

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 RESPONSE

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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

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
2030	Reserved
2031	Withdrawn

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)
2037-2039	Reserved
2040	Email exchange between Petitioners and Patent Owner concerning indefiniteness contentions.
2041-2042	Reserved
2043	Declaration of Prof. Igor Efimov, Ph.D. dated May 7, 2026 (CONFIDENTIAL)
2044	Updated <i>curriculum vitae</i> of Prof. Igor Efimov, Ph.D.
2045	Transcript of Apr. 17, 2026 Deposition of Dr. Brian W. Anthony
2046	Transcript of Apr. 18, 2026 Deposition of Dr. Brian W. Anthony
2048-2099	Reserved
2100	Declaration of Dr. Mohammed Islam (CONFIDENTIAL)
2101	OMS_SAM0031768 (CONFIDENTIAL)
2102	OMS_SAM0031776 (CONFIDENTIAL)
2103	OMS_SAM0031782 (CONFIDENTIAL)
2104	OMS_SAM0031797 (CONFIDENTIAL)
2105	OMS_SAM0031867 (CONFIDENTIAL)
2106	OMS_SAM0031851 (CONFIDENTIAL)
2107	OMS_SAM0031961 (CONFIDENTIAL)

2108	U.S. Patent No. 5,632,272 to Diab et al. (“Masimo ‘272 Patent”)
2109	U.S. Patent No. 7,738,935 to Turcott (“Pacesetter ‘935 Patent”)
2110	U.S. Patent No. 6,126,595 to Amano et al.
2111	Fitbit ‘854 Publication
2112	GE Dash 2000 Patient Monitor Operating Manual
2113	Accuracy in wrist-worn, sensor-based measurements of heart rate and energy expenditure in a diverse cohort, Scherbina et. al, (Stanford 2016)
2114	Are Currently Available Wearable Devices for Activity Tracking and Heart Rate Monitoring Accurate, Precise, and Medically Beneficial” El-Amrawy et al., Healthcare Informatics Research (2015)
2115	A review of wearable sensors and systems with application in rehabilitation, Patel et. al, Journal of Neuroengineering and Rehabilitation, 2012
2116	Samsung Watch Infringement Claim Chart
2117	Declaration of Dr. Mohammed Islam (REDACTED)
2118	Declaration of Prof. Igor Efimov, Ph.D. dated May 7, 2026 (REDACTED)

Omni MedSci, Inc. (“Patent Owner”) submits this Response 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”). Petitioners have not shown any challenged claim is unpatentable.

I. INTRODUCTION

Petitioners have not met their burden to show any challenged claim is unpatentable. First, Petitioners fail to establish obviousness of the “driver” limitation recited in the independent claims. Petitioners rely on a prior Board finding that accepted relocating Lisogurski’s drive circuitry into a sensor. However, neither the prior decision nor the Petition adequately address why Lisogurski’s light drive circuitry would allegedly be relocated to its light source. A POSITA would not have made this modification given Lisogurski’s teaching that the drive circuitry sends signals to the light source and the associated thermal design concerns.

Second, Petitioners fail to show that the “arc” and “reflective surface” limitations would have been obvious based on LeBoeuf. The arrangement of detectors and emitters in LeBoeuf is dictated by the fact that the device is an earbud and there is no teaching or suggestion in LeBoeuf that an arc arrangement provides any benefits. What is more, Petitioners’ arguments are internally contradictory. On

one hand, Petitioners argue for arranging emitters in an arc to increase the illuminated area. On the other hand, Petitioners argue for adding a reflective surface to minimize the illuminated area. Third, collateral estoppel does not apply because the challenged claims contain materially different limitations which were not at issue in any prior IPR. In much of his declaration, Petitioners' expert, Dr. Anthony, merely quotes prior Board decisions and incorporates by reference his prior testimony rather than providing independent technical analysis.

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; EX2043, ¶54.¹ 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; EX2043, ¶54.

¹ Pursuant to p. 51 of the Trial Practice Guide, Patent Owner withdraws its reliance on the Declaration of Igor Efimov, Ph.D. (EX2031) submitted with Patent Owner's Preliminary Response.

An exemplary physiological measurement system is depicted in Figure 24:

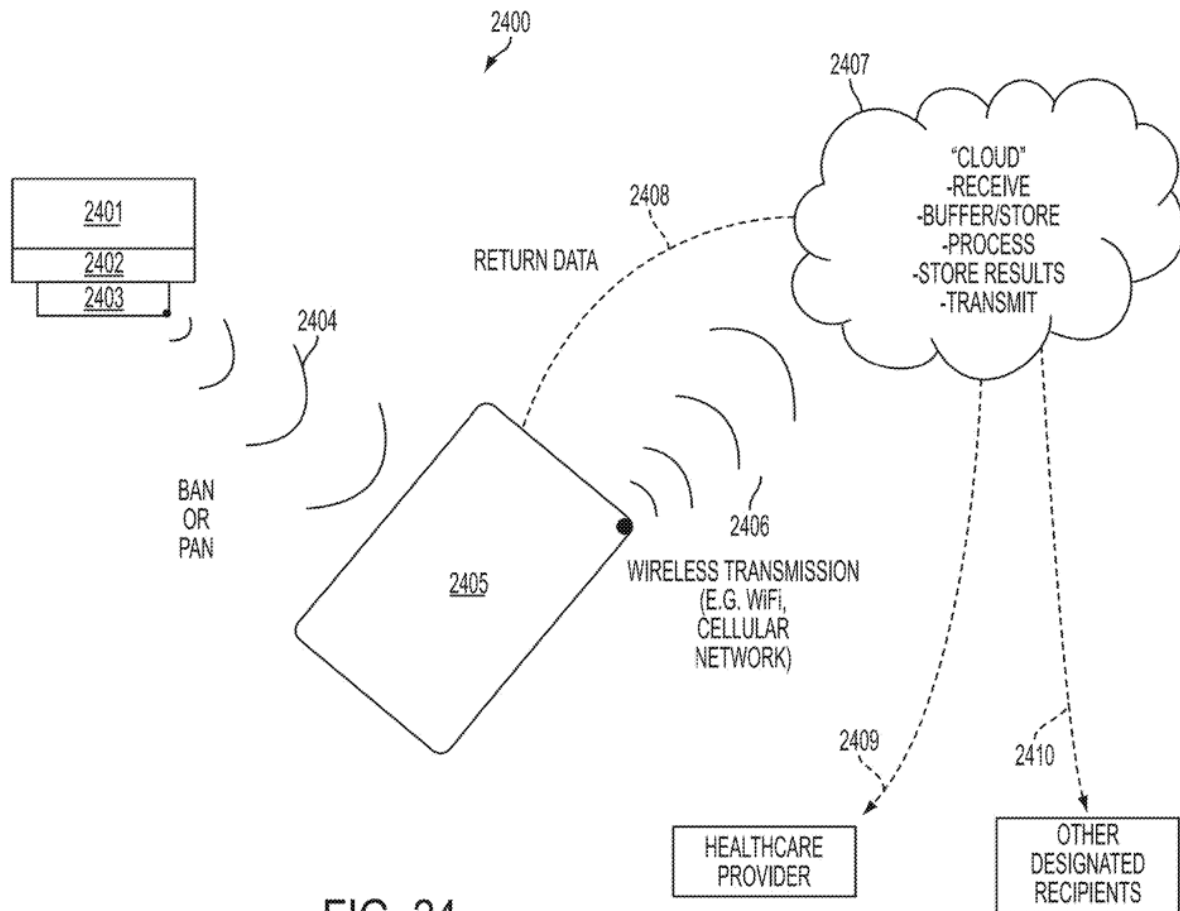


FIG. 24

EX1001, FIG. 24, 12:1-6; EX2043, ¶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; EX2043, ¶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; EX2043, ¶56. The '455 Patent also discloses that the wearable device may include a reflective surface to receive and redirect at least some

of the optical light from the plurality of semiconductor sources. EX1001, 87:51-54, 88:64-67, 90:23-26; EX2043, ¶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; EX2043, ¶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:

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 Response, Patent Owner adopts Petitioners' proposed definition. EX2043, ¶¶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 based on 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; EX2043, ¶80. The system is illustrated in

Figures 3 and 1:

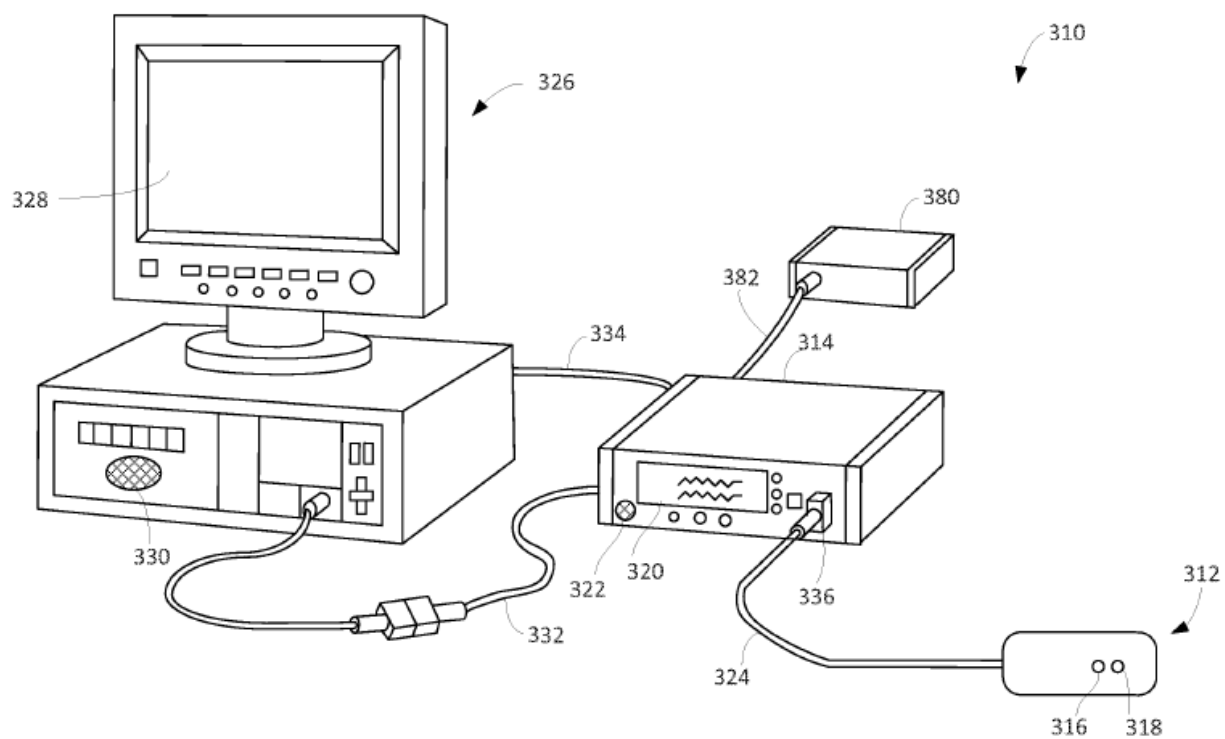


FIG. 3

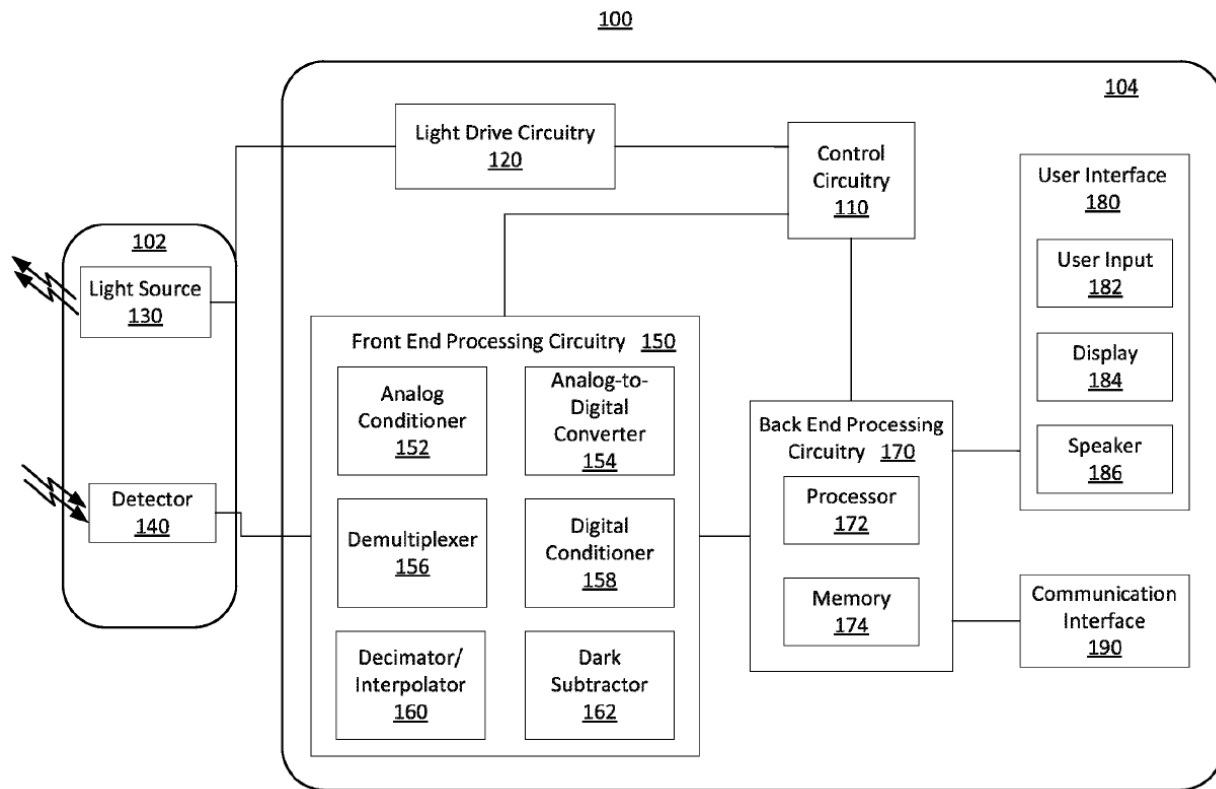


FIG. 1

EX1025, FIGS. 3, 1; EX2043, ¶80. A subject wears sensor unit 312, while other components are included for system calibration, data processing, and displaying information. EX1025, 17:54-18:15, 18:32-67; EX2043, ¶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; EX2043, ¶80.

Front end processing circuitry 150 processes that signal. EX1025, 12:42-49; EX2043, ¶80. Then, “[p]rocessor 172 may receive and process physiological signals received from front end processing circuitry 150. For example, processor 172 may

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

FIG. 3

EX1026, FIG. 3, ¶[0042]; EX2043, ¶81.

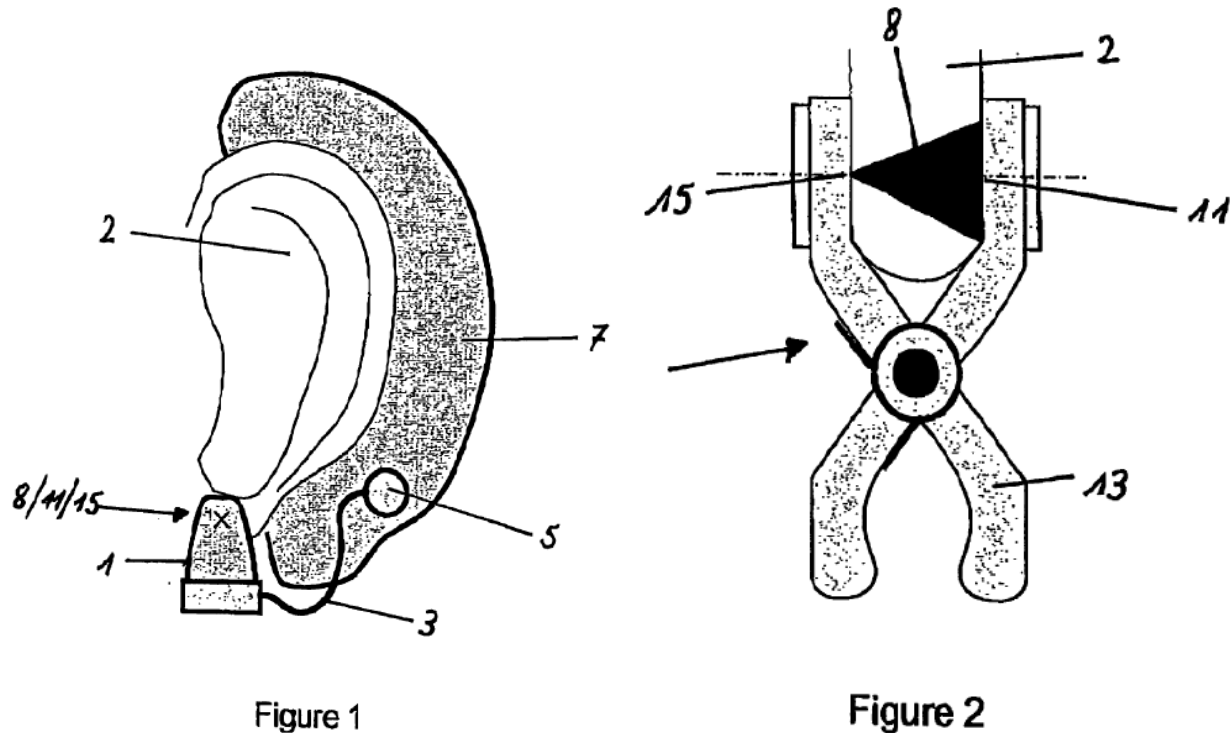
The light-guiding earbuds include a speaker, such as speaker 22 shown in Figure 3, an earbud housing 16 in acoustical communication with the speaker 22, and apertures 34*a*-34*b* through which sound from the speaker 22 can pass. EX1026, ¶¶[0006], [0009], [0102], FIG. 3; EX2043, ¶81. The light-guiding 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; EX2043, ¶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, temperature, blood gas levels, heart rate, blood flow, etc. EX1026, ¶[0010]; EX2043, ¶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; EX2043, ¶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; EX2043, ¶82. The wearable appliance may include sensors and may non-invasively measure blood pressure. EX1027, 4:62-65, 9:23-30; EX2043, ¶82.

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

Carlson describes a non-invasive optical pulse oximeter. EX1028, ¶[0002]; EX2043, ¶83. The oximeter is designed to be clipped onto a user's ear. EX1028, ¶¶[0048]-[0049]; EX2043, ¶83. This is illustrated in Figures 1 and 2:



EX1028, FIGS. 1-2; EX2043, ¶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]; EX2043, ¶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]; EX2043, ¶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 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.*

While Patent Owner does not believe construction is necessary to find that Petitioners failed to meet their burden, for completeness, Patent Owner notes that the Board previously construed the following phrase in a related patent:

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)
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VI. PETITIONERS FAILED TO MEET THEIR BURDEN

For the reasons discussed below, Petitioners failed to carry their burden to show any claim of the '455 Patent is unpatentable.

A. Petitioners Have Not Shown That Collateral Estoppel Applies to the Challenged Claims

Petitioners argue that collateral estoppel applies to “[t]he vast majority of the Challenged Claims.” Pet., 18-20, 1-3. Petitioners’ collateral estoppel argument is based on two previous Board decisions, one involving related U.S. Patent No. 9,651,533 (“the '533 Patent,” EX1081), that found certain claims unpatentable in IPR2019-00916 (“the '533-IPR”) and another involving related U.S. Patent No. 10,517,484 (“the '484 Patent,” EX1082) in IPR2021-00453 (“the '484-IPR”). Pet., 18-20. While the '533 and '484 Patents are related to the '455 Patent, the challenged claims include materially different limitations that were not addressed in the '533-FWD (EX1008) or '484-FWD (EX1015).

Collateral estoppel requires that “(1) the issue is identical to one decided in the first action; (2) the issue was actually litigated in the first action; (3) resolution of the issue was essential to a final judgment in the first action; and (4) [the party against whom collateral estoppel is asserted] had a full and fair opportunity to litigate

the issue in the first action.” *In re Freeman*, 30 F.3d 1459, 1465 (Fed. Cir. 1994). Collateral estoppel does not apply to patent “claims [that] present materially different issues that alter the question of patentability” relative to the prior adjudication. *MaxLinear, Inc. v. CF CRESPE LLC*, 880 F.3d 1373, 1377-78 (Fed. Cir. 2018).

Collateral estoppel does not apply to the challenged claims for three reasons. First, “[c]ollateral estoppel does not apply because there are differences between the claim limitation at issue here and the adjudicated claim limitations at issue in the prior IPRs.” *Palo Alto Networks, Inc. v. Centripetal Networks, Inc.*, IPR2021-01153, Paper 10 at 18 (PTAB Jan. 24, 2022). Second, neither prior IPR decision addressed all the claim limitations. Third, collateral estoppel does not apply for the ‘484-RFWD because it is not final, and the lack-of-incentive to litigate exception applies for the ‘484-FWD.

1. The Challenged Claims Contain Additional Limitations that Present Materially Different Patentability Issues

The challenged claims of the ‘455 Patent contain additional limitations that were not at issue and therefore not addressed in either of the prior IPR decisions. Petitioners and Dr. Anthony both admit that the challenged claims include “[a]dditional limitations.” Pet., 3; EX1003, ¶109 n.2 (admitting there are “new limitations” in the ‘455 Patent); EX2046, 303:5-8, 303:18-23, 306:8-307:8.

For example, independent claims 1, 8, and 15 recite “a light source comprising a driver.” EX1001, 86:46-47, 87:63, 89:9-10. The claims of the ‘533 and ‘484 Patents at issue in the prior IPRs did not recite a “driver.” EX1081, 28:51-32:23; EX1082, 36:45-40:55; EX2043, ¶86; EX2046, 307:19-25. As another example, claims 1, 9, and 16 require “three optical wavelengths.” EX1001, 87:22-23, 88:43-44, 90:13-14. None of the claims of the ‘533 and ‘484 Patents require *three* wavelengths. EX2046, 309:11-22; EX2043, ¶86; EX1081, 28:51-32:23; EX1082, 36:45-40:55.

Claim 1 also requires that “the optical wavelengths comprise near infrared or visible wavelengths.” EX1001, 87:25-26. This too was not recited in the claims of the ‘533 and ‘484 Patents. EX2046, 309:23-310:10; EX2043, ¶87; EX1081, 28:51-32:23; EX1082, 36:45-40:55. Independent claim 8 recites “wherein the plurality of semiconductor sources comprises six light emitting diodes.” EX1001, 88:38-39. This is another new limitation. EX2046, 310:16-25; EX2043, ¶87; EX1081, 28:51-32:23; EX1082, 36:45-40:55.

Independent claim 15 and dependent claims 2 and 9 each recite that “the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more arcs.” EX1001, 87:27-31, 88:40-42. **None** of the claims considered in the prior IPRs recited an “arc.” EX2046, 312:20-313:12; EX2043, ¶88; EX1081, 28:51-32:23; EX1082, 36:45-40:55. Notably, Grounds 2, 4, 6, and 8 rely

on LeBoeuf as allegedly teaching the claimed “arc” arrangement but LeBoeuf was not relied on in the prior IPRs. Pet., 55-58; EX1008; EX1015. This confirms that claims 2, 9 and 15 of the ‘455 Patent present materially different issues of patentability. *MaxLinear*, 880 F.3d at 1377-78.

Dependent claims 6, 13, and 17 each recite “a reflective surface [positioned] to receive and redirect at least some of the output optical light.” EX1001, 87:50-54, 88:64-67, 90:21-25. **None** of the claims addressed in the prior IPRs recited a “reflective surface.” EX2046, 316:6-24; EX2043, ¶89; EX1081, 28:51-32:23; EX1082, 36:45-40:55. Petitioners again rely on LeBouef—which was not at issue in the prior IPRs—as allegedly teaching the “reflective surface” in claims 6, 13, and 17. Pet., 58-60; EX1008; EX1015. Thus, claims 6, 13, and 17 of the ‘455 Patent present materially different issues of patentability. *MaxLinear*, 880 F.3d at 1377-78.

