

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. 12,268,475

Case No. IPR2025-01254

PATENT OWNER'S RESPONSE

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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 Supplemental Invalidity Contentions Cover Document and Charts for the '475 Patent, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (July 18, 2025)
2003	OnePlus's Invalidity Contentions Cover Document and Charts for the '475 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
2012-2015	Reserved
2016	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00912, Paper 1 (PTAB Apr. 10, 2019)

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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)
2026-2027	Reserved
2028	U.S. Patent Pub. No. 2012/0197093 ("Valencell-093")
2029	File History of U.S. Patent App. No. 16/669,794, issued as U.S. Patent No. 10,874,304
2030	File History of U.S. Patent App. No. 17/078,771, issued as U.S. Patent No. 11,160,455
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

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	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	Reserved
2037	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00914, Paper 13 (PTAB Nov. 6, 2019)
2038-2039	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
2044	<i>Curriculum vitae</i> of Prof. Igor Efimov, Ph.D.
2045	Transcript of Apr. 17-18, 2026 Deposition of Dr. Brian W. Anthony (Part I)
2046	Transcript of Apr. 17-18, 2026 Deposition of Dr. Brian W. Anthony (Part II)
2047	Reserved
2048-2099	Reserved
2100	Declaration of Dr. Mohammed Islam
2101	OMS_SAM0031768
2102	OMS_SAM0031776
2103	OMS_SAM0031782
2104	OMS_SAM0031797
2105	OMS_SAM0031867

Exhibit No.	Description
2106	OMS_SAM0031851
2107	OMS_SAM0031961
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	Declaration of Dr. Mohammed Islam (REDACTED)
2117	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. 12,268,475 (“the ’475 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 fail to show that any challenged claim is unpatentable. For independent claim 1, Petitioners improperly rely on the same components in Lisogurski for multiple claim elements, violating the principle that different claim elements correspond to distinct structure. Petitioners further fail to show that Lisogurski discloses or renders that the apparatus to “determine...that the apparatus is being worn by the user” based on the output signal. Independent claim 8 requires that the claimed processor perform the claimed determination, and Petitioners fail to show that the alleged processor in Lisogurski performs that functionality. Petitioners’ analysis is also flawed because they conflate Lisogurski’s “detection signals” with its “processed signals” and fail to identify signals satisfying the claim requirements.

Petitioners’ collateral estoppel arguments are unavailing because the challenged claims of the ’475 Patent contain materially different limitations that

were not at issue in the prior IPR decisions involving related patents. Petitioners' piecemeal approach of combining findings from two separate prior decisions is unsupported by their cited authority. Petitioners' expert, Dr. Anthony, compounds these deficiencies by offering testimony that consists of quoting prior Board decisions and incorporating by reference his prior declarations—rather than providing independent technical analysis.

For the dependent claims, Petitioners fail to establish motivation to combine Lisogurski and LeBoeuf to meet the “arc” arrangement required in claims 6 and 16. LeBoeuf's arrangement is earbud-specific and premised on related components that are absent from Lisogurski, and LeBoeuf contains no teaching or suggestion that an “arc” arrangement would provide any benefits compared to alternative arrangements.

II. OVERVIEW OF THE '475 PATENT

The '475 Patent discloses wearable devices, and systems including wearable devices, for measuring physiological parameters and for use with a smartphone or tablet. EX1001, Abstract, 8:39-57, 9:29-62, 35:32-37, FIG. 24; EX2043, ¶54.¹ The

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.

'475 Patent discloses that a wearable that includes a light source with a plurality of light emitting diodes that generate an output light that is delivered to tissue. EX1001, Abstract, 8:39-57, 9:29-62; EX2043, ¶54. The wearable device is also disclosed as including a detection system comprising a plurality of detectors, and the '475 Patent describes that the detection system receives at least a portion of reflected light and generates an output signal. EX1001, Abstract, 8:39-61, 9:29-62; EX2043, ¶54.

An exemplary physiological measurement system is depicted in Figure 24:

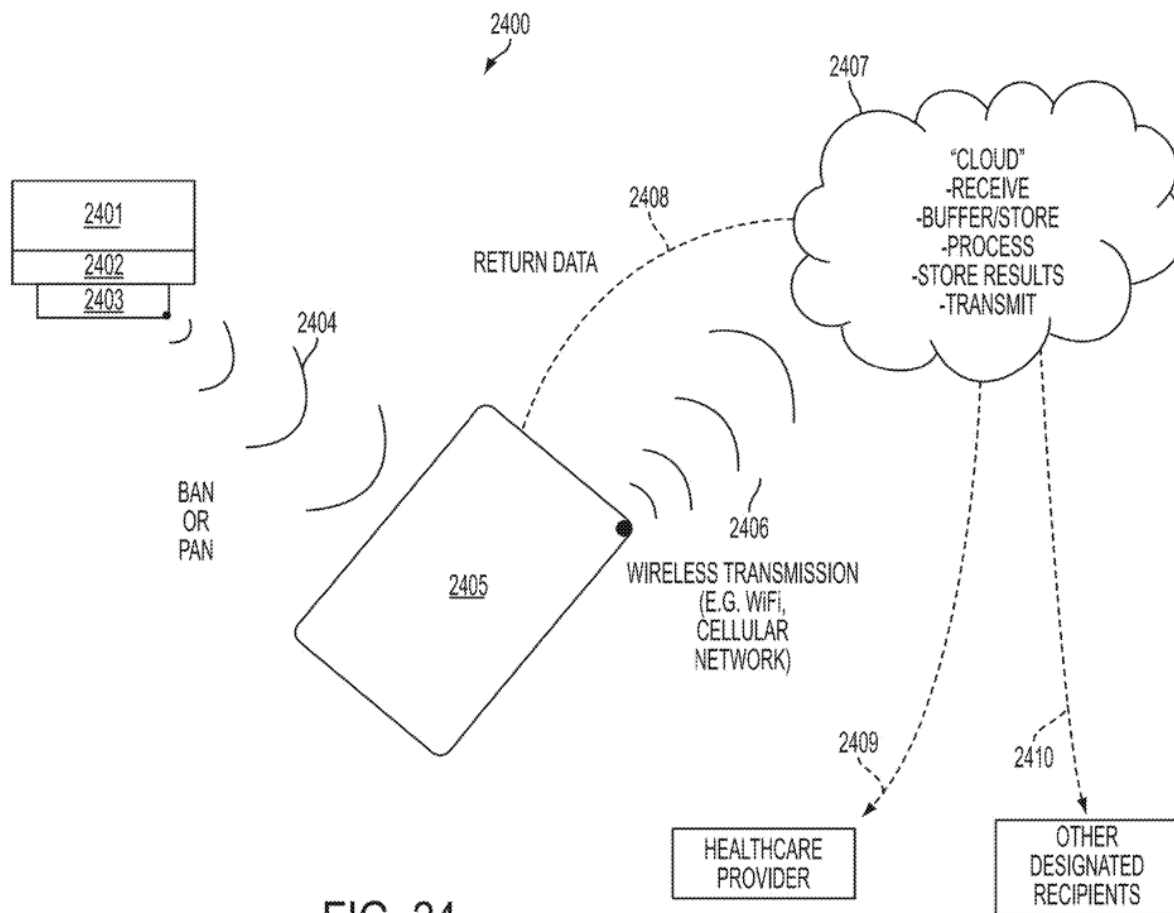


FIG. 24

EX1001, FIG. 24, 11:32-37; 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, 35:32-36:3; EX2043, ¶55.

The '475 Patent discloses that the wearable device may comprise one or more biosensors. EX1001, Abstract; EX2043, ¶56. The '475 Patent also discloses that the wearable device, or a processor, may be configured to determine, based at least in part on an output signal, that the wearable device is being worn by a user. EX1001, Abstract, 9:3-62; EX2043, ¶56. According to the '475 Patent the wearable device may also comprise a processor configured to be coupled to a non-transitory computer readable medium. Ex. 1001 at 86:1-3; EX2043, ¶56. The '475 Patent also discloses that the plurality of detectors in the detection system of the wearable device may be arranged along an arc. EX1001, 86:9-10; EX2043, ¶56. The wearable device may improve a signal-to-noise ratio via various techniques disclosed in the '475 Patent, resulting in improved accuracy of physiological measurements despite interference from spectral artifacts. EX1001, 58:1-22, 3:11-51; 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 '475 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. Such a person 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, 5-8, and 11-13 of the '475 Patent as allegedly obvious in Grounds 1-8 based on Lisogurski, Tran, LeBoeuf, and Carlson. Pet., 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, ¶78. The system is illustrated in Figures 3 and 1:

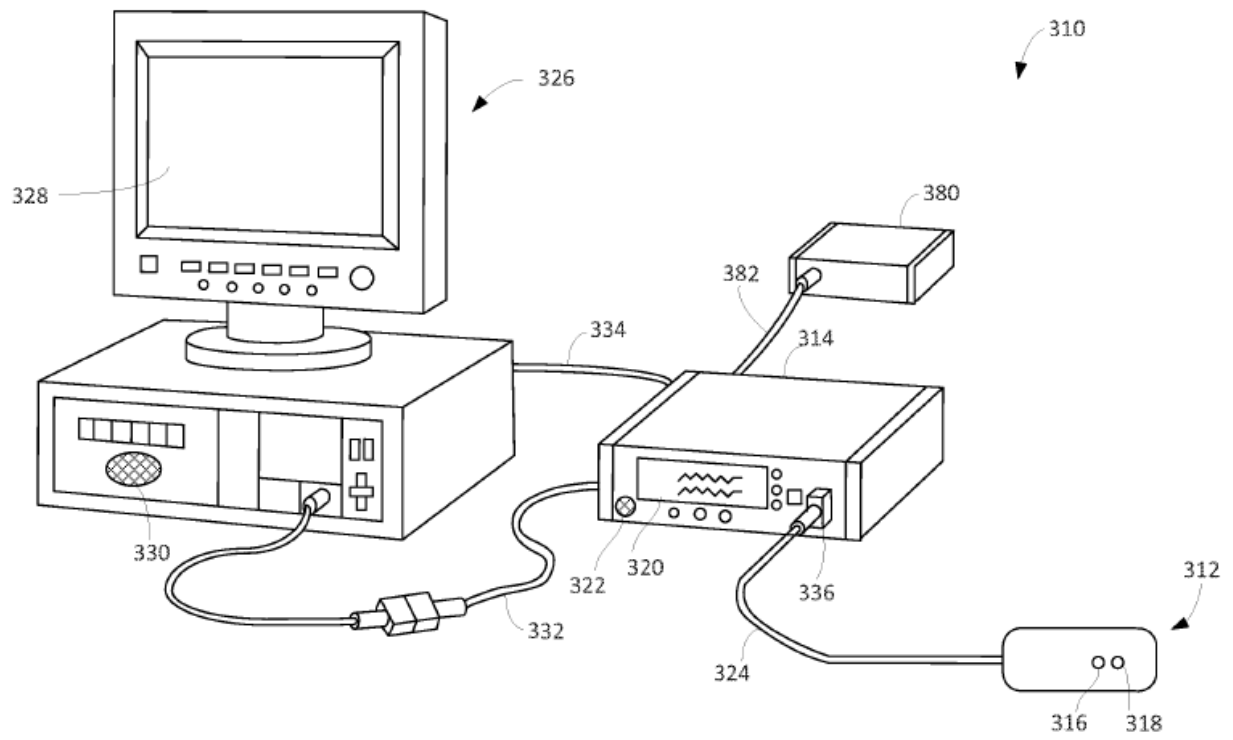


FIG. 3

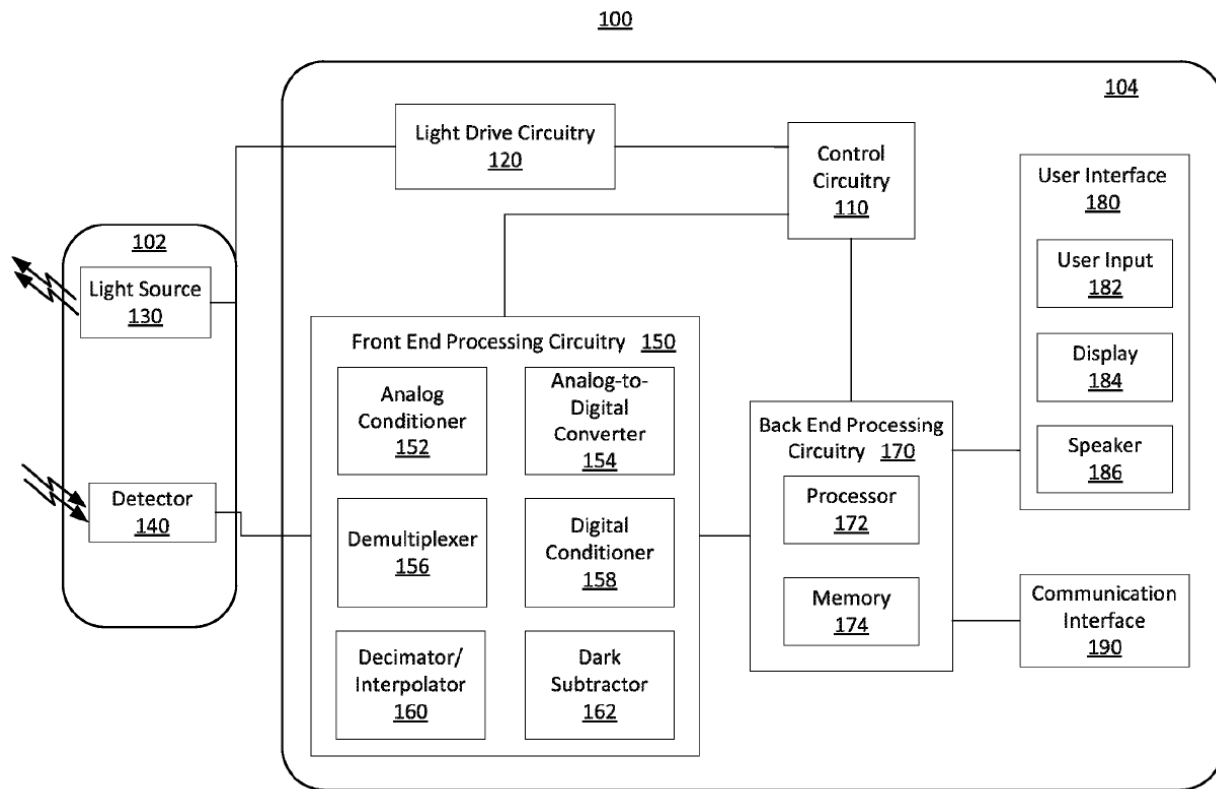


FIG. 1

EX1025, FIGS. 3, 1; EX2043, ¶78. 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, ¶78. 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, ¶78.

