petitioners argue that “a POSITA would have been motivated to apply LeBoeuf's reflective surface teachings to Lisogurski's system.” Pet., 60. Petitioners rely on the following annotated Figure 8C of LeBoeuf:

⁵ Collateral estoppel does not apply for the reflective surface limitation, which is not included in claims addressed in prior Board decisions, and Petitioners recognize this by not referencing any prior decisions. Pet., 59-60.



a) Petitioners Do Not Establish Motivation to Implement LeBoeuf’s Alleged Reflective Surface in Lisogurski

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(1) Petitioners Fail to Show *Why* a POSITA Would Have Combined Lisogurski and LeBoeuf

As an initial matter, the Petition appears to only argue that a POSITA would modify Lisogurski to include the “reflective [surface or material]” from LeBoeuf’s Figure 8C embodiment, but not any of the components in Figure 8C related to that alleged reflective surface, such as earbud housing 16, cover 18, or apertures 34*a*-34*b*. Pet., 53-54; EX2031, ¶¶199-204. Petitioners do not clearly specify which, if any, such related component(s) in LeBoeuf’s Figure 8C would allegedly be implemented in Lisogurski. Pet., 53-54 (asserting merely to “incorporate a reflective surface” and “apply LeBoeuf’s teaching of reflective surface to Lisogurski’s wearable device”), 60 (“apply LeBoeuf’s reflective surface teachings to Lisogurski’s system”); EX2031, ¶204. Indeed, Petitioners’ motivation argument refers only to LeBoeuf’s “reflective [surface or material]” and does not mention any related components in LeBoeuf’s Figure 8C embodiment, such as earbud housing 16. Pet., 53-54; EX1003, ¶¶265-66. Thus, Petitioners only argue to implement LeBoeuf’s alleged reflective surface in Lisogurski and not any related components in Figure 8C. Pet., 53-54; EX2031, ¶204.

As for alleged motivation to combine, Petitioners and Dr. Anthony each cite only two potential sources—(i) LeBoeuf at [0125], and (ii) a single cite to Valencell-093 (EX1041) at [0152]. Pet., 53-54; EX1003, ¶¶265-66; EX2031, ¶205. Neither

citation supports the alleged motivation to combine Lisogurski and LeBoeuf.

First—Petitioners cite LeBoeuf's disclosure of two advantages related to the Figure 8C embodiment: focusing light on a particular region and reducing unwanted signals. Pet., 53-54 (citing EX1026, ¶[0125]). Importantly, LeBoeuf states that these are advantages of “this **configuration**,” which refers to not just the alleged reflective surface but to the combination of related components in the Figure 8C embodiment, including at least the components annotated in green below:

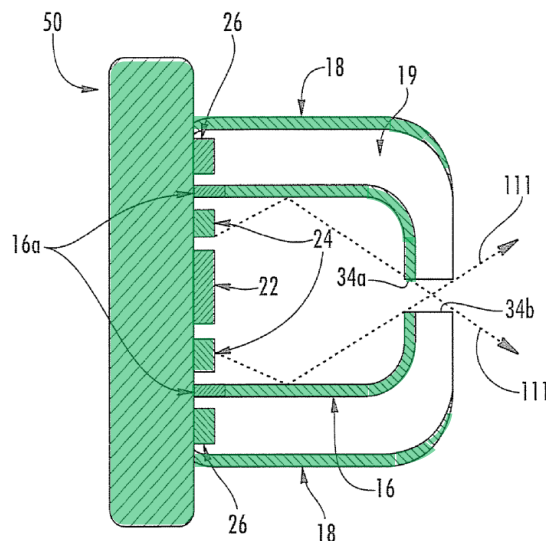


FIG. 8C

EX1026, FIG. 8C (annotated), ¶¶[0123], [0125]; EX2031, ¶¶205-07.