Dependent claim 11 also contains two additional limitations: (1) that “the output optical light comprises wavelengths between 600 nanometers and 1,000 nanometers to measure a level of oxyhemoglobin and deoxyhemoglobin” and (2) “the output signal corresponding to at least one of the optical wavelengths is used to improve measurement of the one or more physiological parameters using the output signal corresponding to the other two optical wavelengths.” EX1001, 88:48-54; EX2043, ¶90; EX2046, 311:6-312:15; EX1081, 28:51-32:23; EX1082, 36:45-40:55.

Dependent claim 5 adds that “the system is configured to apply one or more

regression signal processing methodologies to at least a part of the output signal.”
EX1001, 87:46-49; EX2046, 314:19-315:10; EX2043, ¶91; EX1081, 28:51-32:23;
EX1082, 36:45-40:55.

2. Neither Prior IPR Decision Addresses All Limitations

Petitioners' collateral estoppel arguments are also flawed because they attempt a piecemeal approach, relying on the '533-FWD for some limitation and the '484-FWD for others. For example, for independent claim 1, Petitioners do not cite or rely on the '533-FWD for limitations [1.a], [1.f], [1.h], [1.j], [1.k], [1.l], or [1.m]. Pet., 29, 34-36, 39-40, 42-47. Petitioners do not cite or rely on the '484-FWD for limitations [1.b] or [1.m]. Pet., 30-31, 45-47. Petitioners' piecemeal approach also combines findings from the '533-FWD and '484-FWD to attempt to address the motivation to combine. Pet., 25-45, 62-80.

Petitioners provide no authority for this approach. Pet., 18-19. The only precedential authority that Petitioners cite—*Google LLC v. Hammond Dev. Int'l*, 54 F.4th 1377, 1381-82 (Fed. Cir. 2022)—addressed applying collateral estoppel to entire “claim[s]” based on a prior Board decision, not applying portions of different decisions to different claim limitations. Petitioners' reliance on *Samsung Elecs. Co., Ltd. v. Netlist, Inc.*, IPR2025-00002, Paper 17 at 17-24 (PTAB May 15, 2025) is misplaced because that decision applied estoppel to claims in their entirety (not individual limitations). None of the cases cited in the Petition support Petitioners'

suggestion collateral estoppel applies where one prior decision addresses some aspects of the claim and another addresses other aspects of the claims.

Even if Petitioners' piecemeal approach were allowed, the Petition fails to sufficiently show that the relevant limitations of the '455 patent are equivalent to adjudicated limitations in the '533 and '484 Patents. Pet., 18-19. Petitioners provide a conclusory list of limitations to which collateral estoppel purportedly applies (including only "partially" for some limitations), with no detailed comparison of those limitations to adjudicated limitations in the '533 and '484 Patents. And, Petitioners' conclusory listing is wrong because it includes the "entire[ty]" of limitations [1.b], [8.b], and [15.b], which recite the "driver" limitation that, as explained above, is not included in the claims of the '533 or '484 Patents.

3. The '484-FWD Does Not Give Rise to Collateral Estoppel

In the '484-FWD, the Board found claims 1, 2, 7, and 15-23 of the '484 Patent unpatentable based on combinations of Lisogurski, Carlson, Tran, Isaacson, and/or Valencell-093. EX1015, 61. However, the Board found claims 3-6 and 8-14 of the '484 Patent *not* unpatentable because the prior art failed to disclose "identify[ing] an object" under the Board's claim construction. *Id.*, 51-52, 61. Apple appealed this finding, and the Federal Circuit vacated and remanded. *Apple Inc. v. Omni MedSci, Inc.*, No. 2023-1034, 2024 WL 3084509, at *7 (Fed. Cir. June 21, 2024). On remand,

the Board reversed course. EX1016. That decision is currently on appeal.² EX1091.

One “exception[] to issue preclusion even when the basic requirements for issue preclusion are satisfied” is “a lack of...incentive to litigate the first action.” *Power Integrations, Inc. v. Semiconductor Components Indus., LLC*, 926 F.3d 1306, 1313 (Fed. Cir. 2019). In this case, Patent Owner lacked incentive to litigate the Board's unpatentability findings for claims 1, 2, 7, and 15-23 of the '484 Patent since it prevailed on claims 3-6 and 8-14 (i.e., approximately half the challenged claims). EX1015, 61. Thus, collateral estoppel does not apply. *Oren Techs., LLC v. Proppant Express Invs. LLC*, No. 2019-1778, 2021 WL 3120819, at *3 (Fed. Cir. July 23, 2021) (holding that collateral estoppel did not apply to a prior IPR decision, in part, “because of the survival of a claim” in the prior IPR meant that Patent Owner lacked incentive to litigate the other claims); *see also Power Integrations*, 926 F.3d at 1313 (holding that collateral estoppel did not apply because litigant “had a considerably greater incentive” to litigate an issue in a second IPR compared to a prior IPR).

B. Petitioners' Expert Merely Quotes Prior Decisions and Improperly Incorporates by Reference Prior Testimony

Petitioners' mistaken view that the result of this IPR is preordained in view of

² The '484-RFWD is not “final” and does not give rise to collateral estoppel. *United Therapeutics Corp. v. Liquidia Techs., Inc.*, 74 F.4th 1360, 1372 (Fed. Cir. 2023).

the prior IPRs is also evident in Dr. Anthony's declaration. Many of his "opinions" consist of quoting the prior IPR decisions and incorporating by reference his prior testimony. For example, for limitation [1.pre], he quotes the Board's prior decisions, incorporates his prior declarations by reference, and provides no meaningfully new or independent analysis. EX1003, ¶¶109-114. A similar pattern exists for other limitations. *See, e.g.*, EX1003, ¶¶110-13, 116-17, 120-23, 131-32, 139-40, 146-47, 156-58, 163-64, 171-72, 176-77, 184, 188, 192-93, 376, 379, 385, 395-99, 415, 417, 428, 431-33, 438-40, 445-47.

Dr. Anthony testified that he is "not relying on" the prior decisions and he was "just re-agreeing with myself through the lens of what the [B]oard said." EX2045, 125:9-126:10. Simply quoting what the Board said and agreeing with it is not independent technical analysis. *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15-17 (PTAB Aug. 24, 2022) (precedential) (testimony restating "the petitioner's arguments without any additional supporting evidence or reasoning" is accorded "little weight"); 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"). Moreover, incorporating by reference testimony from different proceedings regarding different patents is improper under the Board's rules. 37 C.F.R. § 42.6(a)(3).

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

Petitioners failed to meet their burden that claims 1, 8 and 11 are obvious over Lisogurski. EX2043, ¶¶92-172.

1. Claim 1

a) Lisogurski Does Not Disclose or Render Obvious the Driver Limitation

Limitation [1.b] recites “a light source *comprising* a driver” (the “driver limitation”). EX1001, 86:46-47;³ EX2046, 308:1-11. 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 does not disclose or render obvious that light source 130 *comprises* the light drive circuitry 120. EX2043, ¶¶93-125.

b) 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”). EX2043, ¶¶99-103. Rather, as depicted FIG. 1 of Lisogurski, drive circuitry 120 (blue) in monitor 104 (green) is separate from light source 130 (red) in sensor 102 (purple):

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

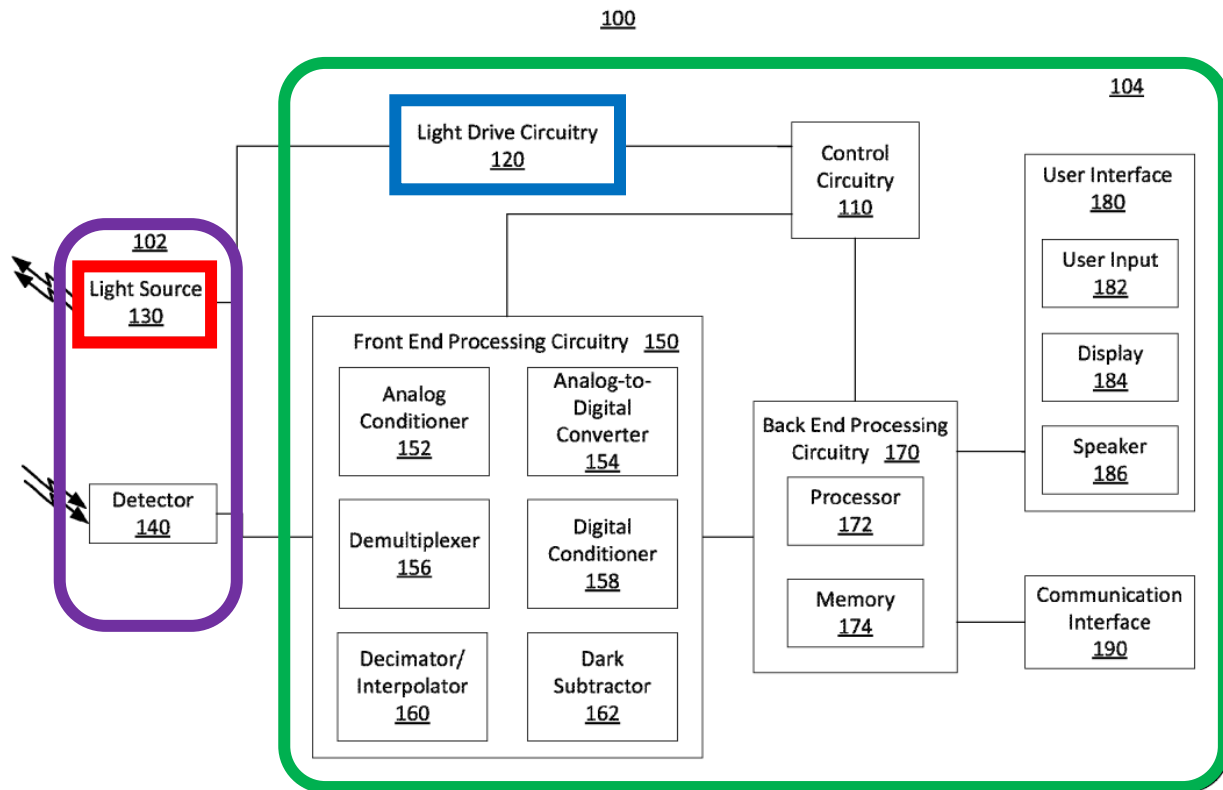


FIG. 1

EX1025, FIG. 1 (annotated), 10:42-49, 11:28-66; EX2043, ¶¶99-103. Accordingly, Petitioners must show that a POSITA would have modified Lisogurski.

(1) Petitioners Do Not Establish Motivation to Modify Lisogurski

With respect to why a POSITA allegedly would have modified Lisogurski to meet the driver limitation, Petitioners merely 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 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 nor the prior IPR decision address relocating drive

circuitry 120 within the light source 130. EX2043, ¶¶103-112.

Petition §IX.B.2 argues: “a POSITA would have been motivated to modify Lisogurski[...]...to ‘relocat[e]...drive circuitry 120...*to sensor 102*’” and “[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, 22-25). That is, as shown below, drive circuitry 120 would be relocated within *sensor 102* (purple), not within *light source 130* (red). Compare Pet., 25-27 (§IX.B.2) with Pet., 31; EX2043, ¶¶107-08.