Front end processing circuitry 150 processes that signal. EX1025, 12:42-49; EX2043, ¶78. Then, “[p]rocessor 172 may receive and process physiological signals received from front end processing circuitry 150. Processor 172 may determine one

or more physiological parameters based on the received physiological signals.” EX1025, 14:60-64; EX2043, ¶78. The system compares the signals to determine parameters such as blood oxygen saturation. EX1025, 24:58-25:5; EX2043, ¶78.

B. Tran (EX1027) (Grounds 2, 4, 6, 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, ¶79. 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, ¶79. The wearable appliance may include sensors and may non-invasively measure, for example, blood pressure. EX1027, 4:62-65, 9:23-30; EX2043, ¶79.

C. LeBoeuf (EX1026) (Grounds 3-4, 7-8)

LeBoeuf describes monitoring devices, particularly light-guiding earbuds for positioning within an ear. EX1026, Abstract, ¶¶[0002], [0006], [0009], [0084]; EX2043, ¶80. Figure 3 shows an exemplary light-guiding earbud:

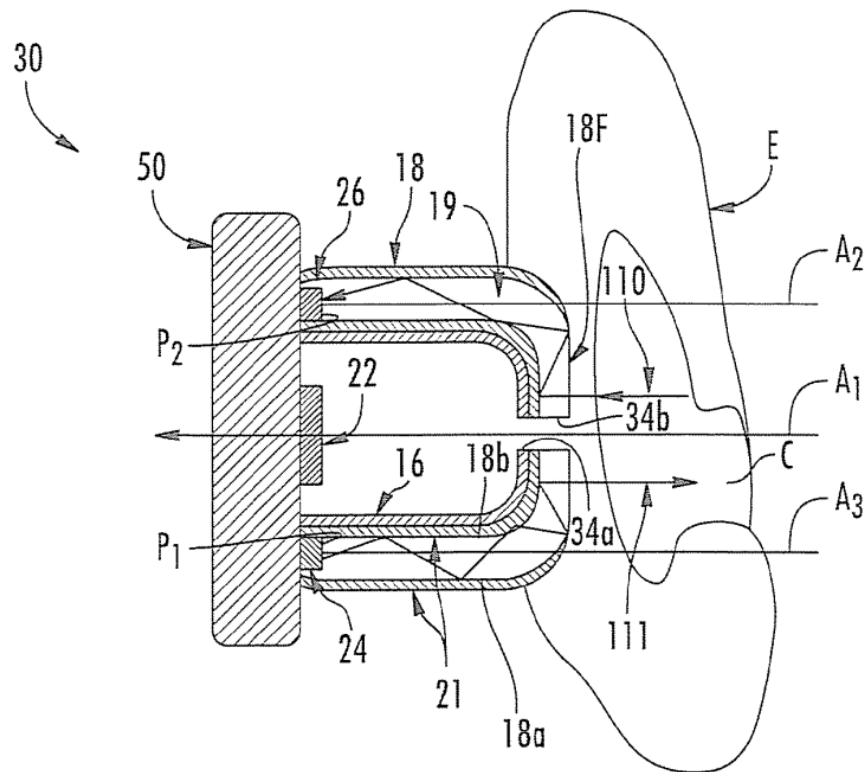


FIG. 3

EX1026, FIG. 3, ¶[0042]; EX2043, ¶80. The light-guiding earbuds include speaker 22, an earbud housing 16 in acoustical communication with the speaker 22, and apertures 34a-34b through which sound from the speaker 22 can pass. EX1026, ¶¶[0006], [0009], [0102], FIG. 3; EX2043, ¶80.

The 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. EX1026, Abstract, ¶¶[0006], [0106], FIG. 3; EX2043, ¶80. The light directed into the ear 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, ¶80.

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

Carlson describes a non-invasive optical pulse oximeter. EX1028, ¶[0002]; EX2043, ¶81. The oximeter is designed to be clipped onto a user's ear. EX1028, ¶¶[0048]-[0049]; EX2043, ¶81. This is illustrated in Figures 1 and 2:

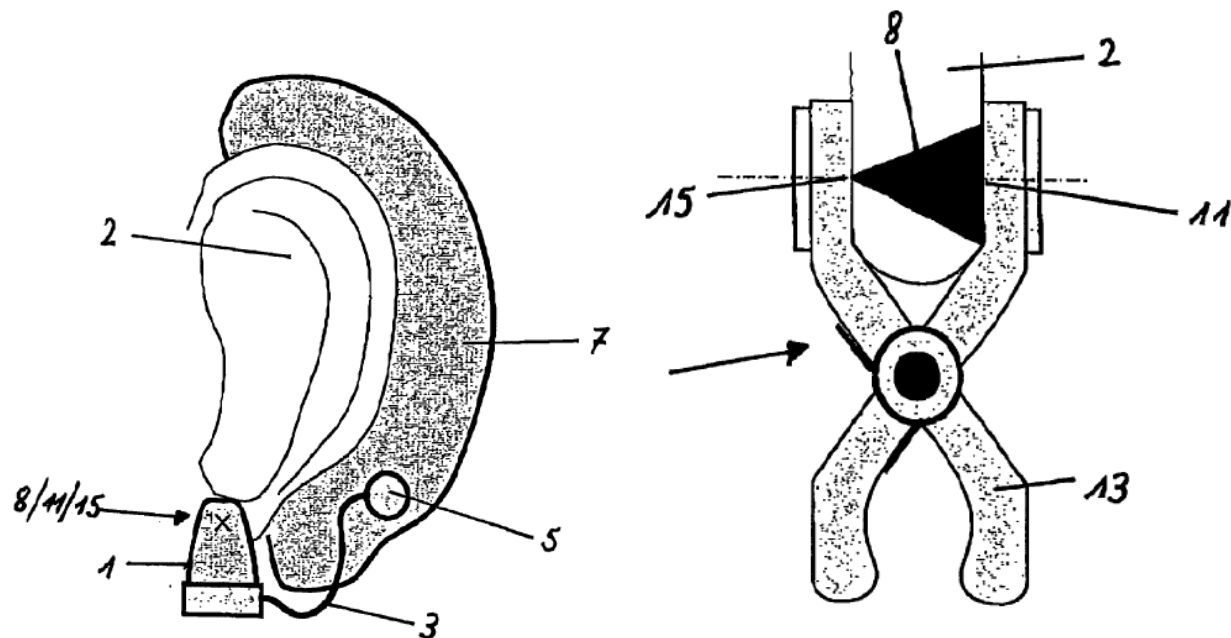


Figure 1

Figure 2

EX1028, FIGS. 1-2; EX2043, ¶81. The oximeter relies on various beam shaping optical elements for improving the signal-to-noise ratio and signal-to-background ratio of the signal generated by photo detecting element when it detects light that has been reflected from tissue. EX1028, ¶¶[0010], [0013]-[0014], [0062]; EX2043, ¶81. Carlson also relies on “optical wavelength filters” which filter the light detected by

the photo detecting element to a particular range of wavelengths. EX1028, ¶¶[0026], [0062]; EX2043, ¶81.

V. CLAIM CONSTRUCTION

The Petition contends that the challenged claims do not require construction and should be afforded their plain and ordinary meaning. Pet., 17-19. While the Petition acknowledges that terms in related patents that are “identical to or substantially similar to” terms in the challenged claims of the ‘475 Patent were construed in prior proceedings, Petitioners contends that they do not need to be construed. *Id.*

The district court issued two claim constructions in the parallel Texas Case. EX1122. First, the court construed the terms “modulate” and “modulation” in claim 13 as “[vary/varying/the varying of] the amplitude, frequency, or phase of the light produced.” *Id.*, 18; Second, the court construed the term “modulation frequency” in claim 13 as “pulse repetition rate.” *Id.* In a prior IPR for a related patent, the Board construed the phrase “modulating at least one of the LEDs” to mean “varying the amplitude, frequency, or phase of the light produced by at least one of the LEDs to include information.” EX2037, 10. Patent Owner submits that the Board need not construe these terms to find that Petitioners failed to meet their burden.

VI. PETITIONERS FAILED TO MEET THEIR BURDEN

For the reasons discussed below, Petitioners failed to carry their burden for

any of the grounds in the Petition.

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., 1-3, 18-20. 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”), respectively. Pet., 18-20. While the ’533 and ’484 Patents are related to the ’475 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). In the context of patentability, 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 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 even arguably 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. Petitioners Have Not Shown that Collateral Estoppel Applies to the Challenged Claims

The challenged claims of the ’475 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.” Petition, 3; EX1003, ¶43 (admitting that the ’475 Patent claims include “additional limitations”); EX2046, 303:5-8, 303:18-23 (confirming “additional limitations” refers to limitations not addressed in prior ’533 and ’484 IPRs).

For example, independent claim 1 recites a limitation requiring the apparatus to “determine[] ... that the apparatus is being worn by the user” (limitation [1.n]).

EX1001, 85:48-50. The claims of the '533 and '484 Patents at issue in the prior IPRs did not recite this limitation. EX1081, 28:51-32:23; EX1082, 36:45-40:55; EX2046, 276:17-279:19; EX1003, ¶¶197-98. Petitioners themselves recognize that collateral estoppel does not apply for limitation [1.n] by not referencing any prior Board decisions for it. Pet., 42-44.

As another example, dependent claims 6 and 7 recite “wherein the detection system comprises the plurality of detectors arranged along an arc” (the “arc limitation”). EX1001, 86:11-12. None of the claims at issue in the prior IPRs recited an “arc” arrangement. EX2046, 312:20-313:12; EX2045, 156:14-157:4 (conceding that the '533 Patent claims do not recite an “arc”), 159:3-14 (conceding that his prior declarations in the '484-IPR and '533-IPR did “not talk[] about an arc or LeBoeuf”); EX1081, 28:51-32:23; EX1082, 36:45-40:55. In Grounds 3-4 and 7-8, Petitioners rely on LeBoeuf as allegedly teaching the claimed “arc” arrangement. Petition, 66-72. But LeBoeuf was not presented in the prior IPRs. EX1008; EX1015. This confirms that claims 6 and 7 of the '475 Patent present materially different issues of patentability. *MaxLinear*, 880 F.3d at 1377-78.

Dependent claim 5 also contains an additional limitation requiring “a processor configured to be coupled to a non-transitory computer readable medium” (the “memory limitation”). EX1001, 86:1-3. None of the claims addressed in the prior IPRs recited this limitation. EX1081, 28:51-32:23; EX1082, 36:45-40:55.

Petitioners themselves recognize that collateral estoppel does not apply for the memory limitation by not referencing any prior Board decisions. Pet., 64-65.

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 limitations and the '484-FWD for others. Petitioners' piecemeal approach combines findings from the '533-FWD and '484-FWD in a mix-and-match approach to attempt to address the various claim limitations and motivation to combine. See Petition, 25-45 (relying on a mix of findings from the '533-FWD and '484-FWD), 62-80 (same).

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 single prior Board decision, not applying portions of different decisions to different claim limitations. Pet., 18-19. 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 institution decision applied collateral estoppel to claims as a whole. None of Petitioners' cited cases support their suggestion collateral estoppel applies where one prior decision addresses some aspects of the claim and another prior decision addresses other aspects.

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

The '484-FWD does not give rise to estoppel for another reason. The Board found that claims 1, 2, 7, and 15-23 of the '484 Patent unpatentable based on 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 applied references 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. 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 based on Lisogurski, Carlson, and Tran since it prevailed on claims 3-6 and 8-14 of the '484 Patent. 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 Testimony is Flawed

Petitioners' mistaken view that the result of this IPR is preordained in view of the prior IPRs is also evident in Dr. Anthony's declaration. Much of his “opinions” consist of quoting the prior IPR decisions and incorporating by reference his prior testimony. For example, for element [1.pre], he quotes the Board's prior decisions, incorporates his prior declarations by reference, and provides no meaningfully new or independent analysis. EX1003, ¶¶109-14. A similar pattern exists for other limitations. *See, e.g., id.*, ¶¶110-13, 116-17, 120-23, 131-32, 136-37, 141, 147-49, 153-55.