For example, regarding the “configuration” in Figure 8C, LeBoeuf discloses that earbud housing 16 “may be at least partially reflective to scatter light [from emitters 24]” such that “optical energy 111 may exit the earbud 30 through apertures

34a, 34b in the housing 16 and cover 18,” through which “sound from the speaker 22” also passes. EX1026, ¶¶[0125], [0123], FIG. 8C; EX2031, ¶207. A POSITA would have understood, as LeBoeuf teaches, that Petitioners’ cited advantages are necessarily based on the collective “configuration” of components and are not the result of LeBoeuf’s alleged reflective surface in isolation. EX1026, ¶[0125], FIG. 8C; EX2031, ¶207. Thus, the cited advantages regarding the “configuration” in Figure 8C do not supply a motivation for Petitioners’ proposed combination implementing only LeBoeuf’s alleged reflective surface in Lisogurski, without any related components from Figure 8C. EX2031, ¶¶207-09.

Second—Petitioners cite once to Valencell-093. Pet., 53-54 (citing EX1041, [0152]). But the cited disclosure relates to the specific configurations shown in “FIGS. 24-27,” in which a “light guiding region 2306” (e.g., “reflector”) “surround[s] or partially surround[s] [a] sensor module 700, 800 and/or isolation region 2304” in such a way that “light guiding region 2305 helps direct light to and/or from the sensor module 700, 800 and a blood flow region,” with “sensor module 700, 800 ... at least partially exposed.” EX1041, ¶[0152], FIGS. 24-27; EX2031, ¶¶210-11. Petitioners improperly ignore the context of Valencell-093’s teaching regarding a reflective surface. *Panduit*, 810 F.2d at 1568. Valencell-093’s full teaching concerns a reflective surface in specified configurations, not in isolation, and thus does not support Petitioners’ argument regarding simply

implementing LeBoeuf's alleged reflective surface without addressing its configuration. EX2031, ¶¶210-11.

Moreover, Petitioners' expert's testimony on motivation-to-combine only includes the same two citations as the Petition, which, as explained above, are flawed. EX1003, ¶¶265-66; EX2031, ¶¶205-11. And one of Dr. Anthony's two paragraphs asserting motivation-to-combine does not cite any evidence at all. EX1003, ¶266. Dr. Anthony's testimony is thus conclusory and should be given little or no weight. *Xerox*, IPR2022-00624, Paper 9 at 15-17 (precedential) (denying institution because "declaration testimony is conclusory and unsupported, adds little to the conclusory assertion for which it is offered to support, and is entitled to little weight"); *TQ Delta*, 942 F.3d at 1361-63 (reversing the Board's obviousness finding based on "unsupported and conclusory" expert testimony); 37 C.F.R. § 42.65(a) ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight").

(2) Petitioners Fail to Show *How* a POSITA Would Have Combined Lisogurski and LeBoeuf

Petitioners also fail to explain specifically *how* LeBoeuf's alleged reflective surface would have been implemented in Lisogurski. *PersonalWeb*, 848 F.3d at 993-94 (finding the Board failed to explain "*how* the combination of the two references was supposed to work" (emphasis in original)); *Braintree*, 749 F.3d at 1359 ("[Party]

failed to prove ... why the ... references would have worked together” (cleaned up)); *see also NuVasive, Inc.*, 842 F.3d at 1381-82 (emphasizing the “need for specificity” in “findings on motivation”).

As explained above, LeBoeuf's alleged reflective surface is based on and involves multiple related components also shown in Figure 8C, including base 50, earbud housing 16, cover 18, arrangement of emitters 24 and detectors 26, and apertures 34*a*-34*b*. EX1026, ¶¶[0123], [0125], FIGS. 8A-8C; EX2031, ¶¶212-13. But, as explained above, Petitioners only addresses LeBoeuf's “reflective [surface or material]” and do not address any related components in the Figure 8C embodiment, much less argue to implement those related components in Lisogurski. Pet., 53-54 (referring merely to “incorporat[ing] a reflective surface” and “apply[ing] LeBoeuf's teaching of reflective surface”). Petitioners thus do not explain how LeBoeuf's alleged reflective surface would be implemented in Lisogurski's sensor that does not have those related components. EX2031, ¶¶212-15.