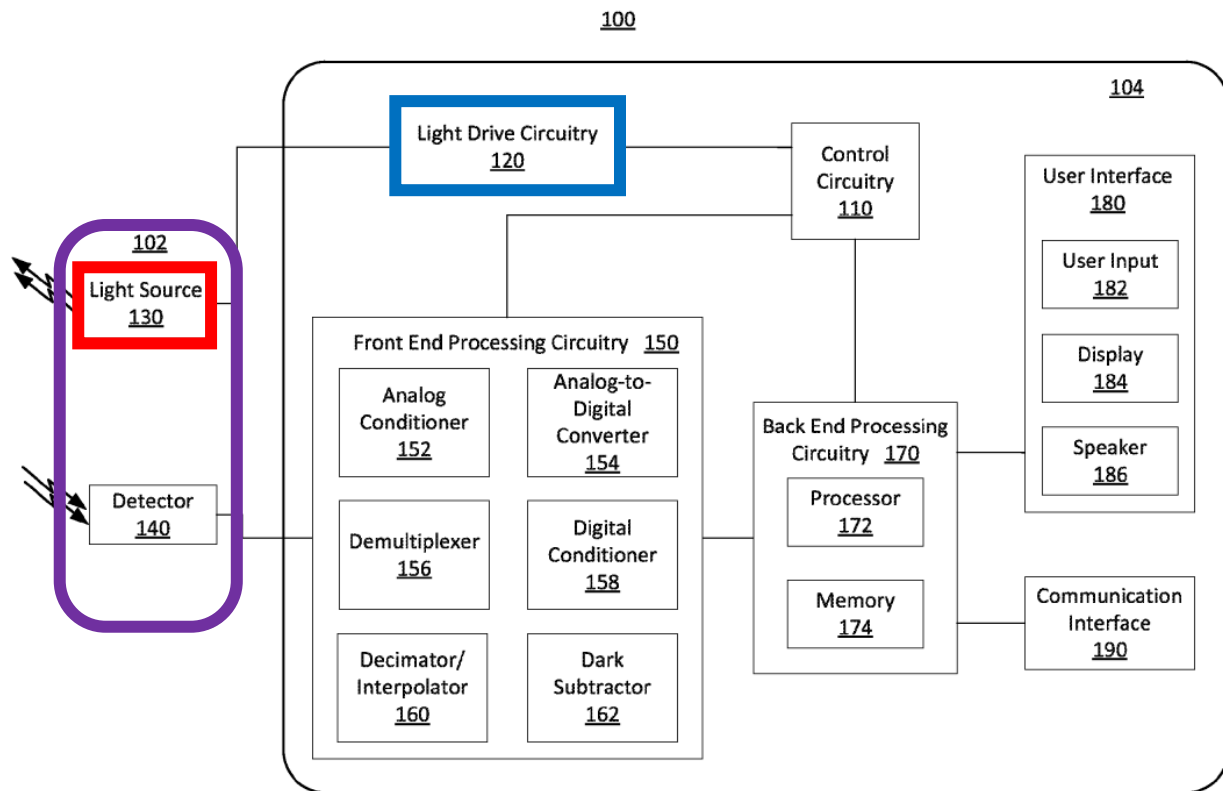


FIG. 1

EX1025, FIG. 1 (annotated)

The Petition suggests that “it was common for light sources to include light drive circuitry,” but this does not address why a POSITA would have been motivated to relocate Lisogurski’s drive circuitry 120 to within light source 130. Pet., 27 (citing EX1031, EX1033-EX1035); EX2043, ¶109. Moreover, Petitioners’ conclusory assertion is unsupported, as Exhibits 1033-1035 relate to processing circuitry rather than drive circuitry. Ex. 1031 only teaches locating “light driver circuit in [a] probe,” not specifically within a light source, according to Petitioners’ own parentheticals. Pet., 27 (citing EX1031, EX1033-35); EX2043, ¶109. Petitioners’ conclusory assertion is also unsupported by their previous argument that the driver circuitry 120 would be relocated to sensor 102. Pet., 25-27; EX2043, ¶109.

Petitioners’ reliance on the ’533-FWD is also misplaced because the proposed modification in the ’533-IPR was to relocate drive circuitry 120 within sensor 102 – 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*”); Pet., 25-26; EX2043, ¶103. The ’533-FWD does not mention light source 130 in the modification to Lisogurski. EX1008, 22-24. In fact, the ’533-FWD discusses drive circuitry 120 sending a drive signal *to* light source 130, showing that the Board did not consider a modification where the light source 130 *comprises* the drive circuitry 120. EX1008, 27, 32-33; EX2043, ¶110.

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; EX2043, ¶111.

While the Petition includes the following annotated figure from the '533-FWD, these annotations were not a finding about relocating drive circuitry 120 into light source 130 because: (1) these annotations came from the '533-IPR petitioner, not the Board, and (2) the '533-FWD's text clarifies that this annotated figure was “[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.

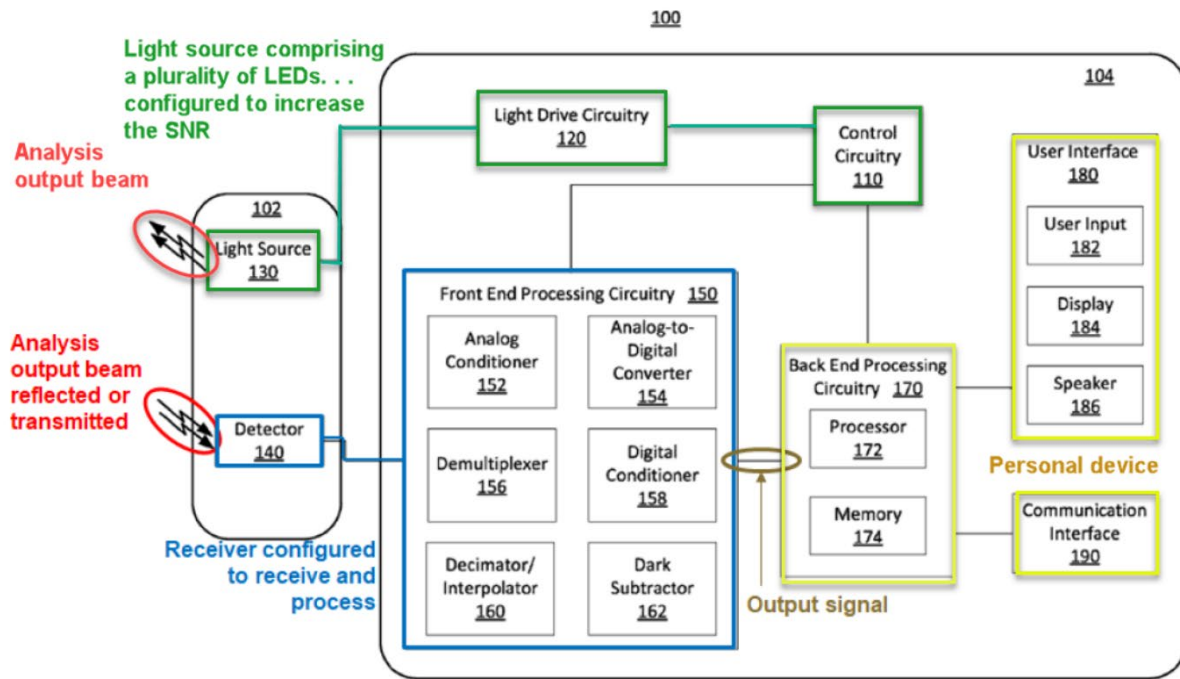


FIG. 1

Pet., 25-26; EX1008, 22-23; EX2043, ¶112.

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). This does not establish any motivation to relocate 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); EX2043, ¶¶114-16. Petitioners also assert that the "Board agreed" with their alleged motivation regarding the components "operat[ing] together" (Pet., 31), but the Board did not address relocating drive circuitry 120 into the light source 130. EX1008, 22-23;

EX2043, ¶¶114-15.

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 sends this signal “*to*” light source 130. EX1025, 11:28-12:6, FIG. 1; EX2043, ¶¶117, 120; *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). Indeed, Dr. Anthony agreed that “the function of...drive circuitry 120,” is to generate a light drive signal that is “provided *to* the light source 130.” EX2045, 51:21-53:12. Based on this teaching, a POSITA would have been dissuaded from such a modification because it would result in light source 130 effectively sending a signal to itself. EX2043, ¶¶117, 120-21 (citing EX1025, 11:28-12:6, FIG. 1).

Even accepting Petitioners’ alleged motivation of “drive circuitry 120 and light source 130 operat[ing] together” (Pet., 31), it shows a POSITA would at most relocate drive circuitry 120 into sensor 102, not into light source 130 itself. EX2043, ¶¶118-20. Petitioners fail to explain why a POSITA would have further relocated drive circuitry 120 to within light source 130 rather than just relocating it “in the same device as the light source [130].” Pet., 26.

Petitioners' expert declaration is also inadequate. Dr. Anthony's only alleged support for relocating drive circuitry 120 to within light source 130 is a lone citation to "Section IX.A.2," which—similar to Petition §IX.B.2 and the '533-FWD discussed above—does not address relocation to within light source 103. EX1003, ¶125 (citing "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"); EX2043, ¶¶104-120. This testimony should be given no weight. *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1361-63 (Fed. Cir. 2019) (reversing obviousness finding based on "unsupported and conclusory" expert testimony); 37 C.F.R. § 42.65(a).

(2) 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 drive circuitry 120 provides or sends the light drive signal "*to*" light source 130. EX1025, 11:28-12:6, FIG. 1; EX2045, 51:21-53:12. A POSITA would not have relocated drive circuitry 120 to within light source 130 because this would cause light source 130 to effectively send a signal to itself, creating unnecessary redundancy and inefficiency. EX2043, ¶122.

Second, a POSITA would not have been motivated to relocate drive circuitry 120 to be within light source 130 because the heat generated by the light source 130 would potentially damage or interfere with the driver circuitry 120. EX1025, 1:17-19, 3:58-60, 5:7-9; EX2036; EX1037, 30-31; EX2043, ¶¶123-24. Lisogurski recognizes the undesirable heating effects of light emitters like light source 130 and teaches that they should be reduced. 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”); EX2043, ¶123.

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 where the light source 130 emits infrared (IR) light for oximetry. Pet., 43-47; EX2043, ¶¶123-24. Dr. Anthony acknowledged that heating effects are a concern depending on the design. EX2045, 104:18-105:14, 107:1-13, 108:22-109:12, 110:18-112:25, 114:11-19. Nevertheless, Dr. Anthony's declaration failed to consider this issue. EX2045, 86:9-87:11 (“I haven't opined in my declaration about heat”), 88:11-21 (“I did not opine about heat...in my declaration”).

Third, the proposed modification would have created unnecessary complications, costs, and design issues for a combined light-source-and-driver. EX2043, ¶125. 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; EX2043, ¶125.

**(3) A POSITA Would Not Relocate Components
from Monitor 104 into Sensor 102**

Petitioners argue that a POSITA would have relocated circuitry from Lisogurski's monitor 104 into sensor 102, and Dr. Anthony reasons that such integration allegedly "enhances the system's efficiency by reducing noise, signal degradation, and latency." EX1003, ¶100; Pet., 25-28. But this modification would degrade the signal-to-noise ratio of the detection signal. EX1025, 9:46-60; EX1003, ¶182; EX2045, 74:3-75:22; EX2043, ¶¶126-136.

Lisogurski's architecture deliberately separates noise-generating components in monitor 104 from the sensitive detector 140 in sensor 102. EX1025, FIG. 1, 10:42-49, FIGS. 3, 17:32-42; EX2043, ¶¶130-131. Relocating control circuitry 110, light drive circuitry 120, and front end processing circuitry 150 into sensor 102 would place those components in closer proximity to detector 140, introducing heat, electromagnetic interference, and electrical noise that—unlike ambient light noise—would be present during both the "LEDs on" and "LEDs off" measurement periods

and therefore would not be removed by Lisogurski's dark subtraction technique (EX1025, 14:46-55, 16:44-17:10). EX2043, ¶¶132-134. Dr. Anthony does not consider the noise introduced by this relocation, the inability of dark subtraction to remove it, or the inconsistency with Lisogurski's express SNR goal. EX1003, ¶¶90-107, 124-125; EX2043, ¶135. A POSITA would not have relocated noise-generating circuitry into the sensor. EX2043, ¶¶126-136.

**c) Lisogurski Does Not Disclose or Render Obvious
Three Optical Wavelengths**

Petitioners have not shown that Lisogurski discloses “three optical wavelengths” in claim limitation [1.m], and their obviousness theory relying on LeBoeuf fails. EX1001, 87:23-25; Pet., 45-47; EX2043, ¶¶137-142.

Lisogurski discloses embodiments with two wavelengths—red (600-700 nm) and infrared (800-1000 nm)—for pulse oximetry. EX1025, 10:52-58, 24:58-25:5; Pet., 30-32. Lisogurski's general statement that it “may include any number of light sources with any suitable characteristics” does not disclose three wavelengths. EX1025, 10:58-60. The number of light sources is different than the number of wavelengths. EX2043, ¶¶138-40. Lisogurski teaches that “the light source may include multiple LEDs of the same wavelength.” EX1025, 19:25-31. Dr. Anthony confirmed that using three or more wavelengths is a recent advancement in pulse oximeters “over the last six years”—not a routine design choice at the time of the

invention. EX2046, 391:10-392:13.