Dr. Anthony testified that he is “not relying on” the prior Board decisions and he was “just re-agreeing with myself through the lens of what the board 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, 6-8, 11-13)

Petitioners failed to meet their burden for Ground 1. EX2043, ¶¶83-209.

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

Petitioners fail to show obviousness of claim 1 for two independent reasons.

a) Petitioners Improperly Rely on the Same Prior Art Components for Different Claim Elements

Claim 1 recites "[a]n apparatus ... comprising" the following as separate and distinct claim elements:

- "one or more biosensors" ([1.a]);
- "a light source" ([1.d]); and
- "a detection system" ([1.f]).

EX1001, 85:11-50. Indeed, the specification shows that the "one or more biosensors" are separate from the "light source" and "detection system." EX1001, Abstract ("A wearable device...comprising one or more biosensors, **as well as** a light source...and a detection system"); EX2045, 257:15-259:8.² Petitioners, however,

² All emphasis in case and evidence citations herein is added unless otherwise noted.

rely on the same components in Lisogurski for both the “biosensor[]” and the “light source” and “detection system.”

Petitioners rely on Lisogurski's light source 130 as the claimed “light source” and rely on Lisogurski's detector 140 and front end processing circuitry 150 together as the claimed “detection system.” Pet., 33, 35-37; *see also id.*, 49. And Petitioners also rely on those same components of Lisogurski—i.e., light source 130, detector 140, and front end processing circuitry 150, collectively—as the separately claimed “biosensor[].” Pet., 33, 35-37; *see also id.*, 29-30; EX2046, 293:11-25 (relying on Lisogurski's light source and detector for the “biosensor”); EX2045, 258:17-259:15.

Thus, Petitioners improperly rely on the same prior art components for separate and distinct claim elements. *Becton, Dickinson and Co. v. Tyco Healthcare Gr., LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) (“Where a claim lists elements separately, the clear implication of the claim language is that those elements are distinct components of the patented invention” (cleaned up)); *Magnolia Med. Techs., Inc. v. Kurin, Inc.*, 169 F.4th 1094, 1102-04 (Fed. Cir. 2026) (holding that the plain and ordinary meaning of separately listed claim elements “require[s] separate corresponding structures”); *Chemco Sys., L.P. v. FDP Techs., Inc.*, IPR2019-01563, Paper 38 at 21-24 (PTAB Mar. 1, 2021) (finding that a single prior art structure could not teach separately listed claim elements).

**b) Lisogurski Does Not Disclose or Render Obvious
Limitation [1.n]**

Limitation [1.n] recites “wherein the apparatus is at least in part configured to determine, based at least in part on the output signal, that the apparatus is being worn by the user.” EX1001, 85:48-50. Regarding the claimed “determin[ation] ... that the apparatus is being worn by the user,” limitation [1.n] requires:

- 1) The claimed “determin[ation]” must be made by the “apparatus”; and
- 2) The claimed “determin[ation]” must be “based at least in part on the output signal.”

EX2043, ¶¶85-86.

Petitioners argue that the claimed “determin[ation]” is taught by Lisogurski’s single-sentence disclosure of “detect[ing]” a “system error” in the form of a “physiological impossible value” or “probe-off signal” (referenced herein as Lisogurski’s “error detection”). Pet., 42-44 (citing EX1025, 36:66-7:2). Petitioners also argue that the claimed “apparatus” is met by Lisogurski’s sensor 102/312 and that the claimed “output signal” is met by Lisogurski’s processed signals, which are sent from Lisogurski’s front end processing circuitry 150 (“front-end circuitry 150”) to back end processing circuitry 170 (“back-end circuitry 170”). Petition at 42-43, 29, 35-36; EX2043, ¶¶87-89.

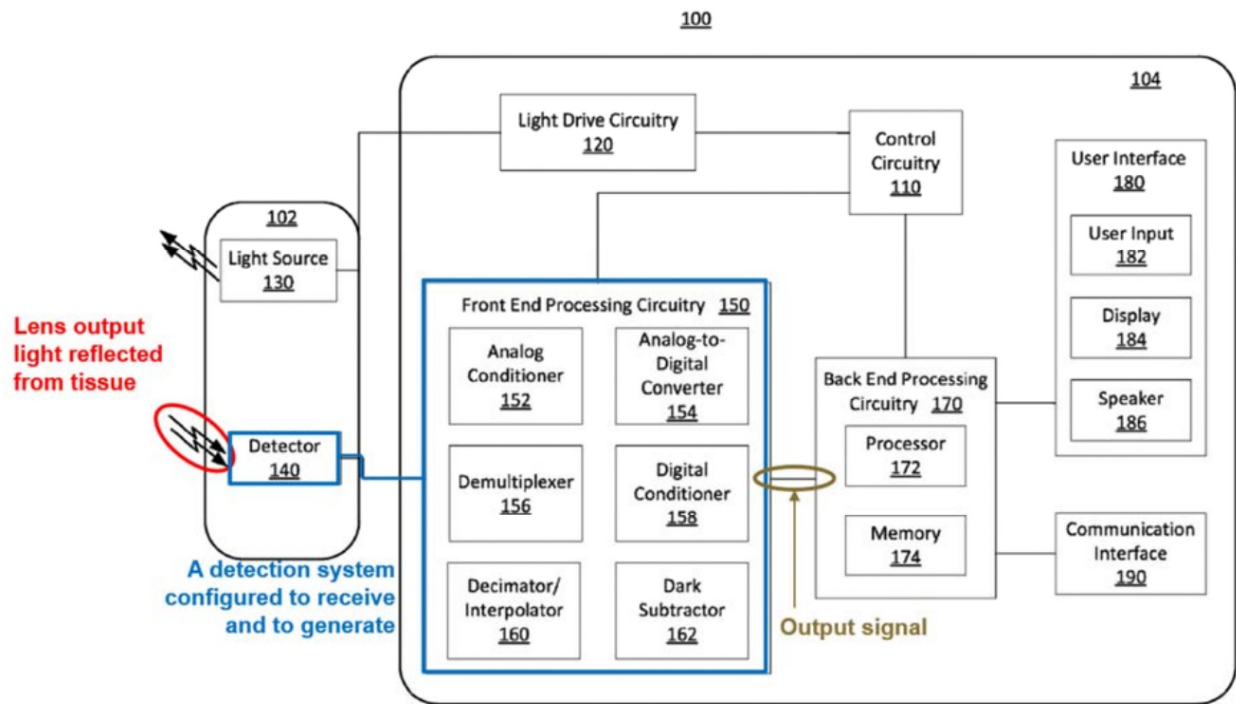


FIG. 1

Pet., 36 (annotating EX1025, FIG. 1)

Lisogurski fails to disclose or render obvious limitation [1.n] because Lisogurski's error detection (the alleged "determin[ation]") is not (1) performed by Lisogurski's sensor (the alleged "apparatus") or (2) based at least in part on Lisogurski's processed signals (the alleged "output signal"). EX2043, ¶¶84-129.

- (1) **Lisogurski does not disclose or render obvious that its "probe-off" system error is the same as determining the apparatus "is being worn by the user"**

Lisogurski neither discloses nor renders obvious that its "probe-off" system error is the same as determining the apparatus "is being worn by the user." EX2043, ¶¶94-102.

Petitioners fail to show that Lisogurski's alleged error detection meets limitation [1.n]'s requirement that the "apparatus" is "configured to determine...that the apparatus is being worn by the user." EX1001, 85:48-50. Petitioners rely on Lisogurski's single-sentence disclosure that "the system may detect a signal indicative of a system error such as a physiologically impossible value ... [or] a probe-off signal...." Pet., 42-44 (citing EX1025, 36:66-37:2); EX1003, ¶¶196-198. But Lisogurski's "probe-off" error detection is different from the claimed determination that the apparatus "is being worn by the user." EX2043, ¶¶95-100.

Lisogurski describes the "probe-off signal" as "a signal indicative of a system error." EX1025, 36:66-37:2. Lisogurski does not explain what "probe-off" means. EX2043, ¶97. While Lisogurski explains "an 'off' state may refer to off or low emission and 'on' may refer to medium or high," this merely describes system-level operational states—not whether the apparatus is being worn by a user. EX1025, 8:27-44; EX2043, ¶97.

Petitioners allege that "when a "probe-off signal" is not detected, Lisogurski's sensor would determine that the apparatus is being worn by the user." Pet., 44. A "system error" such as a "probe-off signal," however, merely detects a negative condition, i.e., the probe is not on. EX1025, 36:66-37:2. But limitation [1.n] requires an affirmative determination—that the apparatus "is being worn by the user." EX1001, 85:48-50. A "probe-off" error might not appear if (a) the probe is attached

to something else, (b) the system hasn't detected the issue yet due to a detection delay, or (c) the sensor is malfunctioning and fails to send the error signal. EX2043, ¶99. In none of these scenarios would the apparatus be "being worn by the user," yet no "probe-off" error would be detected.

Dr. Anthony confirmed that system errors such as a probe-off or a physiologically impossible value can arise from multiple conditions beyond whether the device is worn: "indeed, ***other errors could occur***, but certainly a POSITA reading Lisogurski would understand that the hemoglobin is being detected and if it's not being detected, that is ***an indication that probe is off or something other—something else could be happening.***" EX2045, 44:19-45:20, 48:16-49:21. Dr. Anthony's testimony confirms that the absence of a detected hemoglobin signal—which triggers a "system error"—can result from "something else...happening" beyond the apparatus not being worn by the user. *Id.* This is inconsistent with limitation [1.n]'s requirement of an affirmative determination that the apparatus "is being worn by the user." EX2043, ¶100.

Moreover, Lisogurski describes the "probe-off signal" as one of several types of "system error"—alongside "a physiologically impossible value." EX1025, 36:66-37:2. A POSITA would understand "system errors" are abnormal conditions showing the system is not working properly (for example, a circuit or sensor failure, sweating, or a software bug), not as a positive finding that the device is being worn

by a user. EX2043, ¶101. A “system error” presumes the system is encountering a problem; it does not include the affirmative determination that the device is being worn. EX2043, ¶¶98-102.

(2) Lisogurski does not disclose or render obvious that its sensor (alleged “apparatus”) is configured to perform error detection (alleged “determin[ation]”)

Lisogurski neither discloses nor renders obvious that its sensor (the alleged “apparatus”) is “configured to” perform Lisogurski’s error detection (the alleged “determin[ation]”). EX2043, ¶¶103-117.

First—Lisogurski does not disclose that its sensor performs the error detection (the alleged “determin[ation]”). EX2043, ¶104. Lisogurski’s error detection is mentioned only once in Lisogurski, in a single sentence that merely states that “the system” may detect the error, with no discussion of Lisogurski’s sensor or any indication as to what component makes the detection. EX1025, 36:66-37:2; EX2043, ¶104.

Second—Petitioners fail to show that it would have been obvious for Lisogurski’s sensor to perform the error detection. Pet., 42-44. Petitioners rely on Lisogurski’s statement that “the functionality of some of the components may be combined in a single component” (Pet., 43 (quoting EX1025, 15:66-16:4)), but this fails to show that Lisogurski’s error detection would have been performed by its

sensor because:

- this statement mentions neither Lisogurski's sensor nor error detection;
- Petitioners fail to explain why or how this cited statement applies to either Lisogurski's sensor or error detection;
- this statement refers to Lisogurski's system 100 in Figure 1, and Lisogurski discloses no connection between system 100, or sensor 102 therein, and Lisogurski's error detection;
- Lisogurski does not identify any component in system 100 that performs the error detection, so Petitioners do not and cannot explain how such an unidentified component along with sensor 102 would be included in the cited statement's reference to "**some** of the components"; and
- as explained below, a POSITA would have understood that back-end circuitry 170 performs the error detection and that the cited statement about combining functionality of "some" components would not apply to back-end circuitry 170 and sensor 102, and Petitioners do not argue that combination.

EX1025, 15:66-16:4, 36:66-37:2, 14:56-15:18, FIG. 1; Pet., 42-44, 26-28; EX2043, ¶¶105-109.

Petitioners' analysis of limitation [1.n] concludes by citing Exhibit 1058 to assert that it was well-known for devices to incorporate detection mechanisms, but this has no connection to Lisogurski's sensor. Pet., 44 (citing EX1058). Exhibit 1058

is unrelated to Lisogurski and would not have led a POSITA to understand or find obvious that the error detection is performed by the sensor in Lisogurski. EX2043, ¶110. Exhibit 1058 is also not part of Ground 1. Pet., 8.

Moreover, Dr. Anthony was evasive in response to questions about where Lisogurski's error detection would be performed in Lisogurski's system. *E.g.*, EX2046, 295:18-300:12 (evading questions about FIG. 1). His testimony was also contradictory. *Compare* EX2046, 293:11-25 (testifying that front-end circuitry 150 is "contained within Lisogurski's sensor [102] *as modified*") *with id.*, 299:19-300:12 (testifying that "putting the front-end processing circuitry [150] within the sensor [102]" is "*not modifying* Lisogurski" and "*not modifying* the figure").