(3) Petitioners Fail to Show *Why* or *How* Related Components Would Be Incorporated in Lisogurski

To the extent that Petitioners suggest modifying Lisogurski to include all or some of the related components associated with LeBoeuf's alleged reflective surface in Figure 8C (which they do not, as explained above), Petitioners nonetheless fail to

establish why and how such teachings would be implemented in Lisogurski.

Petitioners do not identify any motivation to modify Lisogrski to include any components from LeBoeuf's Figure 8C because they do not identify which, if any, such components would be implemented in Lisogurski's sensor to begin with. Pet., 53-54; EX2031, ¶¶216-17.

LeBoeuf's earbud housing 16 is mentioned once in Dr. Anthony's motivation analysis and highlighted in Petitioners' annotated Figure 8C for limitation 17. Pet., 60; EX1003, ¶265. But Petitioners fail to establish any motivation to implement earbud housing 16 in Lisogurski's sensor because: (i) earbud housing 16 is an earbud-specific component, but Lisogurski does not teach earbud sensors; (ii) earbud housing 16 is premised on and involves other related components in Figure 8C, which are not in Lisogurski; and (iii) Petitioners fail to explain why or how earbud housing 16 would be implemented in Lisogurski's non-earbud sensor without any other related components from LeBoeuf's Figure 8C. EX1026, ¶¶[0050], [0123], [0125], FIG. 8C; EX1025, 4:6-20; Pet., 53-54, 59-60; EX2031, ¶¶218-21.

Regardless of which component(s) of LeBoeuf's Figure 8B Petitioners purport would be implemented in Lisogurski, such as earbud housing 16 or otherwise, the Petition does not identify motivation for modifying Lisogurski to include any such components because their rationale only mentions LeBoeuf's "reflective [surface or material]." Pet., 53-54; EX2031, ¶222.

b) A POSITA Would Not Have Been Motivated to Implement LeBoeuf's Alleged Reflective Surface in Lisogurski

Regardless of the deficiencies in the Petition, a POSITA would not have been motivated to implement LeBoeuf's alleged reflective surface into Lisogurski as Petitioners allege. EX2031, ¶¶223-31.

LeBoeuf is directed extensively to “earbud” devices—including the “light-guiding earbud” in Figure 8C and the substantially similar embodiment in Figures 8A-8B—that are specifically configured to be placed within an ear and transmit light and sound into the ear canal. EX1026, Abstract, ¶¶[0002], [0009], [0048]-[0050], [0123]-[0125], FIGS. 1-12B; EX2031, ¶¶224-27. As demonstrated by the following annotated Figure 8C, LeBoeuf's alleged reflective surface is premised on and involves other related components (green):

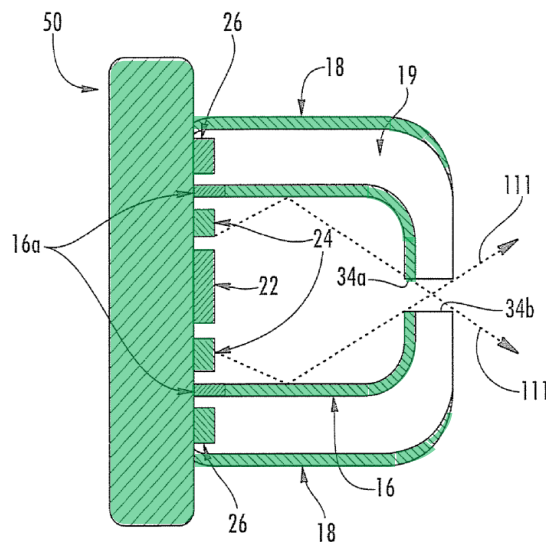


FIG. 8C

EX1026 FIG. 8C (annotated), ¶¶[0123], [0125]; EX2031, ¶¶225-26.