A POSITA would have understood that a third wavelength serves specific technical functions. For example, by selecting the third wavelength at or near an isosbestic point where oxygenated and deoxygenated hemoglobin have approximately equal absorption, it provides a built-in reference for normalizing against common-mode noise (motion, scattering, path-length changes), improving SNR. EX2043, ¶139. Indeed, claims 4, 11, and 16 recite that “the output signal corresponding to at least one of the optical wavelengths is used to improve measurement...using the output signal corresponding to the other two optical wavelengths.” EX1001, 87:36-40. Lisogurski does not disclose using *three* wavelengths or the advantages of using three wavelengths.

Petitioners' reliance on LeBoeuf and Lamego (EX1033) does not cure this deficiency. Pet., 46-47. LeBoeuf discusses wavelength characteristics specific to the “skin of the ear” of an earbud device and describes different wavelengths for different, incompatible purposes (violet/UV for motion data, green/red/IR for blood vessels, blue for vessel size) without teaching any three-wavelength combination for physiological measurement. EX1003, ¶201; EX1026, ¶[0153]. EX2043, ¶141. Lamego is not part of any ground of unpatentability (Pet., 8; EX1003, ¶71), and its “underdetermined system” teaching does not apply to Lisogurski's two-wavelength system measuring only blood oxygen saturation using two absorbers (oxy- and

deoxy-hemoglobin). EX1033, ¶[0035]; EX2043, ¶142.

Petitioners also do not explain what third wavelength a POSITA would have added to Lisogurski's two-wavelength system, or what specific physiological parameter or blood constituent would be measured by the third wavelength that is not already measured by Lisogurski's red and IR wavelengths. Pet., 45-47; EX1003, ¶¶197-204; EX2043, ¶¶141-142.

2. Claim 8

Limitation [8.b] recites "a light source comprising a driver." EX1001, 87:62-65, 86:45-49. Petitioners rely on their analysis of limitation [1.b] for [8.b], without more. Pet., 47. Thus, Lisogurski does not disclose or render obvious limitation [8.b] for the same reasons as limitation [1.b]. EX2043, ¶¶143-46; *supra*, §VI.C.1.

Limitation [8.m] recites "wherein the plurality of semiconductor sources comprises six light emitting diodes." EX1001, 88:38-39. Neither Lisogurski nor LeBoeuf discloses six LEDs. Lisogurski's generic disclosures of "one or more," "multiple," and "any number" do not expressly disclose six, and the only specific embodiment uses two LEDs. EX1025, 1:10-25, 3:50-60, 7:38-8:3, 10:52-58); Pet., 48-49; EX2043, ¶¶153-155. In fact, Lisogurski teaches away from increasing the number of LEDs given its objectives of reducing power consumption and heating effects. EX2043, ¶¶153-155.

LeBoeuf's Figure 8B shows only four emitters (EX1026, FIG. 8B).

Petitioners rely on Lamego (EX1033)—which is not part of any ground (Pet., 8; EX1003, ¶71)—for the bare enumeration of “four, six, eight or sixteen LEDs” without any teaching, preference, or selection criteria favoring six. EX1033, ¶[0041]; Pet., 49; EX1003, ¶252.

The ‘455 Patent, by contrast, explains the technical significance of six LEDs: FIG. 18B specifically depicts six LEDs (EX1001, FIG. 18B, 28:28-50), and a POSITA would understand that six spatially distributed LEDs increase the probability of illuminating blood vessels at sites with non-uniform microvasculature while providing sufficient redundancy for each wavelength. EX2043, ¶¶151-152.

Petitioners do not explain why a POSITA would select six LEDs over any other number, do not identify any technical reason or advantage for six, and do not articulate any motivation to combine Lisogurski and/or LeBoeuf with Lamego. Pet., 49; EX1003, ¶¶199-252. A mere listing of six as one of several equally viable options, without explanation of why six would be preferred, does not supply the requisite motivation and constitutes impermissible hindsight. EX2043, ¶¶157-158.

3. Dependent Claim 11

Petitioners failed to meet their burden for claim 11 for the same reasons as claim 8. *Supra*, §VI.C.2; Pet., 49-51; EX2043, ¶¶159-61.

Petitioners failed to show that Lisogurski discloses claim 11's requirement that “the output signal corresponding to at least one of the optical wavelengths is

used to improve measurement of the one or more physiological parameters using the output signal corresponding to the other two optical wavelengths.” EX1001, 88:51-54; Pet., 49-51. This requirement presupposes at least three wavelengths. Petitioners’ analysis of claim 11 does not address any of the deficiencies regarding Lisogurski’s failure to disclose three wavelengths in relation to limitation [1.m]. *Supra*, §VI.C.1; Pet., 49-51.

Petitioners rely on Lisogurski’s disclosure that “blood with a high blood oxygen saturation may...result[] in higher IR sensitivity” and “blood with a low blood oxygen saturation may...result[] in higher red sensitivity.” EX1025 at 24:58-25:5; Pet., 50-51. The cited language further states: “it may be desired to monitor activity with the more sensitive available wavelength.” EX1025 at 24:58-25:5. This only discusses switching between the two existing wavelengths based on sensitivity—not using a third wavelength to improve measurement using the other two. EX1025 at 24:58-25:5; EX2043, ¶¶163-169.

Dr. Anthony further cites Lamego (Ex. 1033), with no explanation of how the quoted portions of Lamego purportedly relate to any particular teachings in Lisogurski. EX1003, ¶257. Importing a feature from Lamego’s more complex system to fill a gap in Lisogurski, without any teaching, suggestion, or rationale in the cited prior art, constitutes impermissible hindsight.

D. 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 are obvious over Lisogurski in view of LeBoeuf. Pet., 8, 51-60. For the reasons discussed below, Petitioners failed to meet their burden. EX2043, ¶¶173-321.

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

Petitioners' analysis of dependent claim 2 does not address the deficiencies in Lisogurski with respect to claims 1 and 8. Pet., 55-57. Therefore, Lisogurski and LeBoeuf do not render obvious claim 2 for the same reasons as claims 1 and 8. EX2043, ¶¶174-76; *supra*, §VI.C.1-2.

Additionally, Lisogurski and LeBoeuf do not render obvious claim 2's requirement that "the plurality of semiconductor sources and the plurality of spatially separated detectors are located on one or more *arcs*" (the "arc limitation"). EX1001, 87:29-31; EX2043, ¶¶179-236.

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; EX2045, 160:21-163:24; EX2043, ¶¶177-82.

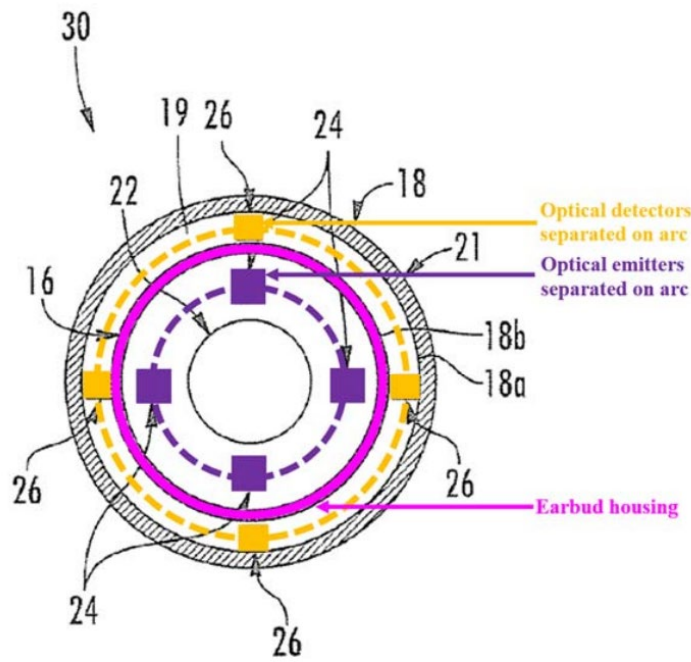


FIG. 8B

Pet., 57.

Petitioners, however, failed to show that a POSITA would have implemented LeBoeuf's alleged arc arrangement in Lisogurski. EX2043, ¶¶174-228.

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 one sentence that refers to §IX.C.2 of the Petition, which includes only one paragraph that arguably discusses a motivation to combine. Pet., 57 ("[a]s discussed (§IX.C.2)"), 52-53 (in §IX.C.2). Petitioners fail to explain why or how LeBoeuf's alleged arc arrangement would have been implemented in Lisogurski.

EX2043, ¶¶188-213.

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

Petitioners first assert that a POSITA would use LeBoeuf's arc arrangement in Lisogurski for increased "accuracy and reliability." Pet., 52-53. But neither Lisogurski (which does not include the alleged arc arrangement) nor LeBoeuf disclose or suggest that such an arrangement would lead to increased accuracy or reliability. EX2043, ¶¶189-198.

LeBoeuf's text does not discuss the arrangement in Figure 8B, let alone suggest this arrangement achieves any benefits related to accuracy/reliability. EX1026, FIG. 8B, ¶¶[0123]-[0124]; EX2043, ¶¶197-98. Petitioners cite LeBoeuf at ¶[0105] and assert that the arc arrangement would "improve the detection of scattered light..., and increase the signal-to-noise ratio," but the cited paragraph contains no such teachings. Pet., 53 (citing EX1026, ¶[0105]); EX2043, ¶197. Dr. Anthony could not identify any text in LeBoeuf discussing purported benefits of the alleged arc arrangement and agreed that LeBoeuf "is not explicitly writing out in the text the use of a [sic] arc arrangement." EX2045, 192:9-196:6.

Petitioners' only other cited evidence is Exhibit 1045 ("Mendelson"). Pet., 52-53 (citing EX1045, 4:14-65); EX2043, ¶145. Petitioners' cite Mendelson's "Background," which merely cites other publications, without showing their

arrangements. Pet. 52-53; EX1045, 4:14-65. Dr. Anthony, however, did not review them. EX2045, 198:19-201:12. Regardless, Petitioners only cite Mendelson regarding alleged arrangement of *detectors*, not *emitters*. Pet., 53 (citing EX1045). Their argument fails because the arc limitation involves both. EX2043, ¶¶199, 204-205. Additionally, Mendelson does not support Petitioners' assertion regarding angularly scattered light because Mendelson does not discuss angles and Dr. Anthony mischaracterizes Mendelson. EX2043, ¶209.

Petitioners also assert that “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 selected LeBoeuf's arrangement in FIG. 8B as opposed to other arrangements where the emitter(s) and/or detector(s) are not arranged along an arc, especially since LeBoeuf does not disclose any advantage to the FIG. 8B. EX1026, FIGS. 6, 7A, 11A, 12A-B, 22B, 23; EX2043, ¶¶200-202; *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).

Contrary to Petitioners' suggestion, a POSITA would have understood that LeBoeuf's alleged arc arrangement of detectors and emitters would not be suitable

for Lisogurski because this arrangement is premised on the other related components depicted in Figure 8B, which Petitioners do not address or argue to implement into Lisogurski. *See* EX1026, FIGS. 8A-8B, ¶¶0123]; Pet., 52-53; EX2043, ¶203; *see also* EX2045, 169:19-171:13, 171:20-172:6, 204:6-205:5, 175:2-177:6, 193:17-194:20, 198:5-17 (testifying about the relationships between LeBoeuf's arrangement of emitters and detectors and LeBoeuf's other related components).