Third—A POSITA would have understood that Lisogurski's error detection is made by back-end circuitry 170 rather than sensor 102 (the alleged "apparatus"). The Petition argues that Lisogurski would be modified to relocate front-end circuitry 150 into sensor 102. Pet., 26-28. But a POSITA would not have understood or found obvious that front-end circuitry 150 performs Lisogurski's error detection, as front-end circuitry 150 performs signal conditioning (not error detection) and uses subcomponents 152-162 that perform prescribed signal-conditioning tasks (which do not include error detection). EX1025, FIG. 1, 13:7-14:10; EX2043, ¶¶111-12.

In contrast to front-end circuitry 150 in sensor 102 (as allegedly modified), back-end circuitry 170 performs decision-making and detection using processor 172,

which Lisogurski describes as “performing the functions described herein,” such as the error detection. EX1025, FIG. 1, 12:42-51, 13:7-14:10, 14:56-15:18; EX2043, ¶¶112-13. Moreover, “step 1904,” which includes Lisogurski’s disclosure of the error detection, and back-end circuitry 170 both involve determining/detecting “physiological parameter[s],” so it would be consistent for “step 1904” and back-end circuitry 170 to also both be involved in the error detection. EX1025, 36:54-37:2, 14:56-64; EX2043, ¶114.

Additionally, Petitioners argue that Lisogurski’s error detection is based on processed signals (the alleged “output signal”). Pet., 42-44, 35-36. As shown in the following annotated figure in the Petition, Lisogurski teaches that these processed signals are sent to back-end circuitry 170. EX1025, 12:42-45, FIG. 1; EX2043, ¶¶115-116.

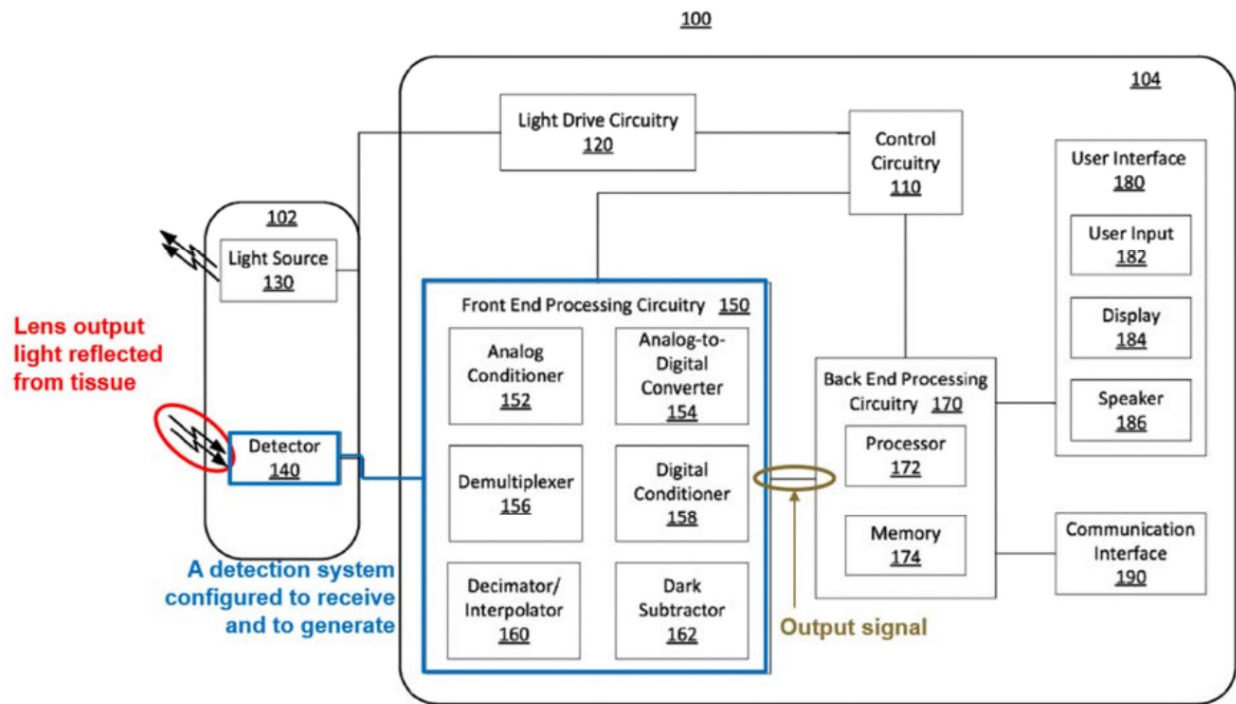


FIG. 1

Pet., 36 (annotating EX1025, FIG. 1)

If Lisogurski's error detection is based on these processed signals (alleged "output signal") as Petitioners allege, then the error detection would be performed by back-end circuitry 170 that receives the processed signals and not by front-end circuitry 150 (allegedly within sensor 102) that sends the processed signals. EX1025, FIG. 1, 12:42-45; EX2043, ¶115-16.

(3) Lisogurski does not disclose or render obvious that the error detection (alleged "determin[ation]") is based on the processed signals (alleged "output signal")

Lisogurski does not disclose or render obvious that its error detection (the alleged "determin[ation]") is "based at least in part on" Lisogurski's processed

signals (alleged “output signal”) as required in limitation [1.n]. EX2043, ¶¶118-124.

First—Lisogurski does not disclose that its error detection is based on processed signals, which are disclosed in the context of system 100 in Figure 1. EX1025, 12:42-45. Lisogurski's error detection is mentioned only once in Lisogurski, in a single sentence with no connection to system 100, no mention of processed signals, and no indication of what component performs the error detection or how. EX1025, 36:66-37:2; EX2043, ¶119.

Second—Petitioners fail to show that it would have been obvious for Lisogurski's error detection to be based on Lisogurski's processed signals. The only two portions of Lisogurski cited in Petitioners' analysis of limitation [1.n] do not even mention or relate to the processed signals. Pet., 42-44 (citing EX1025, 36:66-37:2, 15:66-16:4); EX2043, ¶¶120-21. While Petitioners cross-reference their analysis of limitation [1.f], that analysis does not address Lisogurski's error detection that Petitioners rely on for the claimed “determin[ation]” in limitation [1.n]. Pet., 42-44 (citing §IX.B.3.g.[1.f]); 35-36 (§IX.B.3.g.[1.f]); EX2043, ¶122.

Petitioners also cite Exhibit 1058 but with no connection to Lisogurski's processed signals. Pet., 44 (citing EX1058). Indeed, Exhibit 1058 is unrelated to Lisogurski's teachings and would not have led a POSITA to understand or find obvious that Lisogurski's error detection is based on processed signals involved in

system 100 in Figure 1. EX2043, ¶123. Moreover, Exhibit 1058 is not part of Ground 1. Pet., 8.

(4) Lisogurski's error detection (alleged "determin[ation]") cannot be both (i) performed by the sensor (alleged "apparatus") and (ii) based on the processed signals (alleged "output signal")

As discussed above, limitation [1.n] requires that the apparatus is configured to determine that the apparatus is being worn by the user based at least in part on the output signal. EX1001, 85:48-50

Contrary to Petitioners' suggestions, Lisogurski's error detection (the alleged "determin[ation]") cannot be **both** (1) performed by the sensor (the alleged "apparatus") **and** (2) based at least in part on the processed signals (the alleged "output signal") as required by limitation [1.n]. Pet., 42-44; EX2043, ¶¶125-28. This incompatibility is illustrated by the following annotated figure in the Petition, where the blue annotation illustrates front-end circuitry 150 being relocated into sensor 102 and the brown annotation illustrates processed signals (alleged "output signal") sent from front-end circuitry 150 to back-end circuitry 170. Pet., 35-36, 26-28; EX1025, 12:42-45; EX2043, ¶¶125.126

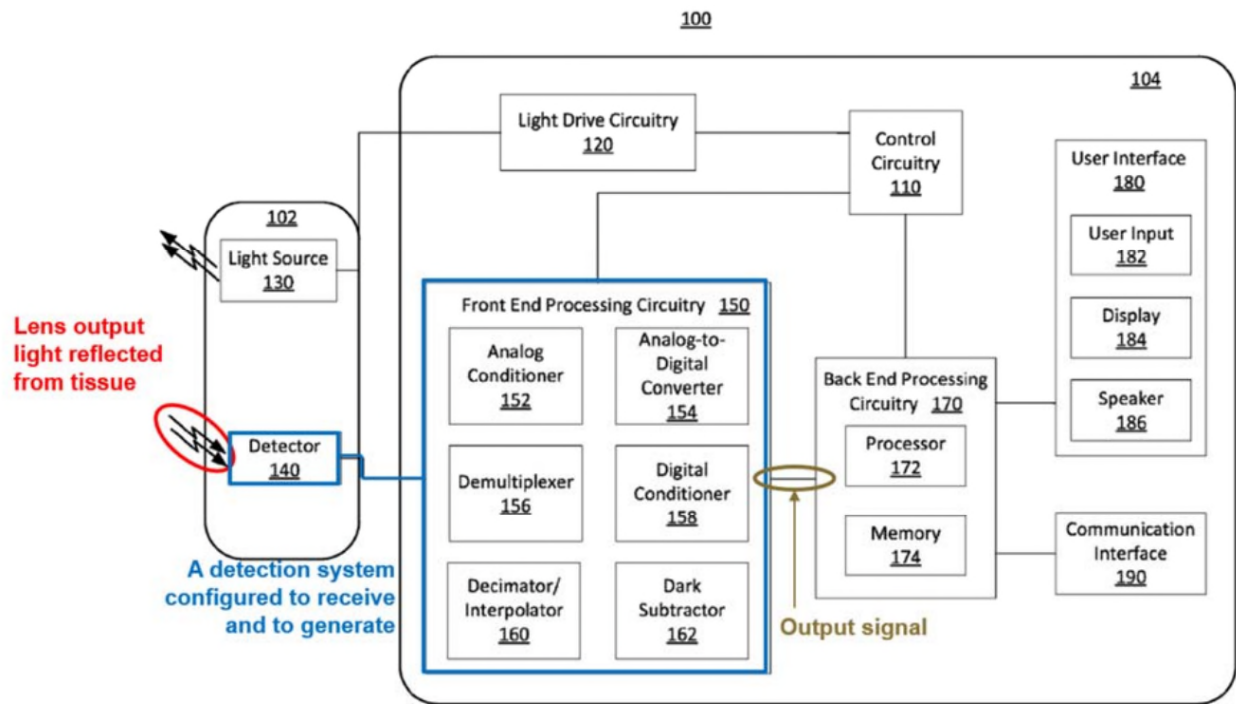


FIG. 1

Pet., 36 (annotating EX1025, FIG. 1)

If Lisogurski's error detection is performed by Lisogurski's sensor 102 (regardless of whether sensor 102 includes front-end circuitry 150), then the error detection (the alleged "determin[ation]") cannot be based on the processed signals (the alleged "output signal") that are received instead by back-end circuitry 170. EX1025, FIG. 1, 12:42-45; EX2043, ¶127. This fails to satisfy limitation [1.n]'s requirement that the error detection (the alleged "determin[ation]") be "based at least in part on" Lisogurski's processed signals (the alleged "output signal").

Alternatively, if Lisogurski's error detection is based on the processed signals received by back-end circuitry 170, then the error detection would be performed by back-end processing circuitry 170 and not sensor 102, regardless of whether sensor

102 includes front-end circuitry 150. EX1025, FIG. 1, 12:42-45; EX2043, ¶128. This fails to satisfy limitation [1.n]'s requirement that Lisogurski's sensor (the alleged "apparatus") is "configured to" make the error detection (the alleged "determin[ation]").

2. Dependent Claim 6

Lisogurski does not render obvious dependent claim 6 for at least the same reasons as claim 1. *Supra*, §VI.C.1; EX2043, ¶¶130-31.

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

Additionally, Lisogurski does not render obvious claim 6's requirement that "the detection system comprises the plurality of detectors arranged along an *arc*" (referenced herein as the "arc limitation"). EX1001, 86:9-10. Petitioners rely on Lisogurski's disclosure of a sensor with multiple detectors as the claimed "plurality of detectors." Pet., 37, 44-45. But Lisogurski does not disclose or render obvious that its detectors are "arranged along an arc." EX2043, ¶¶132-143. Indeed, Petitioners and their expert each provide only a single conclusory paragraph of analysis that fails to explain why an arc would be obvious in view of Lisogurski. Pet., 46-47; EX1003, ¶209; EX2043, ¶134; *see also* EX2045, 160:21-163:24 (Dr. Anthony conceding that he relies on LeBoeuf for the alleged arc).

Lisogurski does not disclose any arrangement for its detectors, much less an

arc arrangement. EX2043, ¶¶135-37. Indeed, Petitioners fail to identify any alleged teaching or suggestion of any particular arrangement in Lisogurski, let alone an arc arrangement. Pet., 46-47.

Lisogurski also does not render obvious the claimed arc arrangement. Petitioners first cite Lisogurski's statement regarding "[a]ny suitable configuration." Pet., 46 (EX1025, 17:39-43). But this statement does not teach or suggest any particular arrangement or teach any one configuration (e.g., arc) as opposed to countless other potential configurations (e.g., triangle or grid). EX2043, ¶¶138-39; *Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 886-87 (Fed. Cir.) (holding that "mere ... exist[ence]" of "possible arrangements" and knowledge of "alternative arrangements" are insufficient for motivation).