For example, earbud housing 16 “may be at least partially reflective to scatter light [from emitters 24],” such that “optical energy 111 may exit the earbud 30 through apertures 34*a*, 34*b* in the housing 16 and cover 18,” and those apertures 34*a*-34*b* are also for “sound from the speaker 22” to pass through. EX1026, FIGS. 8A-8C, ¶¶[0123], [0125]; EX2031, ¶¶225-26. Earbud housing 16 “is in acoustical communication with [that] speaker 22” and “configured to be positioned within an ear.” EX1026, FIGS. 8A-8C, ¶[0123]; EX2031, ¶¶225-26. Cover 18 “surrounds the earbud housing 16,” such that together they define light guiding region 19, and cover 18 “collects ... and delivers ... collected light to the optical detectors 26.” EX1026, FIGS. 8A-8C, ¶[0123]; EX2031, ¶¶225-26. The optical emitters 24 and detectors 26 are arranged relative to speaker 22, earbud housing 16, and cover 18, and all are positioned relative to base 50. EX1026, FIGS. 8A-8C, ¶¶[0123], [0125]; EX2031, ¶¶225-26.

A POSITA would have further understood, as LeBoeuf teaches, that these related components are earbud-specific and that this configuration in Figure 8C—including the alleged reflective surface and the related components upon which it is premised—is specific to an earbud, including the unique physical aspects of guiding sound and light relative to the ear. EX1026, FIG. 8C, ¶¶[0123]-[0125] (“light guiding earbud 30”; “earbud housing 16 ... configured to be positioned within an

ear”; “earbud housing 16 is in acoustical communication with a speaker 22 and ... aperture 34a through which sound ... can pass”; “cover 18 includes ... aperture 34b through which sound ... can pass”; “light guiding region 19”; “cover 18 ... delivers light ... into an ear canal” and “delivers ... collected light to the optical detectors”; “earbud housing 16 ... at least partially reflective to scatter light within the cavity defined by the earbud housing 16” such that “optical energy 111 may exit the earbud 30 through apertures 34a, 34b in the housing 16 and cover 18”); EX2031, ¶227. For example, the alleged reflective surface is within an earbud housing 16 and reflects light from emitters positioned relative to a speaker 22, and optical energy 11 and sound from speaker 22 exit both exit through apertures 34a-34b. EX1026, ¶¶[0123], [0125], FIGS. 8A-8B; EX2031, ¶227.

Lisogurski, in contrast, does not teach or suggest an earbud for placement in an ear, much less teach the related earbud-specific components in LeBoeuf's Figures 8A-8B upon which the alleged arc arrangement is premised. Instead, Lisogurski is limited to sensors for external placement. EX1025, 4:6-20 (describing, at most, placement on an “earlobe” or “around or in front of the ear,” and notably not *within* the ear); EX2031, ¶228.

Because Lisogurski does not teach or suggest an earbud sensor for within an ear, a POSITA would not have been motivated to implement LeBoeuf's alleged reflective surface that, as explained above, is premised on earbud-specific

components and, together with those components, is specific to an earbud. EX1026, FIG. 8C, ¶¶[0123], [0125]; EX1025, 4:6-20; EX2031, ¶231. Further, because Lisogurski does not include the related components upon which LeBoeuf's alleged reflective surface is premised and Petitioners do not argue to implement them into Lisogurski, a POSITA would have had neither the motivation nor capability to implement LeBoeuf's alleged reflective surface in Lisogurski. EX1026, FIG. 8C, ¶¶[0123], [0125]; Pet., 52-53; EX2031, ¶230.

Petitioners improperly ignore the full teachings of the references, including by failing to recognize, as explained above, that (i) LeBoeuf's alleged reflective surface is premised on other, earbud-specific components and is part of an earbud-specific configuration in Figure 8C, and (ii) Lisogurski does not teach an earbud. Pet., 53-54, 59-60; EX2031, ¶229; *Panduit*, 810 F.2d at 1568 (a reference "must be considered in its entirety, ... including portions that would lead away").

C. Ground 3: Alleged Obviousness Based on Lisogurski and Tran (Claims 1, 8, 12, 15)

In Ground 2, Petitioners argue that claims 1, 8, 12, and 15 of the '455 Patent are obvious over Lisogurski in view of Tran. Pet., 8, 60-73. For at least the reasons discussed below, Petitioners fail to meet their burden. EX2031, ¶¶232-39.