Petitioners also argue that a POSITA would modify Lisogurski to use LeBoeuf'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)). *See also* EX1003, ¶263 (similar). 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"); EX1003, ¶263 (arguing motivation related only to the arrangement of detectors, not emitters); EX2043, ¶¶204-05. 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; EX2043, ¶¶204-05. To the extent that Petitioners' reference 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; EX2043, ¶¶204-06

In any event, Petitioners' arguments regarding angularly scattered light are unsupported and flawed. EX2043, ¶¶207-08. The cited portions of Lisogurski and Mendelson do not discuss angular scattering of light. Pet., 53 (citing EX1025, 11:9-27; EX1045, 4:14-65); EX2043, ¶¶207-08. 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. EX1026, FIG. 12A, ¶[0138]; EX2043, ¶¶207-08. 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; EX2043, ¶¶207-08; *Virtek*, 97 F.4th at 886-87 ("mere ... exist[ence]" of "possible arrangements" is insufficient). For example, Mendelson discusses a non-linear, non-arc arrangement that uses only "a single photodiode [i.e., detector]." Pet., 53 (citing EX1045, 4:14-65); EX2043, ¶¶209-10.

Petitioners and Dr. Anthony's reliance on Mendelson is flawed for several additional reasons. EX2043, ¶¶209-10. 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”); EX2043, ¶¶209-10. 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); EX2043, ¶¶209-10. The cited portion of Mendelson is to its Background section, not “its system,” and those two quotes refer to two separate publications. EX1045, 4:14-65; EX2043, ¶¶209-10.

Petitioners therefore fail to establish a connection between their alleged motivation regarding detection of angularly scattered light and LeBoeuf's 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”); EX2043, ¶¶188-210.

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

Petitioners also fail to explain *how* LeBoeuf's alleged arc arrangement would have been implemented in Lisogurski. *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)); *Juniper Networks, Inc. v. Smart Path Connections, LLC*, IPR2021-01356, Paper 27 at 48-50 (PTAB Jan. 19, 2023) (finding petitioner did “not adequately explain[] how [one reference] would be modified to incorporate teachings from [another reference]”); *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1327-28 (Fed. Cir. 2012); *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 arrangement of emitters 24 and detectors 26 in Figure 8B is a function of the geometry and arrangement between the base 50, earbud housing 16 (with bottom portion 16a), cover 18 (with cladding material 21), and speaker 22. EX1026, FIGS. 8A-8B, ¶¶ [0123]-[0124]; EX2043, ¶212. Dr. Anthony testified that the arrangement of detectors 26 in FIGS. 8A-8B depends on the “particular” design of that embodiment. EX2045, 205:6-207:23. He also agreed that the arrangement of emitters 24 and detectors 26 is dictated by the shape of the earbud housing 16 and cover 18. EX2045, 171:20-172:6 (earbud housing 16 and cover 18 are circular), 205:1-5 (Q: “[G]iven that both the cover 18 and the earbud housing [16] are circular, the space between the earbud housing 16 and the cover 18 also has a circulate shape.

Correct?"; A: "Yes."), 204:6-25 (detectors 26 are positioned "[b]etween [earbud housing] 16 and [cover] 18"), 175:2-177:6 (LeBoeuf "use[s] the housing [16] and cladding material [21] to direct light" to detectors 26), 193:17-194:20 ("LeBoeuf talks extensively about...having cladding surfaces...that guide light" and "[t]alks about the issues of...directing light...to the detectors"), 198:5-17 (recognizing that placement of detectors "where the light is to be expected" depends on "structures that guide a light to earbuds"); 169:19-171:13 (light blocking region 16a blocks the detectors from receiving light directly from the emitters).

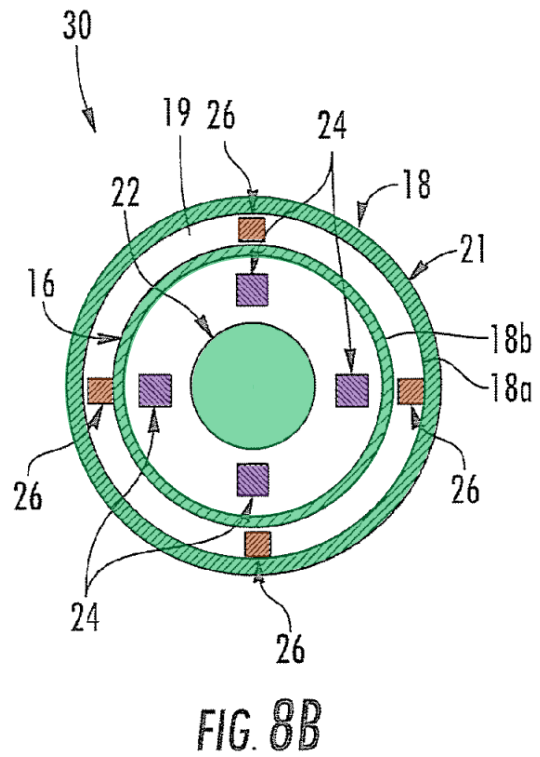
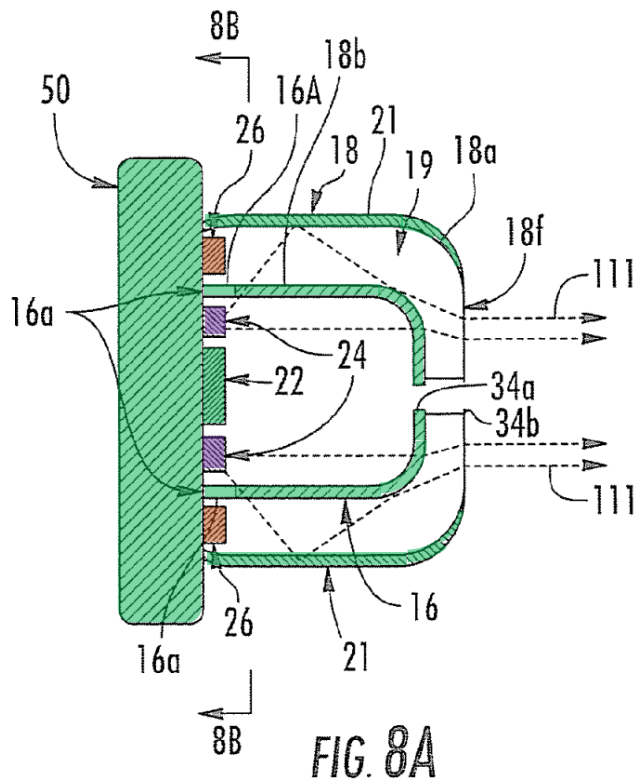
Petitioners do not address those related components, much less argue to implement them in Lisogurski. Pet., 52-53. Petitioners do not explain how LeBoeuf's arc arrangement would be implemented in Lisogurski's sensor without those related components. *Id.*; EX2043, ¶¶211-12. Petitioners' argument thus fails. *See PersonalWeb*, 848 F.3d at 993-94; *Braintree*, 749 F.3d at 1359; *Juniper Networks*, IPR2021-01356, Paper 27 at 48-50; *ActiveVideo*, 694 F.3d at 1327-28.

Petitioners also do not explain how LeBoeuf's alleged arc arrangement would achieve the alleged accuracy/reliability improvement without the related components. Pet., 52-53; EX1026, FIGS. 8A-8B, ¶[0123]; EX2043, ¶213.

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

A POSITA also would not have been motivated to implement LeBoeuf's alleged arc arrangement into Lisogurski. EX2043, ¶¶214-228.

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; EX2043, ¶¶215-221; EX2045, 165:22–166:4, 173:2-12 (agreeing that LeBoeuf's embodiment in FIGS. 8A-8B is “configured to be an earbud” and “configured to fit into an ear”). As demonstrated by the following annotated Figures 8A-8B, LeBoeuf's arrangement of emitters 24 (purple) and detectors 26 (orange) is dictated by the position and shape of other related components (green):



EX1026, FIGS. 8A-8B (annotated), ¶¶[0123]-[0124]; EX2043, ¶160.

For example, emitters 24 are positioned on base 50 around a centrally located speaker 22 and within earbud housing 16, while detectors 26 are positioned on base 50 outside of earbud housing 16 but inside cover 18, with emitters 24 and detectors 26 separated by light blocking region 16a. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX2043, ¶216. Emitters 24 and detectors 26 are directed toward cover end portion 18f, with detectors 26 positioned in light guiding region 19 between cover 18 and earbud housing 16. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX2043, ¶¶216-221.

Dr. Anthony agreed that LeBoeuf's alleged arc arrangement of emitters 24 and detectors 26 is dictated by the geometry and relative position of other

components. EX2045, 171:20-172:6 (earbud housing 16 and cover 18 are circular), 205:1-5 (Q: “[G]iven that both the cover 18 and the earbud housing [16] are circular, the space between the earbud housing 16 and the cover 18 also has a circulate shape. Correct?”; A: “Yes.”), 204:6-25 (detectors 26 are positioned “[b]etween [earbud housing] 16 and [cover] 18”), 175:2-177:6 (LeBoeuf “use[s] the housing [16] and cladding material [21] to direct light” to detectors 26), 193:17-194:20 (“LeBoeuf talks extensively about...having cladding surfaces...that guide light” and “[t]alks about the issues of...directing light...to the detectors”), 198:5-17 (recognizing that placement of detectors “where the light is to be expected” depends on “structures that guide a light to earbuds”); 169:19-171:13 (light blocking region 16a blocks the detectors from receiving light directly from the emitters); 205:6-207:23 (testifying the arrangement of detectors 26 in FIGS. 8A-8B depends on the “particular” design of that embodiment).

A POSITA would have understood that the geometry of the components shown in Figures 8A-8B—including the alleged arc arrangement—is specific to an earbud and dictated by guiding sound and light to the ear canal. EX1026, FIGS. 8A-8B, ¶¶0123]; EX2043, ¶¶216-221. 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; EX2043, ¶¶216-21; *see also* EX2045, 173:2-12 (acknowledging that the “cylindrical shape of the cover 18” is “configured to fit into an ear”). Notably, LeBoeuf's non-earbud embodiments in Figures 22A-23 do not include the alleged arc arrangement of Figure 8B, further demonstrating that the arrangement is earbud-specific. *See* EX1026, ¶¶[0070]-[0072], [0157], [0164], FIGS. 22A-23; EX2043, ¶227; EX2045, 186:15-188:18; *Panduit*, 810 F.2d at 1568.

Lisogurski does not teach or suggest an earbud for taking measurements from the ear canal. EX2043, ¶222. 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 not *within* the ear); EX2043, ¶¶222-27. 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; EX2043, ¶¶227-28.

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 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; EX2043, ¶223. Indeed, Petitioners' own

citations support this distinction. Pet., 53 (citing EX1025, 4:6-20 (no description of placement within an ear); EX1026, ¶¶[0006] (“earbud”), [0010] (“Light directed into the ear”); EX2043, ¶223.

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 is dictated by the shape of earbud-specific components. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX1025, 4:6-20; EX2043, ¶¶217-222, 165. Further, because Lisogurski does not include the related components upon which LeBoeuf's alleged arc arrangement is premised, a POSITA would not have had the motivation to implement LeBoeuf's alleged arc arrangement in Lisogurski. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; Pet., 52-53, 57; EX2043, ¶¶216-222, 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 Figure 8B arrangement to be suitable because the alleged arc arrangement is based on related components not present in Lisogurski and is earbud-specific. EX2043, ¶¶216-28.

c) Petitioners' Alleged Motivations for the Arc and Reflective Surface Limitations Are Contradictory

Petitioners rely on LeBoeuf for both the arc limitation (claims 2, 9, 15) and the reflective surface limitation (claims 6, 13, 17). Pet., 51-60; EX1003, ¶¶262-268,

270-279, 350-355. But the motivations that Petitioners and Dr. Anthony advance for these two limitations are internally contradictory. EX2043, ¶¶229-234.

For the arc limitation (claims 2, 9, 15), Petitioners cite Dr. Anthony's opinion that a POSITA would arrange semiconductor sources along an arc "to enhance measurement accuracy by increasing the surface area of the subject's tissue exposed to the emitted light." EX1003, ¶276; Pet., 57. For the reflective surface limitation (claims 6, 13, 17), Petitioners rely on Dr. Anthony's opinion that a POSITA would add a reflective surface to "focus[light] on a particular region of the ear where a particular physiological activity may be located." EX1003, ¶353 (quoting EX1026, ¶[0125]); Pet., 59. Spreading light across a broader tissue area and focusing light onto a smaller area are opposing objectives—a POSITA would not be simultaneously motivated to maximize the illuminated area and concentrate light onto a particular region. EX2043, ¶¶229-234.