Petitioners' sole alleged motivation for modifying Lisogurski to include the claimed arc arrangement is an alleged need for a non-linear arrangement for "angularly" scattered light. Pet., 46-47 (citing EX1025, 11:16-20; EX1045, 4:14-65). First, however, this alleged motivation is unsupported, as the cited portions of Lisogurski and Exhibit 1045 do not discuss angled light, much less a connection between angled light and an arc arrangement. EX1025, 11:16-20; EX1045, 4:14-65; EX2043, ¶¶140-41. Second, Petitioners' assertion regarding deficiency of a "linear ... detector arrangement" incorrectly assumes that only two possible arrangements existed—i.e., linear and arc—and fails to consider other possible arrangements (e.g.,

triangle or grid) or explain why a POSITA would have chosen an arc over other possible arrangements. Pet., 46-47; EX2043, ¶142; see EX1026, FIG. 12A, ¶¶[0060], [0138] (showing a non-linear, non-arc arrangement of detectors); *Virtek*, 97 F.4th at 886-87 (holding mere existence or knowledge of “possible arrangements” insufficient for motivation). In fact, the Petition does not even identify an arc arrangement anywhere in any reference for Ground 1. Pet., 46-47.

b) Lisogurski Does Not Disclose “Six Light Emitting Diodes”

Claim 6 recites “wherein the plurality of light emitting diodes comprises six light emitting diodes.” EX1001, 86:7-8. The specification depicts an embodiment with six light-emitting diodes in FIG. 18B. EX1001, FIG. 18B, 27:46-28:1. A POSITA would have understood that six spatially distributed LEDs provide the technical advantage of increasing the probability that emitted light will illuminate blood vessels within the tissue—a requirement for accurate physiological measurement at sites where the microvasculature is not uniformly distributed. EX2043, ¶¶146-147. In addition, for example, when a system uses three distinct wavelengths, six LEDs provide exactly two LEDs per wavelength—meaningful redundancy for each wavelength channel while maintaining LED efficiency. EX2043, ¶¶146-147.

Petitioners rely on Lisogurski's generic disclosures that its light source “may

include any number of light sources with any suitable characteristics,” “may be one or more LEDs,” and may include “multiple LEDs of the same wavelength, multiple LEDs of different wavelengths, any other suitable arrangement, or any combination thereof.” Pet., 44-47; EX1003, ¶203; EX1025, 10:58-60, 17:43-45, 19:22-31. These generic terms—“one or more,” “multiple,” and “any number”—do not expressly disclose six. The only specific embodiment in Lisogurski uses two LEDs—one red and one infrared. EX1025, 10:52-56. EX2043, ¶148.

The ‘475 Patent, by contrast, explains the technical significance of six LEDs: FIG. 18B specifically depicts six LEDs (EX1001, FIG. 18B, 27:45-28:3), 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, ¶¶146-147.

Lisogurski's stated objectives counsel against the use of six LEDs. EX2043, ¶149. Lisogurski is entitled “Methods and Systems for Power Optimization in a Medical Device” and is directed to reducing power consumption and minimizing heating effects. *Id.*; EX1025, Title, 1:10-25. Lisogurski teaches that “reducing power consumption may allow for increased battery life in portable systems or increased portability” (EX1025, 1:16-18), that “it may be desirable to reduce the power consumption of the light source” (EX1025, 3:50-53), and expressly states a “desir[e] to reduce the power consumption by the light drive signal to reduce heating effects

caused by an emitter” (EX1025, 3:58-60). EX2043, ¶149.

Increasing Lisogurski's two LEDs to the claimed six would conflict with Lisogurski's objectives. EX1025, 1:10-25, 3:50-60; EX2043, ¶150-151. More LEDs would use more power (undermining power optimization), generate more heat (contrary to reducing heating), and add signal-processing complexity because Lisogurski sequences LEDs with dark periods and each added wavelength would require additional drive/dark periods and processing (EX1025, 12:16-41). EX2043, ¶150; EX2045, 105:4-9, 109:14-110:3. More LEDs would also likely make the sensor larger, which conflicts with Lisogurski's portability objective. EX1025, 1:15-18; EX2043, ¶150; EX2045, 64:9-68:23 (testifying that this may require using “miniaturized components” and involves “trade-offs”). Lisogurski teaches minimizing how many LEDs are on and how bright they are, such as running one LED at full brightness while modulating additional LEDs to save power and reduce heat. EX1025, 7:38-8:3; EX2043, ¶151. A POSITA would understand Lisogurski is designed for fewer LEDs, not more, and would not be motivated to triple the LED count from two to six. EX2043, ¶150-51.

Petitioners also rely on LeBoeuf and Lamego to argue that adding additional light sources increases measurement accuracy. Pet., 45-46. LeBoeuf does not disclose six LEDs. LeBoeuf's Figure 8B depicts only four emitters 24, but LeBoeuf does not state how many emitters are depicted and does not specifically disclose six.

EX1026, FIG. 8B, ¶[0123]. LeBoeuf describes “[v]arious configurations and arrangements of optical emitters and detectors” without specifying any particular number. EX1026, ¶[0123]; EX2043, ¶152

Petitioners rely on Lamego (EX1033) —which is not part of any ground (Pet., 46; EX1003, ¶208)—for the bare enumeration “four, six, eight or sixteen LEDs” without any teaching, preference, or selection criteria favoring six. EX1033, ¶¶[0035], [0041].

Petitioners and Dr. Anthony do not explain why a POSITA would select six LEDs over other numbers, 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., 44-46; EX1003, ¶¶199-208. 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, ¶¶153-154.

3. Dependent Claim 7

Lisogurski does not render obvious claim 7 for at least the same reasons discussed above for claims 1 and 6. *Supra*, §§VI.C.1 (claim 1), VI.C.2 (claim 6); EX2043, ¶¶155-57.

4. Independent Claim 8:

Claim 8 recites “determine ... that the wearable device is being worn by the

user,” similar to claim 1. Ex. 1001 at 86:44-46. Claim 8 also recites, in part: “[8.d] a processor configured to: ... [8.g] (iv) determine, based at least in part on the third output signal, that the wearable device is being worn by the user.” EX1001, 86:26, 86:44-46. Taken together, limitations [8.d] and [8.g] require the following:

- 1) The claimed “determin[ation]” must be made by the “processor”; and
- 2) The claimed “determin[ation]” must be “based at least in part on the third output signal.”

EX2043, ¶159.

Similar to its arguments for limitation [1.n], Petitioners argue that the claimed “determin[ation]” in limitation [8.g] is taught by Lisogurski’s error detection, i.e., Lisogurski’s single-sentence disclosure of “detect[ing]” a “system error” in the form of a “physiological impossible value” or “probe-off signal.” Pet., 54-56 (citing EX1025, 36:66-7:2); EX2043, ¶¶160, 165. Petitioners do not address the same deficiencies as claim 1 because Lisogurski’s “probe-off” system error is different from determining the apparatus “is being worn by the user.” See §VI.C.1.b.(1).

While they rely on the same disclosure in Lisogurski, Petitioners’ arguments for limitations [8.d] and [8.g] are materially different from their arguments for limitation [1.n] in two ways. First, Petitioners argue the claimed “processor” of limitation [8.d] is met by Lisogurski’s front-end circuitry 150 rather than the sensor 102. Pet., 50-51, 26-28, 42-44; EX2043, ¶¶162-168. Second, for the claimed “third

output signal” in limitation [8.g] (and [8.f]), Petitioners rely on Lisogurski's purported teaching of a “‘dark subtract[ed]’ signal,” which Petitioners argue is “an output signal generated after application of a dark subtraction technique,” rather than Lisogurski's processed signals. Pet., 52-56, 42-44; EX2043, ¶¶163-168.

Lisogurski fails to disclose or render obvious that the alleged error detection is (1) performed by Lisogurski's front-end circuitry 150 (the alleged “processor”) or (2) based at least in part on Lisogurski's “‘dark subtract[ed]’ signal” (the alleged “output signal”) to meet requirements (1) and (2) above for limitations [8.g] and [8.d]. EX2043, ¶¶158-92.

a) Lisogurski does not disclose or render obvious front end processing circuitry 150 configured to perform error detection

Lisogurski does not disclose or render obvious its front-end circuitry 150 (the alleged “processor”) being “configured to” make Lisogurski's error detection (the alleged “determin[ation]”). EX2043, ¶¶171-81.

First—Lisogurski does not disclose that its front-end circuitry 150 performs error detection. Lisogurski mentions error detection only once, in a single sentence that merely states that “the system” may detect the error, with no discussion of Lisogurski's front-end circuitry 150 or any indication as to what component makes the detection. EX1025, 36:66-37:2; EX2043, ¶172.

Second—Petitioners fail to show that it would have been obvious for

Lisogurski's front-end circuitry 150 to perform the error detection. Pet., 54-56. Petitioners' analysis for limitation [8.g] does not even mention front-end circuitry 150. Pet., 54-56. Petitioners instead argue that sensor 102 performs the error detection. *Id.* This argument fails for two reasons. First, limitations [8.d] and [8.g] together require the error detection (the alleged "determin[ation]") be performed by the claimed "processor," for which Petitioners rely on front-end circuitry 150 (not sensor 102). Pet., 54-56, 51-52; EX2043, ¶173. Second, the argument fails to the same reasons discussed above in §VI.C.1.b.(2) for limitation [1.n].

Third—A POSITA would have understood that Lisogurski's error detection is made by back-end circuitry 170, not front-end circuitry 150, for at least the same reasons explained above in §VI.C.1.b. EX2043, ¶¶175-79.

Petitioners argue that the error detection is based on Lisogurski's "'dark subtract[ed]' signal" (alleged "[third] output signal"), and according to Petitioners, this "output signal" is sent to back-end circuitry 170, as depicted by the following annotated figure in the Petition. Pet., 52-56, 35-36; EX1025, FIG. 1, 12:42-45; EX2043, ¶176.

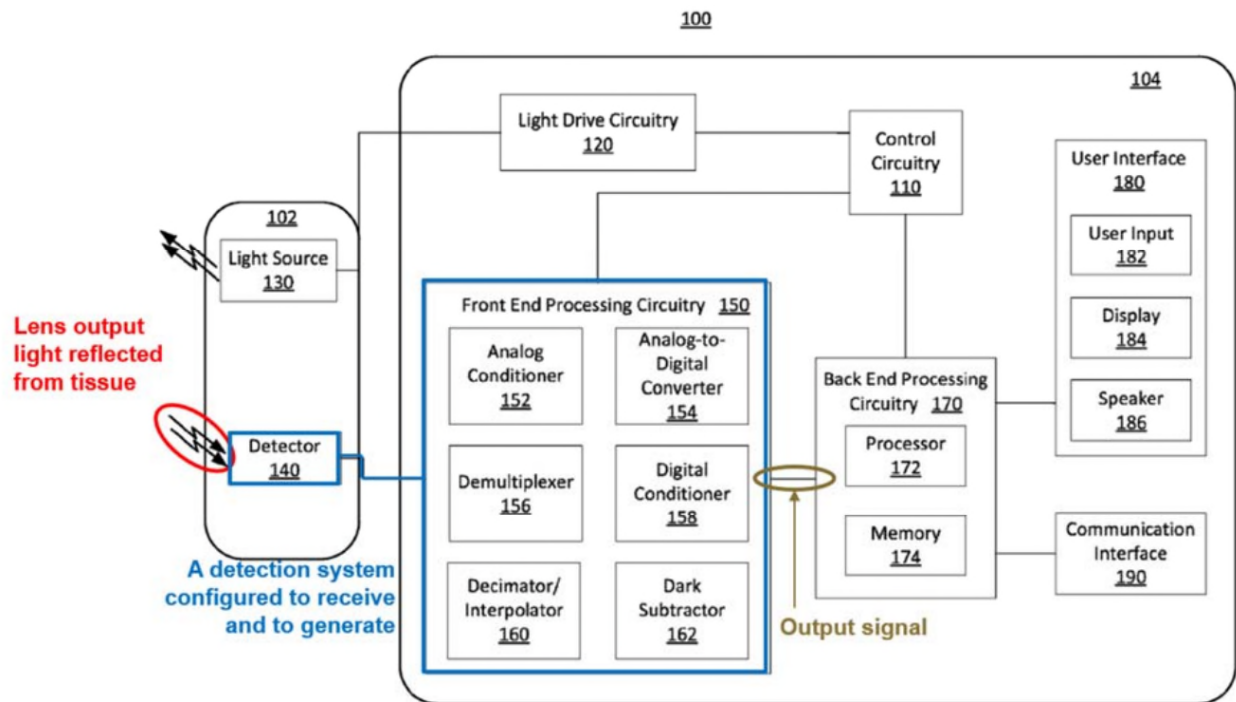


FIG. 1

Pet., 36 (annotating EX1025, FIG. 1)

If Lisogurski's error detection is based on the “‘dark subtract[ed]’ signal” (alleged “[third] output signal”) that is sent to back-end circuitry 170, as Petitioners allege, then a POSITA would have understood that the error detection is performed by back-end circuitry 170 that receives this signal, not by front-end circuitry 150 that sends the signal. Pet., 52-56, 35-36; EX1025, FIG. 1, 12:42-45; EX2043, ¶180.

b) Lisogurski does not disclose or render obvious that the error detection is based on a “‘dark subtract[ed]’ signal”

Lisogurski neither discloses nor renders obvious that its error detection (the alleged “determin[ation]”) is “based at least in part on” Lisogurski's “‘dark subtract[ed]’ signal” (the alleged “third output signal”). EX2043, ¶¶182-89.