1. Independent Claims 1, 8, and 15

For Ground 3, Petitioners' analysis of independent claims 1, 8, and 15 focuses on limitations [1.pre], [8.pre], and [15.pre] and does not address the deficiencies discussed above regarding Lisogurski with respect to limitation [1.b], [8.b], [15.b], and [15.n] for Grounds 1-2 or rely upon Tran to cure those deficiencies. Pet., 60-73. Therefore, Lisogurski and Tran do not render obvious claims 1, 8, and 15 for at least the same reasons discussed above for claims 1, 8 and 15. *Supra*, §§VII.A.1-2 (claims 1 and 8), VII.B.5 (claim 15); EX2031, ¶¶233-35.

Additionally, independent claim 15 **cannot** be rendered obvious in Ground 3 because the Petition's only analysis of limitation [15.n] (in Ground 2) relies upon LeBoeuf but LeBoeuf is not asserted in Ground 3. Pet. 55-58 (relying on LeBoeuf for the arc limitation in claim 2 and relying, in turn, on Petitioners' claim 2 analysis for limitation 15[n], which includes the same arc limitation); EX2031, ¶236. Ground 3 asserts the combination of only Lisogurski and Tran, but (i) Petitioners recognize that Lisogurski is deficient regarding limitation [15.n], as Petitioners rely on LeBoeuf for limitation [15.n] in Ground 2, and (ii) Petitioners' analysis in Ground 3 does not address Lisogurski's deficiency regarding limitation [15.n] or rely upon Tran to cure that deficiency, as Ground 3 does not even address limitation [15.n]. Pet., 55-58, 60-73; EX2031, ¶236.

This apparent oversight in Ground 3 regarding independent claim 15, in which the “ground[] ... ha[s] not been sufficiently developed,” demonstrates the Petition’s “unfocused approach” and “unfocused grounds,” and as the Director recognized in *Zhuhai*, this warrants denial of institution. IPR2025-00405, Paper 24 at 2-4; *supra*, §VI.

2. Dependent Claim 12

Claim 12 depends indirectly from independent claim 8. Petitioners’ analysis of claim 12 (which relies on their analysis claim 5 below in Ground 4) does not address the deficiencies discussed above regarding claim 8 in Ground 1 or rely upon Tran to cure those deficiencies. Pet., 71, 65-68. Therefore, Lisogurski and Tran do not render obvious claim 12 for at least the same reasons as claim 8. *Supra*, §VII.A.2; EX2031, ¶¶237-39.

D. Ground 4: Alleged Obviousness Based on Lisogurski, LeBoeuf, and Tran (Claims 5-7, 13-14, 18-20)

In Ground 2, Petitioners argue that claims 5-7, 13-14, and 18-20 of the ’455 Patent are obvious over Lisogurski in view of LeBoeuf and Tran. Pet., 8, 60-73. For at least the reasons discussed below, Petitioners fail to meet their burden. EX2031, ¶¶240-64.

1. Dependent Claim 5

Claim 5 depends from claim 2 and independent claim 1. Petitioners’ analysis of claim 5 does not address the deficiencies discussed above for claim 1 in Ground

1 or claim 2 in Ground 2 and does not rely on Tran to cure those deficiencies. Pet., 65-68. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 5 for at least the same reasons as claims 1 and 2. *Supra*, §§VII.A.1, VII.B.1; EX2031, ¶¶241-43.

2. Dependent Claim 6: Lisogurski, LeBoeuf, and Tran Do Not Render Obvious the Reflective Surface Limitation

Claim 6 depends from claim 2 and independent claim 1. Petitioners' analysis of claim 6 (which relies on their analysis of claim 17) does not address the deficiencies discussed above for claim 1 in Ground 1 or for claim 2 in Ground 2 and does not rely on Tran cure those deficiencies. Pet., 68, 59-60. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 6 for at least the same reasons as claims 1 and 2. *Supra*, §§VII.A.1, VII.B.1; EX2031, ¶¶244-46.