This contradiction is significant because claims 6 and 17 (reciting a reflective surface) depend from claims 2 and 15 (reciting arcs), respectively and require *both* features. EX1001, 87:27-54, 90:6-26. These dependent claims require both an arc arrangement (to spread light) and a reflective surface (to focus light)—two features that, according to Petitioners' own stated motivations, serve contradictory purposes. EX2043, ¶¶233-34. A POSITA would have recognized that these objectives work at cross-purposes: if the goal is to focus light onto a particular

region, spreading it broadly first is counterproductive, and if the goal is to illuminate a broad area, focusing defeats that purpose. EX2043, ¶234.

d) Petitioners' Alleged Motivation for the Arc Limitation with Respect to Semiconductor Sources Is Conclusory and Unsupported

Petitioners' reliance on Dr. Anthony's stated motivation for the arc arrangement of semiconductor sources—"enhance[ing] measurement accuracy by increasing the surface area of the subject's tissue exposed to the emitted light" (EX1003, ¶276)—is conclusory and unsupported. Pet., 57. Dr. Anthony's claim 2 analysis provides no explanation or evidence for why arranging emitters in an arc would increase illuminated tissue area or why increased area would enhance measurement accuracy. EX1003, ¶276. His only alleged support is a cross-reference to "Section IX.B.2" (EX1003, ¶276), but that section (paragraphs 262-263) addresses motivation for arranging *detectors*—not *emitters* (semiconductor sources)—in an arc. EX1003, ¶¶261-264; EX2043, ¶235. Moreover, increased surface area does not require an arc—it can be achieved through planar, faceted, segmented, or irregular geometries—and does not necessarily improve measurement accuracy, which depends on factors such as sensor placement, optical coupling, signal-to-noise ratio, and motion artifact sensitivity, none of which Dr. Anthony addresses. EX1003, ¶276; EX2043, ¶236.

2. Dependent Claims 3-4

Lisogurski and LeBoeuf do not render obvious claims 3-4 for the same reasons as claims 1-2, and 11. *Supra*, §§VI.C.1, VI.C.3, VI.D.1; EX2043, ¶¶237-41; Pet., 57-58, 49-51.

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

Petitioners' analysis of dependent claim 9 does not address the deficiencies of claim 8. Pet., 57-58, 55-57. Therefore, Lisogurski and LeBoeuf do not render obvious claim 9 for the same reasons as claim 8. *Supra*, §VI.C.2; EX2043, ¶¶172-74. Further, Lisogurski and LeBoeuf do not render obvious claim 9, which recites an "arc" arrangement, for the same reasons as claim 2. *Supra*, §VI.D.1; EX1001, 88:40-42, 87:29-31; Pet., xiii, x, 57-58; EX2043, ¶¶245-47.

4. Dependent Claim 10

Lisogurski and LeBoeuf do not render obvious claim 10 for the same reasons as claims 1, 8 and 9. *Supra*, §§VI.C.1-2, VI.D.3; Pet., 57-58, 45-47; EX2043, ¶¶248-252.

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

Lisogurski and LeBoeuf also do not render obvious claim 15 for the same reasons as claims 1-2, and 8. *Supra*, §VI.C.1-2, VI.D.1; EX2043, ¶¶253-62; Pet., 47, 58; EX1001, 90:6-9.

6. Dependent Claim 16

Lisogurski and LeBoeuf do not render obvious claim 16 for at least the same reasons as claims 1, 11, and 15. *Supra*, §§ VI.C.1, VI.C.3, VI.D.5; EX2043, ¶¶263-69; Pet., 57-58, 45-47, 49-51.

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

Lisogurski and LeBoeuf do not render obvious claim 17 for at least the same reasons as claim 15. *Supra*, §VI.D.5; EX2043, ¶¶270-72.

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.

Because Lisogurski does not teach the claimed "reflective surface," Petitioners rely instead on LeBoeuf's Figure 8C embodiment, where the 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; EX2046, 316:17-24; EX2043, ¶¶273-74. 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:

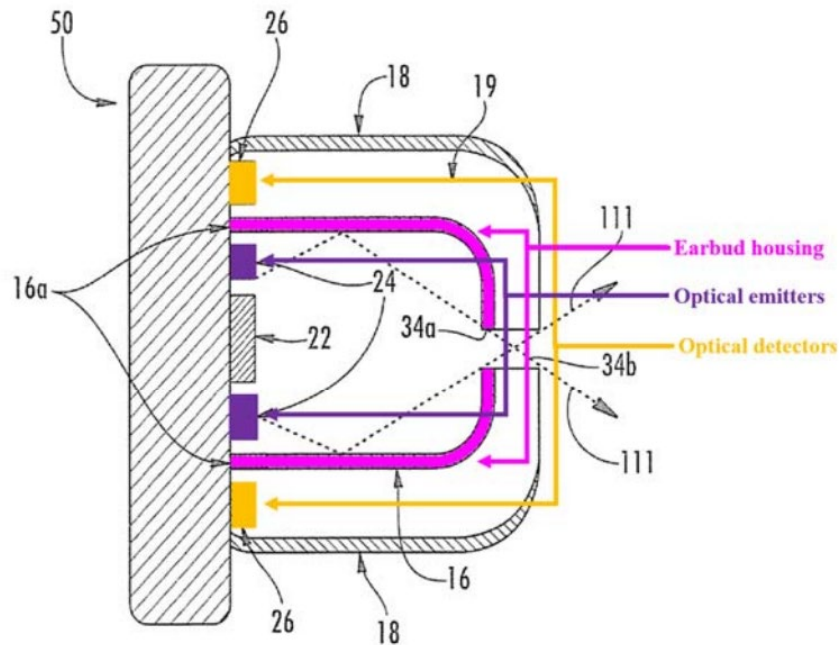


FIG. 8C

Pet., 60.

Petitioners, however, fail to establish that a POSITA would have implemented LeBoeuf's alleged reflective surface in Lisogurski. EX2043, ¶¶270-310.

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

Petitioners entire motivation-to-combine argument for the reflective surface limitation consists of a single paragraph in Petition §IX.C.2 and a single sentence of their claim 17 analysis referring to that paragraph. *See* Pet., 53-54 (in §IX.C.2), 60 (“[a]s discussed (§IX.C.2)”). Petitioners fail to explain why or how LeBoeuf's alleged reflective surface in Figure 8C would have been implemented in Lisogurski.

EX2043, ¶¶278-301.

(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 other components in Figure 8C. Pet., 53-54; EX2043, ¶¶278-283. 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, and Dr. Anthony testified that he is not proposing implementing such related components from LeBoeuf’s Figure 8C into Lisogurski. Pet., 53-54; EX1003, ¶¶265-66; EX2046, 336:1-340:10 (admitting that he is “not proposing the earbud housing”). Thus, Petitioners only argue to implement LeBoeuf’s alleged reflective surface in isolation in Lisogurski. Pet., 53-54; EX2043, ¶283.

As for alleged motivation to combine, Petitioners and Dr. Anthony each cite only two potential sources: LeBoeuf at [0125] and Valencell-093 at [0152]. Pet., 53-54; EX1003, ¶¶265-66; EX2043, ¶284. 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:

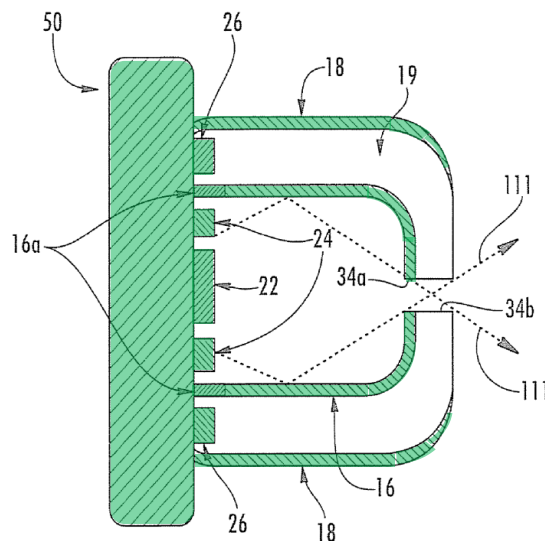


FIG. 8C

EX1026, FIG. 8C (annotated), ¶¶[0123], [0125]; EX2043, ¶¶284-86.

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; EX2043, ¶286; EX2046, 322:21–330:17.

A POSITA would have understood 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; EX2043, ¶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. EX2043, ¶¶286-88.

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; EX2043, ¶¶289-90. 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. EX2043, ¶¶289-90.

Moreover, Dr. Anthony's testimony on motivation-to-combine only includes the same two citations as the Petition. EX1003, ¶¶265-66; EX2043, ¶¶284-90. One

of Dr. Anthony's two paragraphs asserting motivation-to-combine does not cite any evidence. EX1003, ¶266. This conclusory testimony should be given little or no weight. *TQ Delta*, 942 F.3d at 1361-63; 37 C.F.R. § 42.65(a).

(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; *Juniper Networks*, IPR2021-01356, Paper 27 at 48-50; *ActiveVideo*, 694 F.3d at 1327-28.

As explained above, LeBoeuf's alleged reflective surface functions by interacting with other components shown in Figure 8C, including base 50, earbud housing 16, cover 18, arrangement of emitters 24 and detectors 26, and apertures 34a-34b. EX1026, ¶¶[0123], [0125], FIGS. 8A-8C; EX2043, ¶¶291-92; EX2046, 322:21-330:17. As also explained above, Petitioners are not proposing to implement any those components in the combination with Lisogurski. Pet., 53-54. Petitioners thus do not explain how LeBoeuf's alleged reflective surface would be implemented in Lisogurski's sensor. EX2043, ¶¶291-94. A reflective surface cannot exist in isolation.

Similarly, in Dr. Anthony's deposition, he did not propose implementing in

Lisogurski any of LeBoeuf's components related to LeBoeuf's reflective surface, such as earbud housing 16 on which the reflective surface is located. Instead, Dr. Anthony proposed an abstract implementation of the mere concept of a "reflective surface" to an unidentified surface in Lisogurski. EX2046, 336:1-340:10 (admitting that he is "not proposing the earbud housing" but rather proposing applying LeBoeuf's reflective surface to undisclosed and unidentified "relevant surfaces" or "particular surface" in Lisogurski).

Petitioners thus fail to sufficiently explain the alleged combination. *See PersonalWeb*, 848 F.3d at 993-94; *Braintree*, 749 F.3d at 1359; *Juniper Networks*, IPR2021-01356, Paper 27 at 48-50; *ActiveVideo*, 694 F.3d at 1327-28.

b) A POSITA Would Not Have Implemented 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 in Lisogurski. EX2043, ¶¶302-10.

As discussed above, LeBoeuf describes "earbud" devices configured to be placed within an ear to transmit light and sound into the ear canal. EX1026, Abstract, ¶¶[0002], [0009], [0048]-[0050], [0123]-[0125], FIGS. 1-12B; EX2043, ¶¶303-06; EX2045, 165:22-166:4, 173:2-12; EX2046, 316:25-319:15. Further, as

demonstrated by the following annotated Figure 8C, LeBoeuf's alleged reflective surface is premised on and involves other related components (green):

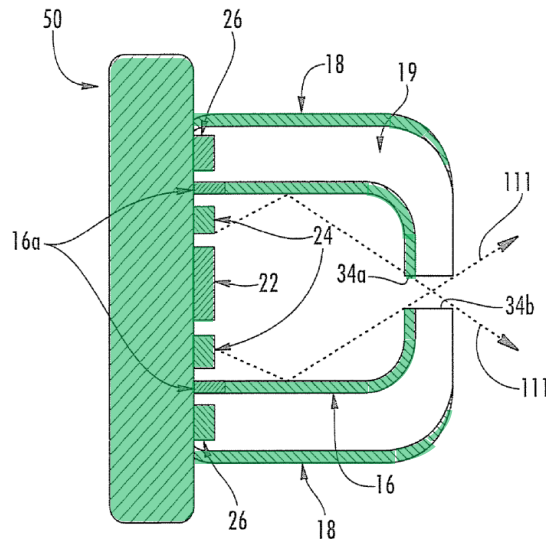


FIG. 8C

EX1026 FIG. 8C (annotated), ¶¶[0123], [0125]; EX2043, ¶¶304-05

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 34a, 34b in the housing 16 and cover 18,” and those apertures 34a-34b are also for “sound from the speaker 22” to pass through. EX1026, FIGS. 8A-8C, ¶¶[0123], [0125]; EX2043, ¶¶304-05. Earbud housing 16 “is in acoustical communication with [that] speaker 22” and “configured to be positioned within an ear.” EX1026, FIGS. 8A-8C, ¶¶[0123]; EX2043, ¶¶304-05. 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]; EX2043, ¶¶304-05. 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]; EX2043, ¶¶304-05. Additionally, in Dr. Anthony's deposition, he discussed how LeBoeuf's alleged reflective surface involves such other related components. *See, e.g.*, EX2046, 322:21-330:17.