First—Lisogurski does not disclose that its error detection is based on a “‘dark subtract[ed]’ signal.” Lisogurski’s error detection is mentioned in only one sentence in Lisogurski, with no connection to Lisogurski’s disclosures regarding subtraction, no mention of a “‘dark subtract[ed]’ signal,” and no indication of what component performs the error detection or how. EX1025, 36:66-37:2; EX2043, ¶183.

Second—Petitioners fail to show that it was obvious for Lisogurski’s error detection to be based on a “‘dark subtract[ed]’ signal.” The only two portions of Lisogurski cited in Petitioners’ analysis of limitation [8.g] do not mention or relate to dark subtraction or any “‘dark subtract[ed]’ signal.” Pet., 54-56 (citing EX1025, 36:66-37:2, 16:12-14); EX2043, ¶¶184-85. While Petitioners cross-reference their analysis of limitation [1.n], that analysis does not address dark subtraction or any “‘dark subtract[ed]’ signal.” Pet., 54-56 (citing “§IX.B.3.o.[1.n]”); 42-44 (§IX.B.3.o.[1.n]); EX2043, ¶186.

Petitioners assert that Lisogurski’s error detection would be based on a “‘dark subtract[ed]’ signal” to “avoid ... noise[]” and improve “accura[cy].” Pet., 55. But Petitioners provide no evidence, and a POSITA would not have understood, that Lisogurski’s error detection would be affected by noise or made more accurate with a “‘dark subtract[ed]’ signal.” Pet., 55 (citing Petitioners’ [1.n] analysis and EX1025, 16:12-14, neither of which address dark subtraction); EX2043, ¶187. As explained above, Petitioners’ limitation [8.g] analysis cites no evidence in Lisogurski regarding

dark subtraction. While Petitioners cite Exhibit 1057, this exhibit has no connection to Lisogurski, and a POSITA would not have understood Lisogurski's error detection to be associated with a "'dark subtract[ed]' signal" based on this unrelated Exhibit 1057. Pet., 55-56; EX2043, ¶188.

c) Lisogurski's error detection cannot be both (i) performed by front end processing circuitry 150 and (ii) based on the "'dark subtract[ed]' signal"

Lisogurski's error detection (the alleged "determin[ation]") cannot be **both** (1) performed by front-end circuitry 150 (the alleged "processor") **and** (2) based at least in part on a purported "'dark subtract[ed]' signal" (the alleged "third output signal"). Pet., 50-51, 54-56; EX2043, ¶¶190-94. This incompatibility is illustrated by the following annotated figure in the Petition, where the blue annotation illustrates front-end circuitry 150 being relocated into sensor 102 and the brown annotation illustrates processed signals (the alleged "third output signal") sent from front-end circuitry 150 to back-end circuitry 170. Pet., 35-36, 26-28, 50-56 (mapping claimed "output signal[s]" to Lisogurski's processed signals from front-end circuitry 150 and identifying the "'dark subtract[ed]' signal" as the claimed "third output signal"); EX1025, 12:42-45; EX2043, ¶¶190-91.

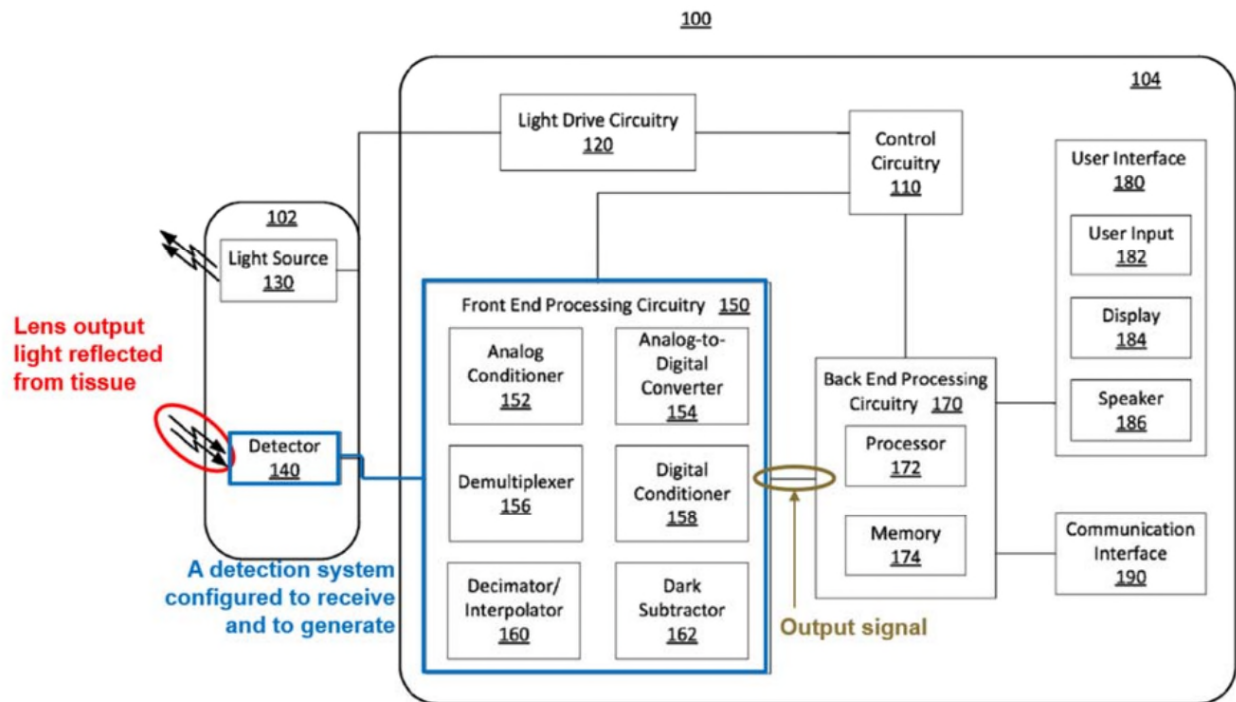


FIG. 1

Pet., 36 (annotating EX1025, FIG. 1)

If Lisogurski's error detection is performed by Lisogurski's front-end circuitry 150 (regardless of whether front-end circuitry 150 is relocated to sensor 102), then the error detection cannot be based on a “dark subtract[ed]’ signal” that is received instead by back-end circuitry 170. EX1025, FIG. 1, 12:42-45; Pet., 35-36, 50-56; EX2043, ¶¶191-92. This fails to satisfy limitation [8.g]’s requirement that the error detection (alleged “determin[ation]”) be “based at least in part on” Lisogurski’s “dark subtract[ed]’ signal” (alleged “third output signal”).

Even if Lisogurski's error detection were based on a “dark subtract[ed]’ signal” that is received by back-end circuitry 170, then the error detection would be performed by back-end processing circuitry 170 and not front-end circuitry 150

(regardless of whether front-end circuitry 150 is included in sensor 102). EX1025, FIG. 1, 12:42-45; Pet., 35-36, 50-56; EX2043, ¶193. This fails to satisfy the requirement of limitations [8.d] and [8.g] that Lisogurski's front-end circuitry 150 (alleged "processor") is "configured to" make the error detection (alleged "determin[ation]").

d) Petitioners do not show that the third signal-to-noise ratio ("SNR") is greater than both the first and second signal-to-noise ratios

Limitation [8.f] of claim 8 requires the processor to "generate a third output signal using at least a portion of the first output signal and at least a portion of the second output signal, the third output signal having a third signal-to-noise ratio that is greater than the first signal-to-noise ratio and greater than the second signal-to-noise ratio." EX1001, 86:26-43. Petitioners map: (1) the "first output signal" to Lisogurski's red and IR signals; (2) the "second output signal" to Lisogurski's dark signal when LEDs are off; and (3) the "third output signal" to Lisogurski's dark-subtracted signal—the adjusted red and IR signals. Pet., 50-56; EX1003, ¶¶244-247; EX1025, 12:53-13:6. Petitioners' entire analysis rests on the general assertion that dark subtraction "remove[s] ambient and background signals" and thereby "reduc[es] the detrimental effect[s] on the signal-to-noise ratio of the detection signal." Pet., 53; EX1003, ¶247 (citing EX1025, 6:7-19, 13:60-14:10, 14:46-55,

16:33-54). But this general assertion does not address the requirement that the third SNR must be greater than both the first SNR and the second SNR.

Claim 8 requires “a second output signal having a second signal-to-noise ratio” and requires the third SNR to be “greater than ... the second signal-to-noise ratio.” EX1001, 86:33-43. Petitioners fail to show how the SNR of Lisogurski's dark signal relates to the third SNR. The alleged “second output signal”—Lisogurski's dark signal when LEDs are off—is essentially a measurement of ambient and background signals. EX1003, ¶¶245-246; EX1025, 6:7-19. Dr. Anthony asserts that “Lisogurski's generated dark signal...has a signal-to-noise ratio,” but never defines or explains what signal-to-noise ratio the dark signal purportedly has. EX1003, ¶¶243-247. To support this assertion, Dr. Anthony cites Lisogurski's statement about “a detrimental effect on the signal-to-noise ratio of the detection signal” and then asserts that Lisogurski's dark signal “is a type of detection signal” and thus “has a signal-to-noise ratio.” EX1003, ¶243 (citing EX1025, 14:49-50). This assertion is conclusory and unsupported. The sentence preceding the cited statement shows that the “detection signal” refers to “the signal from the light source.” EX1025, 14:49-50, 13:67-14:3. But the dark signal occurs when the light source is “off.” EX1003, ¶243. The signal “from the light source” is different from the dark signal. Petitioners thus fail to establish that Lisogurski's dark signal has a signal-to-noise ratio for comparison with the alleged third SNR as claim 8 requires. EX2043, ¶¶195-200.

Petitioners do not show the third SNR is greater than the second SNR. Even assuming the dark signal has some signal-to-noise ratio, Petitioners do not explain how the dark-subtracted signal's SNR is greater than the dark signal's SNR. EX1003, ¶¶244-247. The noise environment can differ between the "LEDs off" and "LEDs on" states. EX2043, ¶200. Intrinsic noise may come from the sensor or LED-drive circuitry, while extrinsic noise may come from the surrounding environment. *Id.* Noise levels may also vary with temperature changes associated with turning the LEDs on or off. *Id.* Petitioners provide no quantitative or qualitative analysis demonstrating that the dark-subtracted signal necessarily has a higher SNR than the dark signal under all—or even typical—operating conditions. EX1003, ¶¶244-247; EX2043, ¶¶196-200.

e) Petitioners do not show the “first output signal” and “second output signal” responsive to the light source being “on”/“off”

Claim 8 requires, in relevant part, a processor configured to “generate a first output signal” “responsive to the light source being on” (limitation [8.d]) and “generate a second output signal” “responsive to the light source being off” (limitation [8.e]). EX1001, 86:28-35. Petitioners fail to identify signals in Lisogurski that satisfy both requirements—being an “output signal” and being “responsive to the light source being on” or “off.”

Petitioners' analysis of the "first output signal" conflates two different signals. For limitation [8.d], Petitioners do not identify the claimed "first output signal" in Lisogurski. Instead, Petitioners cross-reference their analyses of limitations [1.f] and [1.l]. Pet., 50-51; EX1003, ¶237. But those analyses refer to different signals, neither of which satisfies limitation [8.d].

For limitation [1.f], Petitioners rely on Lisogurski's *processed* signals sent from front end processing circuitry 150 to back end processing circuitry 170—but with no discussion of those signals being responsive to the LEDs being "on." Pet., 35-36; EX1003, ¶¶145-152. For limitation [1.l], Petitioners rely on Lisogurski's *detection* signal received by front end processing circuitry 150 when LEDs are on. Pet., 41-42; EX1003, ¶¶186-188. Petitioners themselves distinguish between Lisogurski's "detection signal" and its "processed signals" (the alleged "output signal"). Pet., 35; EX1003, ¶¶146-148; *see also* EX1025, 12:42-49 ("front end processing circuitry 150 may receive a *detection* signal from detector 140 and provide one or more *processed* signals to back end processing circuitry 170"). The signal that is responsive to the LEDs being "on" (the detection signal relied upon for [1.l]) is different from the signal that Petitioners map to the "output signal" (the processed signal relied upon for [1.f]). Neither signal alone satisfies the requirement in limitation [8.d] of a signal that is *both* an "output signal" *and* "responsive to the light source being on." EX2043, ¶201-205.

This same inconsistency appears in Petitioners' analysis of limitation [8.f]. For limitation [8.f], Petitioners identify the "first output signal" as Lisogurski's "red and IR signals" discussed in the '484-FWD. Pet., 53-54; EX1003, ¶247. But as the cited passages of Lisogurski show, these "red and IR signals" are *detection* signals sent *to* front end processing circuitry 150—not *processed* signals sent *from* front end processing circuitry 150. EX1025, 13:60-14:10 (discussing Red and IR components of "detection signal"). Petitioners thus map Lisogurski's detection signal—not its processed/output signal—to the "first output signal" in limitation [8.f], contradicting their own mapping of the "output signal" in limitation [1.f] to the processed signal. EX2043, ¶206.