Additionally, claim 6 includes the same reflective surface limitation as claim 17 (i.e., "wherein the wearable device further comprises a reflective surface to receive and redirect at least some of the output optical light from the plurality of semiconductor sources"). EX1001, 87:51-54, 90:23-26; Pet., x, xvi. For claim 6, Petitioners rely on their analysis of claim 17 in Ground 2 and do not rely on Tran to cure the deficiencies discussed above for claim 17. Pet., 68. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 6 for at least the same reasons as claim 17. *Supra*, §VII.B.7; EX2031, ¶¶247-49.

3. Dependent Claim 7

Claim 7 depends from claim 6 and indirectly from claim 2 and independent claim 1. Petitioners' analysis of claim 7 does not address the deficiencies discussed above regarding claim 1 in Ground 1, does not rely upon LeBoeuf or Tran to cure those deficiencies regarding claim 1, does not address the deficiencies discussed above regarding claim 2 over Lisogurski and LeBoeuf in Ground 2, does not rely upon Tran to cure those deficiencies regarding claim 2, and does not address the deficiencies discussed above regarding claim 6 here in Ground 4. Pet., 68-70. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 7 for at least the same reasons discussed above for claims 1, 2, and 6. *Supra*, §VII.A.1 (claim 1), §VII.B.1 (claim 2), §VII.D.2 (6); EX2031, ¶¶250-52.

4. Dependent Claim 13: Lisogurski, LeBoeuf, and Tran Do Not Render Obvious the Reflective Surface Limitation

Claim 13 depends indirectly from independent claim 8. Petitioners' analysis of claim 13 (which relies on their analysis of claim 17) does not address the deficiencies discussed above for claim 8 in Ground. Pet., 71, 59-60. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 13 for the same reasons as for claim 8. *Supra*, §VII.A.2; EX2031, ¶¶253-55.

Additionally, claim 13 recites "wherein the wearable device further comprises a reflective surface positioned to receive and redirect at least some of the output

optical light from the plurality of semiconductor sources,” which is substantially similar to the reflective surface limitation in claims 17 and 6 discussed above (except for the term “positioned”). EX1001, 88:64-67, 90:23-26, 87:51-54; Pet., xiii-xiv, xvi, x. For claim 13, Petitioners rely on their analysis of claim 17 in Ground 2. Pet., 71. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 13 for the same reasons as claim 17. *Supra*, §VII.B.7; EX2031, ¶¶256-58.

5. Dependent Claim 14

Claim 14 depends indirectly from independent claim 8. Petitioners' analysis of claim 14 (which relies on their analysis of claim 7) does not address the deficiencies discussed above regarding claim 8 in Ground 1 and does not rely upon LeBoeuf or Tran to cure those deficiencies. Pet., 71, 68-70. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 14 for the same reasons as claim 8. *Supra*, §VII.A.2; EX2031, ¶¶259-61.

6. Dependent Claims 18-20

Claims 18-20 each depend (directly or indirectly) from claim 17 and independent claim 15. Petitioners' analysis of claims 18-20 (which relies on their analysis of claims 5 and 7 for claims 18 and 20, respectively) does not address the deficiencies discussed above for claims 15 and 17 in Ground 2 and does not rely upon Tran to cure those deficiencies. Pet., 71-73, 65-70. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claims 18-20 for at least the same reasons

as claims 15 and 17. *Supra*, §§VII.B.5 (claim 15), VII.B.7 (claim 17); EX2031, ¶¶262-64.

E. Ground 5: Alleged Obviousness Based on Lisogurski and Carlson (Claims 1, 8, 11)

In Ground 5, Petitioners argue that claims 1, 8 and 11 of the '455 Patent are obvious over Lisogurski in view of Carlson. Pet., 8, 73-80. Ground 5 is similar to Ground 1 except that Ground 5 further addresses limitations [1.c] and [8.c] in view of Carlson. Pet., 8, 73-80; EX2031, ¶266. Ground 5 does not address the deficiencies discussed above regarding claims 1, 8, and 11 in Ground 1, including for limitations [1.b] and [8.b], or rely on Carlson to cure those deficiencies. *See* Pet., 73-80. Therefore, Petitioner failed to meet its burden for Ground 5 for at least the same reasons as Ground 1. *Supra*, §VII.A; EX2031, ¶¶265-67.