A POSITA would have further understood 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”); EX2043, ¶306. 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 in earbud housing 16 and cover 18. EX1026, ¶¶[0123], [0125], FIGS. 8A-8B; EX2043, ¶306; EX2045, 173:2-12 (acknowledging that the “cylindrical shape of the cover 18” is “configured to fit into an ear”); EX2046, 316:25-319:15 (testifying that “LeBoeuf discloses an earbud with earbud housing that’s at least partially reflective”).

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); EX2043, ¶307.

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; EX2043, ¶310. 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; EX2043, ¶309.

Petitioners improperly ignore the full teachings of the references, including by failing to recognize 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; EX2043, ¶308; *Panduit*, 810 F.2d at 1568 (a reference "must be considered in its entirety, ... including portions that would lead away").

**c) Petitioners Improperly Combine Two Different
LeBoeuf Embodiments Without Explanation and
With Contradictory Alleged Motivations**

Petitioners rely on LeBoeuf's Figures 8A-8B for the arc limitation and Figure 8C for the reflective surface limitation. Pet., 55-57, 59-60; EX1003, ¶¶275-279, 350-355. But Figures 8B and 8C are *different embodiments* in LeBoeuf. EX2045, 178:9-179:17 ("it's a slightly different embodiment"), 179:10-17; EX1026, ¶¶[0048]-[0050], [0124]-[0125]. Figure 8C shows only two emitters and two detectors in a side cross-section and does not illustrate an arc arrangement. EX2043, ¶¶311-320. Petitioners do not explain why a POSITA would combine the arc from the Figure 8B embodiment with the reflective surface in the Figure 8C—a combination necessarily required because claims 6 and 17 depend from claims 2 and 15,

respectively. EX1001, 87:27-54, 90:6-26. Nor do they acknowledge that combining features from these different embodiments to achieve contradictory objectives (spreading light vs. focusing light) further undermines the motivation. EX2043, ¶¶229-234; *see supra*, §§VI.D.1.c (explaining why Petitioners' alleged motivations for the arc and reflective surface limitations are contradictory).

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

In Ground 3, Petitioners argue that claims 1, 8, 12, and 15 are obvious over Lisogurski in view of Tran. Pet., 8, 60-73. Petitioners failed to meet their burden. EX2043, ¶¶322-26.

1. Independent Claims 1, 8, and 15

For Ground 3, Petitioners' analysis of claims 1, 8, and 15 focuses on limitations [1.pre], [8.pre], and [15.pre] and does not address the deficiencies discussed above with respect to limitations [1.b], [8.b], [15.b], and [15.n] for Grounds 1-2. Pet., 60-73. Therefore, Lisogurski and Tran do not render obvious claims 1, 8, and 15 for the same reasons as claims 1, 8 and 15. *Supra*, §§VI.C.1-2, VI.D.5; EX2043, ¶¶323-26.

Additionally, Petitioners' analysis of claim 15 in Ground 3 is deficient because the Petition's only analysis of limitation [15.n] (in Ground 2) relies on LeBoeuf, which is not part of Ground 3. Pet. 55-58 (relying on LeBoeuf for the arc

limitation in claim 2 and relying, in turn, on claim 2 analysis for limitation 15[n]); EX2043, ¶326. Ground 3 asserts the combination 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 for limitation [15.n]. Pet., 55-58, 60-73; EX2043, ¶326.

2. Dependent Claim 12

Lisogurski and Tran do not render obvious claim 12 for the same reasons as claim 8. *Supra*, §VI.C.2; EX2043, ¶¶327-29.

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

In Ground 4, Petitioners argue that claims 5-7, 13-14, and 18-20 are obvious over Lisogurski, LeBoeuf, and Tran. Pet., 8, 60-73. Petitioners failed to meet their burden. EX2043, ¶¶330-54.

1. Dependent Claim 5

Lisogurski, LeBoeuf, and Tran do not render obvious claim 5 for the same reasons as claims 1-2. *Supra*, §§VI.C.1, VI.D.1; EX2043, ¶¶331-33.

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

Lisogurski, LeBoeuf, and Tran do not render obvious claim 6 for the same reasons as claims 1 and 2. *Supra*, §§VI.C.1, VI.D.1; EX2043, ¶¶334-36.

Additionally, claim 6 includes the same reflective surface limitation as claim 17. EX1001, 87:51-54, 90:23-26; Pet., x, xvi. For claim 6, Petitioners rely on their analysis of claim 17 in Ground 2. Pet., 68. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claim 6 for the same reasons as claim 17. *Supra*, §VI.D.7; EX2043, ¶¶337-39.

3. Dependent Claim 7

Lisogurski, LeBoeuf, and Tran do not render obvious claim 7 for the same reasons as claims 1, 2, and 6. *Supra*, §§VI.C.1, VI.C.1, VI.F.2; EX2043, ¶¶340-42.

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

Lisogurski, LeBoeuf, and Tran do not render obvious claim 13 for the same reasons as for claim 8. *Supra*, §VI.C.2; EX2043, ¶¶343-45.

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. 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*, §VI.D.7; EX2043, ¶¶346-48.

5. Dependent Claim 14

Lisogurski, LeBoeuf, and Tran do not render obvious claim 14 for the same reasons as claim 8. *Supra*, §VI.C.2; EX2043, ¶¶349-51.

6. Dependent Claims 18-20

Petitioners' analysis of claims 18-20 (which relies on their analysis of claims 5 and 7) does not address the deficiencies for claims 15 and 17 in Ground 2. Pet., 71-73, 65-70. Therefore, Lisogurski, LeBoeuf, and Tran do not render obvious claims 18-20 for the same reasons as claims 15 and 17. *Supra*, §§VI.D.5, VI.D.7; EX2043, ¶¶252-54.

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

In Ground 5, Petitioners argue that claims 1, 8 and 11 are obvious over Lisogurski and Carlson. Pet., 8, 73-80. Ground 5 is based on Ground 1 and addresses limitations [1.c] and [8.c] in view of Carlson. Pet., 8, 73-80; EX2043, ¶266. Ground 5 does not address the deficiencies in Ground 1, including for limitations [1.b] and [8.b], or rely on Carlson to cure those deficiencies. *See* Pet., 73-80. Therefore, Ground 5 fails for the same reasons as Ground 1. *Supra*, §VI.C; EX2043, ¶¶355-57.

H. 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 are obvious over Lisogurski, LeBoeuf, and Carlson. Pet., 8, 73-80. Ground 6 is based on Ground

2 but does not address the deficiencies in Ground 2. Pet., 8, 73-80; EX2043, ¶359. Therefore, Ground 6 fails for the same reasons as Ground 2. *Supra*, §VI.D; EX2043, ¶¶358-60.

I. 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 are obvious over Lisogurski, Tran, and Carlson. Pet., 8, 73-80. Ground 7 is based on Ground 3 and addresses limitations [1.c], [8.c], and [15.c] with Carlson. Pet., 8, 73-80; EX2043, ¶272. Ground 7 does not address the deficiencies in Ground 3, including for limitations [1.b], [8.b], [15.b], and [15.n]. Pet., 73-80. Therefore, Ground 7 fails for the same reasons as Ground 3. *Supra*, §VI.E; EX2043, ¶¶361-63.

J. 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 are obvious over Lisogurski, LeBoeuf, Tran, and Carlson. Pet., 8, 73-80. Ground 8 is based on Ground 4 and addresses claims 7, 14, and 20 with Carlson but does not address the deficiencies in Ground 4. Pet., 8, 73-80; EX2043, ¶275. Therefore, Ground 8 fails for the same reasons as Ground 4. *Supra*, §VI.F; EX2043, ¶¶364-66.

K. Secondary Considerations of Non-Obviousness

Even if Petitioners had made a threshold showing of obviousness—which they did not—secondary considerations of non-obviousness weigh against

obviousness. The evidence establishes copying by Samsung, a long-felt but unsolved need that the '455 Patent addressed where others failed. EX2100, ¶¶6-33; EX2043, ¶¶369-401.

1. Copying

Dr. Islam, the inventor of the '455 Patent, disclosed Patent Owner's patented SNR-improvement techniques directly to senior Samsung executives and engineers from March through November 2017. EX2100, ¶¶7-21.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED].

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

These techniques are claimed in the '455 Patent. EX2043, ¶¶381-83. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Samsung subsequently implemented the same suite of SNR-improvement techniques in its wearable products. EX2043, ¶¶370, 382-86; EX2118.

The nexus between the challenged claims and the copied features is direct: Dr. Islam's presentations identified related patents and patent applications. EX2100, ¶80; EX2103, OMS_SAM0031793.

2. Long-Felt but Unsolved Need and Failure of Others

The '455 Patent addressed a widely recognized problem but unsolved problem in wearable health monitoring: the degradation of PPG signal quality caused by motion artifacts and ambient light interference. EX2043, ¶¶388-401. For example, the Masimo '272 Patent states that "erratic motion induced noise typically cannot be predetermined and/or subtracted from the measured signal via traditional filtering techniques." EX2108, 34:1-7; EX2043, ¶391. The Pacesetter '935 Patent acknowledges that pulse oximetry methods were "acutely sensitive to sensor and/or tissue motion" and that "even rather subtle motion can (and often do) swamp the detected optical signals and render the oxygen saturation measurements unusable." EX2109, 3:24-34. EX2100, ¶22; EX2043, ¶392.

The industry's responses to these problems were inadequate. EX2043, ¶¶393-97. First, prior devices required that the patient remain still. EX2110, 61:38-47, 68:39-49 (stating that "measurements obviously cannot be made during sports activity" and requires the user to be in a "state of repose"); EX2100, ¶¶24-25; EX2043, ¶394. Second, measurements were confined to controlled clinical environments. EX2110, 16:1-23; EX2100, ¶25; EX2043, ¶395. Third, software-based filtering was insufficient. EX2111, ¶¶[0136], [0147] (explaining that algorithms were designed only for "periodic" motion); EX2112 (proposing GE selecting a "quieter" body site as a workaround); EX2100, ¶¶26-29; EX2043, ¶396.

The '455 Patent solves these long-felt problems with an integrated suite of hardware and signal-processing techniques—including change detection, synchronization, increased light intensity, and spatially separated detectors—that collectively enable accurate physiological measurements during daytime and exercise. EX2100, ¶30; EX2043, ¶¶390, 401-02. For example, the following claimed features directly address the long-felt needs in the industry that others failed to solve, including the motion-artifact and signal-strength problems:

- “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” (claims 1, 15);
- “the detection system further configured to generate a first signal responsive to light received while the semiconductor sources are off, generate a second signal responsive to light received while at least one of the semiconductor sources is on; and increase the signal-to noise ratio by comparing the first signal and the second signal” (claims 1, 15)
- “wherein the detection system is configured to be synchronized to the light source” (claim 1);
- “a plurality of detectors that are spatially separated from each other” (claims 1, 15).

The industry-wide failure to solve these problems despite substantial resources demonstrates that the techniques claimed in the '455 Patent were not obvious. EX2043, ¶¶393-401; EX2100, ¶¶31-33; EX2106, OMS_SAM0031851 (study documenting that the Samsung Gear S2 exhibited high heart-rate errors at the time).

VII. CONCLUSION

For the foregoing reasons, Petitioners failed to establish that any challenged claim of the '455 Patent is unpatentable.

Respectfully submitted,

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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 Response is produced using a 14-point Times New Roman font and contains approximately 13,306 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 May 7, 2026.

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing **Patent Owner's**

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