Petitioners' analysis of the "second output signal" suffers from the same deficiency. For limitation [8.e], Petitioners identify the "second output signal" as Lisogurski's dark signal—the signal when LEDs are off. Pet., 50-52; EX1003, ¶¶239-243, 247. But Petitioners themselves recognize that Lisogurski's dark signal "is a detection signal." Pet., 52; EX1003, ¶243. A "detection signal" is different from the "processed signals" that Petitioners map to the claimed "output signal" in limitation [1.f]. Pet., 35; EX1003, ¶¶146-148. Lisogurski expressly distinguishes between these signal types. EX1025, 12:42-49. If the dark signal is a "detection signal"—as Petitioners concede—then it is not the "processed signal" that

Petitioners equate with the “output signal.” The dark signal therefore cannot be the claimed “second *output* signal.” EX2043, ¶208.

Petitioners’ analysis of claim 8 is internally inconsistent. Petitioners map the claimed “output signal” to Lisogurski’s *processed* signals (for limitation [1.f]) but then map the “first output signal” and “second output signal” in claim 8 to Lisogurski’s *detection* signals (red/IR signals and dark signal, respectively). Pet., 35, 50-54; EX1003, ¶¶146-148, 237, 243, 247. Because Petitioners distinguish between “detection signals” and “processed signals”—and rely on detection signals for the claim 8 output signals—Petitioners fail to show that claim 8’s “first output signal” and “second output signal” are met by Lisogurski. EX2043, ¶201-208.

5. Dependent Claims 11-13

Lisogurski does not render obvious claims 11-13 for at least the same reasons as claim 8. *Supra*, §VI.C.4; EX2043, ¶¶209-211.

D. Ground 2: Alleged Obviousness Based on Lisogurski and Tran (Claims 5, 7)

Petitioners fail to meet their burden for Ground 2. EX2043, ¶¶212-32.

1. Dependent Claim 5: Lisogurski and Tran Do Not Disclose or Render Obvious the Memory Limitation

Petitioners’ analysis of dependent claim 5 does not address the deficiencies discussed above for claim 1 in Ground 1 or rely on Tran to cure the deficiencies. Pet., 64-66. Thus, Petitioners failed to meet their burden for claim 5 in Ground 2 for

at least the same reasons they did not meet their burden for claim 1 in Ground 1. *Supra*, §VI.C.1; EX2043, ¶¶213-15.

Additionally, Lisogurski and Tran do not render obvious claim 5's additional requirement that "the apparatus further comprises a processor configured to be coupled to a non-transitory computer readable medium" (referenced herein as the "memory limitation"). EX1001, 86:1-3; EX2043, ¶¶216-29.

a) Lisogurski and Tran Do Not Disclose the Memory Limitation

Lisogurski does not disclose that its front-end circuitry 150 (alleged "processor") includes any memory (alleged "non-transitory computer readable medium"). EX2043, ¶220. Petitioners recognize this; they fail to identify any such memory for front-end circuitry 150 and instead assert obviousness. Pet., 64-65.

b) Lisogurski and Tran Do Not Render Obvious the Memory Limitation

First—Petitioners fail to show that memory in front-end circuitry 150 would have been obvious. EX2043, ¶¶221-25. Petitioners assert that Lisogurski's front-end circuitry 150 would have included memory because back-end circuitry 170 includes memory (i.e., memory 174). Pet., 64-65. But Petitioners ignore the differences between Lisogurski's front-end and back-end circuitries such that the mere inclusion of memory 174 in back-end circuitry 170 does not render obvious that front-end circuitry 150 would likewise include memory. EX2043, ¶¶221-23.

Memory 174 is specific to back-end circuitry 170, as memory 174 is associated with processor 172 in back-end circuitry 170. EX1025, FIG. 1, 14:56-15:18; EX2043, ¶223. Front-end circuitry 150 does not include a processor comparable to processor 172 in back-end circuitry 170 and instead includes only specialized subcomponents 152-162 that perform prescribed signal-conditioning functions and are thus different from processor 172 and do not need memory. EX1025, FIG. 1, 13:7-14:10, 14:56-66; EX2043, ¶185. Indeed, Lisogurski expressly discloses that back-end circuitry 170 includes memory 174 but does not disclose memory in front-end circuitry 150. EX1025, FIG. 1, 13:7-14:10, 14:56-66; EX2043, ¶223.

Additionally, Petitioners fail to articulate any particular reason why a POSITA would have modified Lisogurski to add memory comparable to memory 174, which is associated with processor 172, into front-end circuitry 150 and its specialized signal-conditioning components, which are different from processor 172. Pet., 64-65; EX2043, ¶224. Petitioners also fail to cite support for including memory in front-end circuitry 150 because they only cite two portions of Lisogurski, one that describes functionality that front-end circuitry already has without memory (EX1025, 12:42-50) and another that relates only to back-end circuitry (EX1025, 14:56-15:18). Pet., 64-65; EX2043, ¶225.

Second—Adding memory in front-end circuitry 150 would not have been obvious. EX2043, ¶¶226-29. Lisogurski teaches that processor 172 in back-end circuitry 170 is a general-purpose processor that “may be adapted to execute software ... as part of performing the functions described herein,” and that “[m]emory 174 may ... stor[e] information that can be interpreted by processor 172.” EX1025, 14:56-66, FIG. 1; EX2043, ¶190. Front end processing circuitry 150, in contrast, contains subcomponents with prescribed tasks related only to signal conditioning, and thus memory would not have been understood to be in front-end circuitry 150 comparable to memory 174 associated with processor 172 in back-end circuitry 170. EX1025, 12:42-51, 13:7-14:10, 14:56-66, FIG. 1; EX2043, ¶¶227-28. Consistent with Lisogurski’s express disclosure of memory for back-end circuitry 170 but not front-end circuitry 150, this would not have been obvious. EX1025, FIG. 1, 14:56-66, 13:7-14:10; EX2043, ¶¶227-28.

2. Dependent Claim 7

Petitioners’ analysis of claim 7 does not address the deficiencies discussed above for claims 1 and 6 in Ground 1 and does not rely upon Tran to cure the deficiencies. Pet., 66. Thus, Lisogurski and Tran do not render obvious dependent claim 7 for at least the same reasons as claims 1 and 6. *Supra*, §§VI.C.1 (claim 1), VI.C.2 (claim 6); EX2043, ¶¶230-32.

E. Ground 3: Alleged Obviousness Based on Lisogurski and LeBoeuf (Claims 6-7)

Petitioners fail to meet their burden for Ground 3. EX2043, ¶¶233-291.

1. Dependent Claim 6: Lisogurski and LeBoeuf Do Not Disclose or Render Obvious the Arc Limitation

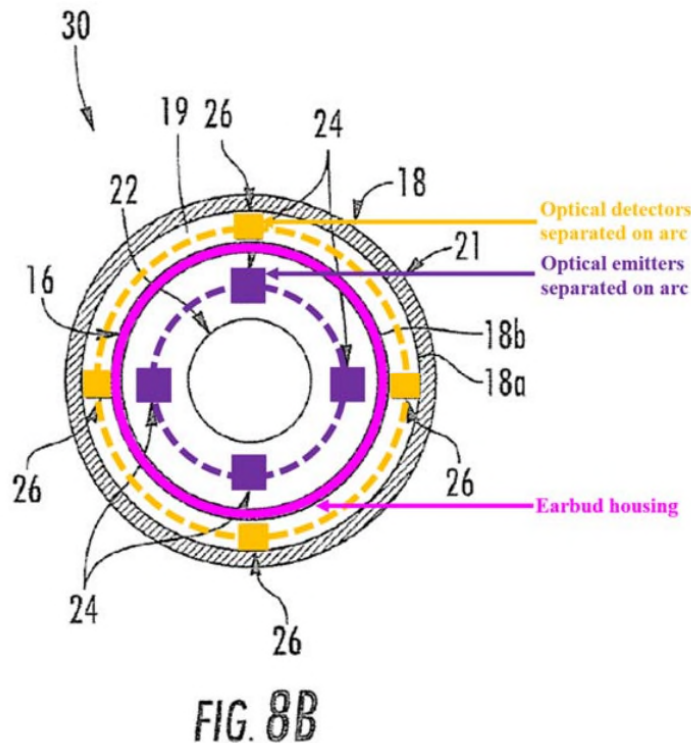
Petitioners' analysis of claim 6 does not address the deficiencies discussed above regarding claim 1 over Lisogurski in Ground 1 and does not rely upon LeBoeuf to cure those deficiencies. Pet., 70-71. Therefore, Lisogurski and LeBoeuf do not render obvious claim 6 for at least the same reasons as claim 1. *Supra*, §VI.C.1; EX2043, ¶¶234-235.

Petitioners' analysis for Ground 3 also does not address Lisogurski's deficiencies with respect to "six light emitting diodes" discussed above for Ground 1 or rely upon LeBoeuf to cure those deficiencies. Pet., 70-71. Therefore, this limitation is not met for the same reasons as Ground 1. *Supra*, §VI.C.2.b.

Additionally, Lisogurski and LeBoeuf do not render obvious claim 6's arc limitation, which recites "wherein the detection system comprises the plurality of detectors arranged along an *arc*." EX1001, 86:9-10.

Petitioners rely on Lisogurski's sensor's multiple detectors as the claimed "detectors." Pet., 70, 37, 44-45. Because Lisogurski does not disclose any arrangement of its detectors, much less the claimed "arc," Petitioners rely on LeBoeuf's arrangement of 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 sensor." Pet., 70-71; EX2043, ¶¶237-238. Petitioners rely on the following annotated Figure 8B of LeBoeuf:



Pet., 71 (annotating EX1026, FIG. 8B)

Petitioners, however, failed to show that a POSITA would have implemented LeBoeuf's arrangement in Lisogurski. EX2043, ¶¶236-288.

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 back to §IX.D.2, which includes only one paragraph that arguably discusses a motivation to combine. See Pet., 71 ("[a]s

discussed (§IX.D.2)”), 68-69 (in §IX.D.2). Petitioners fail to explain why or how LeBoeuf’s Figure 8B arrangement would have been implemented in Lisogurski. EX2043, ¶¶246-88.

(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 for increased “accuracy and reliability.” Pet., 68-69. But neither Lisogurski (which does not have an arc arrangement) nor LeBoeuf disclose or suggest that such an arrangement would lead to increased accuracy or reliability. EX2043, ¶¶250-56.

LeBoeuf’s text does not discuss the arrangement in Figure 8B, let alone suggest this arrangement achieves any benefits related to accuracy/reliability. *See* EX1026, FIG. 8B, ¶¶[0123]-[0124]; EX2043, ¶256. Petitioners cite LeBoeuf at [0105] to assert that an arc arrangement would “improve the detection of scattered light ... , and increase the signal-to-noise ratio,” but the cited paragraph contains no such teachings or even a discussion of the alleged arc arrangement. Pet., 69 (citing EX1026, ¶[0105]); EX2043, ¶255. 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., 68-

69. Petitioners' cite Mendelson's "Background," which merely cites other publications, without showing their arrangements. 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., 68-69 (citing EX1045). Their argument fails because the arc limitation involves both. EX2043, ¶¶239, 246-247.

Petitioners also assert that "both Lisogurski and LeBoeuf disclose physiological monitoring devices that can be worn on various parts of the body" "Lisogurski discloses that '[a]ny suitable configuration ... may be used.'" Pet., 68 (quoting EX1025, 17:42-45). But this fails to establish why a POSITA would have understood LeBoeuf's Figure 8B arrangement to be suitable or would have chosen it opposed to other possible arrangements, such as the arrangements with multiple detectors that are not arranged in an arc. EX1026, FIGS. 6, 7A, 11A, 12A-B, 22B, 23; EX2043, ¶¶259-61; *Virtek*, 97 F.4th at 886-87 (holding that "mere...exist[ence]" of "possible arrangements" and knowledge of "alternative arrangements" are insufficient).

Contrary to Petitioners' suggestion, a POSITA would have understood LeBoeuf's alleged arc arrangement is premised on the multiple related components depicted in Figure 8B and that without those related components, LeBoeuf's arrangement would not be suitable for Lisogurski. EX1026, FIGS. 8A-8B, ¶[0123];

Pet., 68-69; EX2043, ¶¶261-262; *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, ¶304 (similar). Notably, however, these issues only relate to **detectors**—not **emitters**. Pet., 68-69 (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, ¶304 (arguing motivation related only to the arrangement of detectors, not emitters); EX2043, ¶¶219-20. The arrangement of detectors 26 in LeBoeuf's Figure 8B is based on and related to the corresponding arrangement of emitters 24 (as well as other related components) in Figure 8B, so without motivation to apply this arrangement of emitters to Lisogurski, a POSITA would not have been motivated to apply LeBoeuf's arrangement of detectors to Lisogurski. EX2043, ¶¶262-64.

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

unsupported and flawed. EX2043, ¶¶266-22. The cited portions of Lisogurski and Mendelsohn do not address angular scattering of light. Pet., 68-69 (citing EX1025, 11:9-27, EX1045, 4:14-65); EX2043, ¶¶266-67. Petitioners' assertion that "linear" arrangements are deficient wrongly assumes the existence of only two arrangements—i.e., linear and arc—and fails to consider the existence of other potential arrangements (e.g., triangle, square, or grid) for capturing angularly scattered light, including the non-linear and non-arc arrangement of detectors in LeBoeuf's Figure 12A. EX1026, FIG. 12A, ¶[0138]; EX2043, ¶¶266-270. 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 LeBoeuf's Figure 8B arrangement. Pet., 68-69; EX2043, ¶¶266-270; *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]." EX1045, 4:14-65; EX2043, ¶¶266-270.