F. Ground 6: Alleged Obviousness Based on Lisogurski, LeBoeuf, and Carlson (Claims 2-4, 9-10, 15-17)

In Ground 6, Petitioners argue that claims 2-4, 9-10, and 15-17 of the '455 Patent are obvious over Lisogurski in view of LeBoeuf and Carlson. Pet., 8, 73-80. Ground 6 is similar to Ground 2 except that Ground 6 further addresses limitation [15.c] in view of Carlson. Pet., 8, 73-80; EX2031, ¶269. Ground 6 does not address the deficiencies discussed above for claims 2-4, 9-10, and 15-17 in Ground 2, including for limitations [15.b] and [15.n], or rely on Carlson to cure those deficiencies. *See* Pet., 73-80. Therefore, Petitioners failed to meet their burden for

Ground 6 for at least the same reasons as Ground 2. *Supra*, §VII.B; EX2031, ¶¶268-70.

G. Ground 7: Alleged Obviousness Based on Lisogurski, Tran, and Carlson (Claims 1, 8, 12, 15)

In Ground 7, Petitioners argue that claims 1, 8, 12, and 15 of the '455 Patent are obvious over Lisogurski in view of Tran and Carlson. Pet., 8, 73-80. Ground 7 is similar to Ground 3 except that Ground 7 further addresses limitations [1.c], [8.c], and [15.c] in view of Carlson. Pet., 8, 73-80; EX2031, ¶272. Ground 7 does not address the deficiencies discussed above regarding claims 1, 8, 12, and 15 in Ground 3, including for limitations [1.b], [8.b], [15.b], and [15.n], or rely on Carlson to cure those deficiencies. *See* Pet., 73-80. Therefore, Petitioners failed to meet their burden for Ground 7 for at least the same reasons as Ground 3. *Supra*, §VII.C; EX2031, ¶¶271-73.

H. Ground 8: Alleged Obviousness Based on Lisogurski, LeBoeuf, Tran, and Carlson (Claims 5-7, 13-14, 18-20)

In Ground 8, Petitioners argue that claims 5-7, 13-14, and 18-20 of the '455 Patent are obvious over Lisogurski in view of LeBoeuf, Tran, and Carlson. Pet., 8, 73-80. Ground 8 is similar to Ground 4 except that Ground 8 further addresses claims 7, 14, and 20 in view of Carlson. Pet., 8, 73-80; EX2031, ¶275. Ground 8 does not address the deficiencies discussed above with respect to claims 5-7, 13-14, and 18-20 in Ground 4. Pet., 73-80. Therefore, Petitioner failed to meet its burden for

Ground 8 for at least the same reasons as for Ground 4. *Supra*, §VII.D; EX2031, ¶¶274-76.

VIII. CONCLUSION

For at least the foregoing reasons, the Petition should be denied as to each of the requested grounds. For brevity, Patent Owner may not have addressed all characterizations of the applied references and the challenged claims and reserves the right to do so should institution be granted. The absence of a response by Patent Owner to any of the positions presented in the Petition or the associated expert declaration is not a concession to those positions. The fact that Patent Owner's Preliminary Response has focused on particular arguments is not a concession that there are no other arguments for patentability of the challenged claims.

Respectfully submitted,

Dated: November 12, 2025

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CERTIFICATION OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the foregoing Patent Owner's Preliminary Response is produced using a 14-point Times New Roman font and contains approximately 11,965 words, which is less than the 14,000 total words permitted by the U.S. Patent Trial and Appeal Board rules. Counsel relies on the word count of the computer program used to prepare the response on November 12, 2025.

By: /s/ Jennifer Hayes

Lead Counsel for Patent Owner

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing **Patent Owner's Preliminary Response** was served on November 12, 2025, by email:

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