Petitioners and Dr. Anthony's reliance on Mendelson is flawed for several additional reasons. EX2043, ¶¶267-270. 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, ¶¶267-270. 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, ¶ 304 (emphasis in original) (quoting EX1045, 4:14-65). The cited portion of Mendelson is its Background section, not "its system," and the quotes refer to two separate, unrelated publications. EX1045, 4:14-65; EX2043, ¶¶267-270.

Petitioners therefore fail to establish a specific connection between their alleged motivation regarding detection of angularly scattered light and LeBoeuf's particular arrangement 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, ¶¶250-270.

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

Petitioners also fail to explain specifically *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)); *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381-

82 (Fed. Cir. 2016) (emphasizing the “need for specificity” in “findings on motivation”).

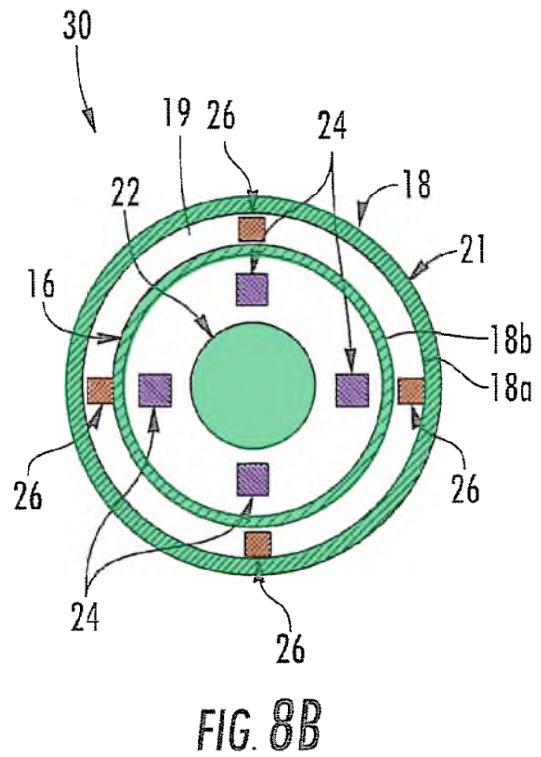
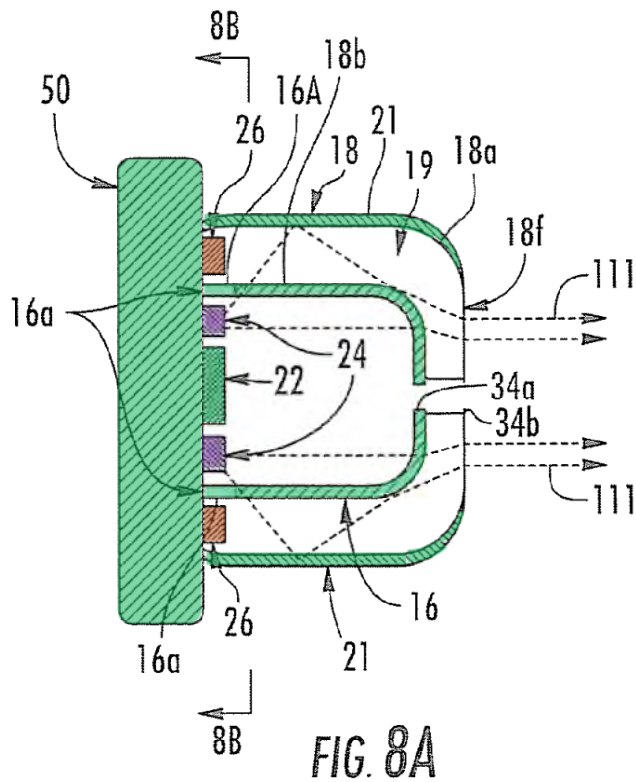
LeBoeuf's arrangement of detectors 26 in Figure 8B is based on and involves multiple related components, including base 50, earbud housing 16 (with bottom portion 16a), cover 18 (with cladding material 21), speaker 22, and light guiding region 19. EX1026, FIGS. 8A-8B, ¶[0123]; EX2043, ¶272. Dr. Anthony 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., 68-69. Petitioners do not explain how LeBoeuf's alleged arc arrangement would be implemented in Lisogurski without those components. EX2043, ¶¶271-72. Petitioners also do not explain how LeBoeuf's alleged arc arrangement of detectors would work to achieve accuracy/reliability in Lisogurski without those other related components. Pet., 68-69; EX1026, FIGS. 8A-8B, ¶[0123]; EX2043, ¶273.

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, ¶¶273-88.

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, ¶¶275-281. 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, ¶¶275-81.

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, ¶¶275-81. Further, emitters 24 and detectors 26 are generally directed toward cover end portion 18f, with detectors 26 positioned in light guiding region 19 defined between cover 18 and earbud housing 16. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX2043, ¶¶275-81.

Dr. Anthony agreed that LeBoeuf's 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 and the related components upon which it is premised—is specific to an earbud and dictated by the unique physical aspects of guiding sound and light relative to the ear canal. EX1026, FIGS. 8A-8B, ¶[0123], EX2043, ¶¶275-281. 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 “serves as a light guide” for delivering and collecting light relative to “an ear canal.” EX1026, ¶[0123], FIGS. 8A-8B; EX2043, ¶275-281; *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 same arrangement as Figure 8B, further demonstrating Figure 8B is earbud-specific. *See* EX1026, ¶¶[0070]-[0072], [0157], [0164], FIGS. 22A-23; EX2043, ¶287; EX2045, 186:15-188:18 (LeBoeuf’s non-earbud embodiment in FIG. 22B does not show an arc arrangement); *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 (Fed. Cir. 1987) (reference “must be considered in its entirety,...including portions that would lead away” from the invention).

Lisogurski does not teach or suggest an earbud for taking measurements from the ear canal. EX2043, ¶282. Lisogurski is limited to sensors for a patient’s external sites. EX1025, 4:6-20 (describing, at most, placement on an “earlobe” or “around or in front of the ear,” and notably not *within* the ear); EX2043, ¶282. 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. EX2043, ¶¶287-88; *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.

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 detectors is premised on related, earbud-specific components, and (iii) Lisogurski does not teach an earbud. Pet., 68; EX2043, ¶283; *Panduit*, 810 F.2d at 1568. Indeed, Petitioners’ own citations support this distinction between the references. Pet., 68 (citing EX1025, 4:6-20 (no description of placement within an ear); EX1026, ¶¶[0006] (“earbud”), [0010] (“Light directed into the ear”); EX2043, ¶283.

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 earbud-specific arrangement. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX1025, 4:6-20; EX2043, ¶¶279-82, 285. Further, because Lisogurski does not include the related components upon which LeBoeuf’s alleged arc arrangement is premised, a POSITA would have had neither the motivation nor capability to implement LeBoeuf’s arrangement in Lisogurski. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; Pet., 68-69; EX2043, ¶¶276-282, 284. To address these differences, Petitioners quote Lisogurski’s statement that “[a]ny suitable configuration ... may be used” (Pet., 68 (quoting EX1025, 17:42-45)), but a POSITA would not have understood LeBoeuf’s

Figure 8B arrangement to be suitable because it uses related components not present in Lisogurski and is earbud-specific. EX2043, ¶¶275-86.

2. Dependent Claim 7

Lisogurski and LeBoeuf do not render obvious claim 7 for the same reasons as claims 1 and 6. *Supra*, §§VI.C.1, VI.C.2; EX2043, ¶¶289-91.

F. Ground 4: Alleged Obviousness Based on Lisogurski, Tran, and LeBoeuf (Claims 6-7)

Petitioners failed to meet their burden for claims 6-7. EX2043, ¶¶292-300.

1. Dependent Claim 6

Petitioners' analysis of claim 6 does not address the deficiencies discussed above regarding claim 1 over Lisogurski in Ground 1 and does not rely upon Tran or LeBoeuf to cure those deficiencies. Pet., 70-71. Therefore, Lisogurski, Tran, and LeBoeuf do not render obvious claim 6 for at least the same reasons discussed above for claim 1. *Supra*, §VI.C.1; EX2043, ¶¶293-95.

Additionally, Petitioners' analysis of claim 6 is the same for Grounds 3 (Lisogurski and LeBoeuf) and 4 (same, plus Tran). Pet., 70-71. Therefore, Lisogurski, Tran, and LeBoeuf do not render obvious claim 6 for the same reasons discussed above for claim 6 in Ground 3. *Supra*, §VI.E.1; EX2043, ¶¶296-97.

2. Dependent Claim 7

Claim 7 depends from claim 6 and indirectly from independent claim 1. Petitioners' analysis of claim 7 does not address the deficiencies discussed above for

claim 1 or claim 6. Pet., 71-72. Accordingly, Petitioners failed to meet their burden for claim 7 in Ground 4 for the same reasons as claims 1 and 6. *Supra*, §§VI.C.1, VI.F.1; EX2043, ¶¶298-300.

G. Ground 5: Alleged Obviousness Based on Lisogurski and Carlson (Claims 1, 6-8, 11-13)

Ground 5 is similar to Ground 1 but further addresses limitations [1.e], [1.f], [8.b], and [8.d] in view of Carlson. Pet., 8, 72-76; EX2043, ¶250. Ground 5 does not address the deficiencies for claims 1, 6-8, and 11-13 in Ground 1. Pet., 72-76. Accordingly, Ground 5 fails for the same reasons as Ground 1. *Supra*, §VI.C; EX2043, ¶¶291-303.

H. Ground 6: Alleged Obviousness Based on Lisogurski, Tran, and Carlson (Claims 5, 7)

Ground 6 is similar to Ground 2 but further addresses certain limitations of claims 1 and 8 in view of Carlson. Pet., 8, 72-76; EX2043, ¶305. Ground 6 does not address the deficiencies for claims 5 and 7 in Ground 2. Pet., 72-76. Accordingly, Ground fails 6 for the same reasons as Ground 2. *Supra*, §VI.D; EX2043, ¶¶304-06.

I. Ground 7: Alleged Obviousness Based on Lisogurski, LeBoeuf, and Carlson (Claims 6-7)

Ground 7 is similar to Ground 3 but further addresses certain limitations in claims 1 and 8 in view of Carlson. Pet., 8, 72-76; EX2043, ¶256. Ground 7 does not address the deficiencies for claims 6-7 in Ground 3. Pet., 72-76. Accordingly, Ground 7 fails for the same reasons as Ground 3. *Supra*, §VI.E; EX2043, ¶¶307-09.

J. Ground 8: Alleged Obviousness Based on Lisogurski, Tran, LeBoeuf, and Carlson (Claims 6-7)

Ground 8 is similar to Ground 4 but further addresses certain limitations in independent claims 1 and 8 in view of Carlson. Pet., 8, 72-76; EX2043, ¶259. Ground 8 does not address the deficiencies for claims 6-7 in Ground 4. Pet., 72-76. Accordingly, Ground 8 fails for the same reasons as Ground 4. *Supra*, §VI.F; EX2043, ¶¶310-312.

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 '475 Patent addressed where others failed. EX2100, ¶¶6-33; EX2043, ¶¶313-350.

1. Copying

Dr. Islam, the inventor of the '475 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]

[REDACTED]

These techniques are claimed in the '475 Patent. EX2043, ¶¶328-31. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]" EX2100, ¶¶13, 16, 30; EX2043, ¶331; EX2106, OMS_SAM0031852, OMS_SAM0031857. Samsung subsequently implemented the same suite of SNR-improvement techniques in its wearable products. EX2043, ¶¶327-332; 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 '475 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, ¶¶334-450. 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, ¶337. 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, ¶338.

The industry's responses to these problems were inadequate. EX2043, ¶¶339-43. 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, ¶340. Second, measurements were confined to controlled clinical environments. EX2110, 16:1-23; EX2100, ¶25; EX2043, ¶341. 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, ¶342.

The '475 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, ¶¶336, 344-250. 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 apparatus being configured to increase the signal-to-noise ratio by increasing light intensity of at least one of the plurality of light emitting diodes from an initial light intensity” (claim 1);

- “the detection system further configured to: generate a first signal responsive to light received while the light emitting diodes are off, generate a second signal responsive to light received while at least one of the light emitting diodes is on, and increase the signal-to-noise ratio by comparing the first signal and the second signal”; “a processor configured to: (i) responsive to the light source being on and the detector receiving at least a portion of the output light that is reflected from the bodily tissue of the user, generate a first output signal having a first signal-to-noise ratio; and (ii) responsive to the light source being off and the detector receiving ambient light, generate a second output signal having a second signal-to-noise ratio; (iii) generate a third output signal using at least a portion of the first output signal and at least a portion of the second output signal, the third output signal having a third signal-to-noise ratio that is greater than the first signal-to-noise ratio and greater than the second signal-to-noise ratio” (claims 1, 8);
- “wherein the detection system comprises a plurality of detectors that are spatially separated from each other”; “wherein the detection system comprises the plurality of detectors arranged along an arc” (claims 1, 6);
- “wherein the detection system is configured to be synchronized to the light source” (claim 1).

The industry-wide failure to solve these problems despite substantial resources demonstrates that the techniques claimed in the '475 Patent were not obvious. EX2043, ¶¶334-350; 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 is unpatentable.

Respectfully submitted,

Dated: May 7, 2026

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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 13,872 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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