

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. 10,874,304

Case No. IPR2025-01251

PATENT OWNER'S RESPONSE

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LISTING OF EXHIBITS

Exhibit No.	Description
2001	Complaint, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (Dec. 20, 2024)
2002	Samsung, Fossil, and Oura's Invalidity Contentions Cover Document and Charts for the '304 Patent, <i>Omni MedSci, Inc. v. Samsung Electronics Co. Ltd. et al.</i> , 2:24-cv-01070-JRG-RSP (E.D. Tex.) (June 3, 2025)
2003	OnePlus's Invalidity Contentions Cover Document and Charts for the '304 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	<i>Apple Inc. v. Omni Medsci, Inc.</i> , No. IPR2021-00453, Paper 27 (PTAB Apr. 11, 2025)
2013	R. Marbach, T. Koschinsky, F. Gries, and H. Heise, "Noninvasive Blood Glucose Assay by Near-Infrared Diffuse Reflectance

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2015	Buttussi, F., et al., MOPET: A context-aware and user-adaptive wearable system for fitness training, Artificial Intelligence in Medicine (2008) 42, 153-163
2016	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00912, Paper 1 (PTAB Apr. 10, 2019)
2017	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00913, Paper 1 (PTAB Apr. 10, 2019)
2018	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00914, Paper 1 (PTAB Apr. 10, 2019)
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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. v. 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)

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2026	Reserved
2027	Reserved
2028	Reserved
2029	Reserved
2030	Reserved
2031	Withdrawn
2032	<i>Curriculum vitae</i> of Prof. Igor Efimov, Ph.D.
2033	Omni MedSci Inc.'s P.R. 4-2 Disclosure of Preliminary Claim Constructions and Extrinsic Evidence
2034	Samsung Electronics, Co. Ltd., Samsung Electronics America, Inc., Fossil Group, Inc., Fossil Stores I, Inc., and Fossil Partners, L.P., and Oura Health Oy's P.R. 4-2 Disclosure of Preliminary Claim Constructions and Extrinsic Evidence
2035	König, V., et al., "Reflectance Pulse Oximetry – Principles and Obstetric Application in the Zurich System," <i>Journal of Clinical Monitoring</i> , 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	Statutory Disclaimer dated November 11, 2025
2039	<i>Omni MedSci, Inc. v. Apple Inc.</i> , No. 25-1646, Corrected Opening Brief of Appellant Omni MedSci, Inc. (Fed. Cir. Sept. 11, 2025)
2040	Email exchange between Petitioners and Patent Owner concerning indefiniteness contentions
2041	Reserved
2042	Statutory Disclaimer dated January 2, 2026
2043	Declaration of Prof. Igor Efimov, Ph.D. dated May 7, 2026 (CONFIDENTIAL)
2044	Updated <i>curriculum vitae</i> of Prof. Igor Efimov, Ph.D.

Exhibit No.	Description
2045	Transcript of Apr. 17, 2026 Deposition of Dr. Brian W. Anthony
2046	Transcript of Apr. 18, 2026 Deposition of Dr. Brian W. Anthony
2047	2026-01-30 - Exhibit A to the P.R. 4-5 Joint Claim Construction Chart, <i>Omni MedSci, Inc. v. Samsung Electronics Co., Ltd. et al.</i> , No. 2:24-cv-01070-JRG-RSP (E.D. Tex.)
2048-2099	Reserved
2100	Declaration of Dr. Mohammed Islam (CONFIDENTIAL)
2101	OMS_SAM0031768 (CONFIDENTIAL)
2102	OMS_SAM0031776 (CONFIDENTIAL)
2103	OMS_SAM0031782 (CONFIDENTIAL)
2104	OMS_SAM0031797 (CONFIDENTIAL)
2105	OMS_SAM0031867 (CONFIDENTIAL)
2106	OMS_SAM0031851 (CONFIDENTIAL)
2107	OMS_SAM0031961
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	U.S. Patent Publication No. 2014/0275854 ("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

Exhibit No.	Description
	Rehabilitation, 2012
2116	Samsung Watch Infringement Claim Chart
2117	Declaration of Dr. Mohammed Islam (REDACTED)
2118	Declaration of Prof. Igor Efimov, Ph.D. dated May 7, 2026 (REDACTED)

Omni MedSci, Inc. (“Patent Owner”) submits this Response to the Petition for *Inter Partes* Review (“Petition”) of U.S. Patent No. 10,874,304 (“the ’304 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 obviousness of the “arc” limitations that are recited in multiple challenged claims, as Petitioners fail to establish specifically why or how a person of skill in the art would have implemented the particular relied-upon teachings of LeBoeuf in Lisogurski for these limitations. A person of skill would not have been motivated to make the alleged combinations.

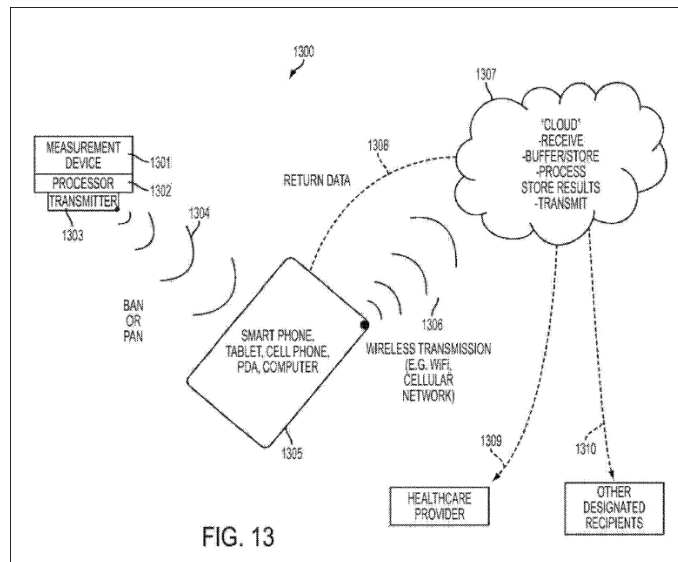
Petitioners also failed to show that Lisogurski discloses the “selection or identification of an object” limitation recited in other challenged claims. A person of skill would recognize that Lisogurski’s pulse oximeter is performing parameter measurement, not object identification.

Petitioners also failed to show that Lisogurski, Tran and/or Marbach disclose “improv[ing] a signal-to-noise ratio of the selection or identification by applying regression signal processing methodologies or multivariate techniques.” A person of skill would not have been motivated to make the alleged combinations.

II. OVERVIEW OF THE '304 PATENT

The '304 Patent discloses a comprehensive system for optical measurement and data management that integrates optical signal acquisition, processing, wireless transmission, and cloud-based storage and computation to enable non-invasive physiological monitoring and data analytics. EX1001, Abstract; EX2043, ¶54.¹

An exemplary physiological measurement or blood constituent monitoring system including a measurement device 1301, a personal device 1305 such as a smartphone or tablet, and a cloud server 1307 is illustrated in FIG. 13:



EX1001, FIG. 13, 33:45-50; 34:58-61; EX2043, ¶55.

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.

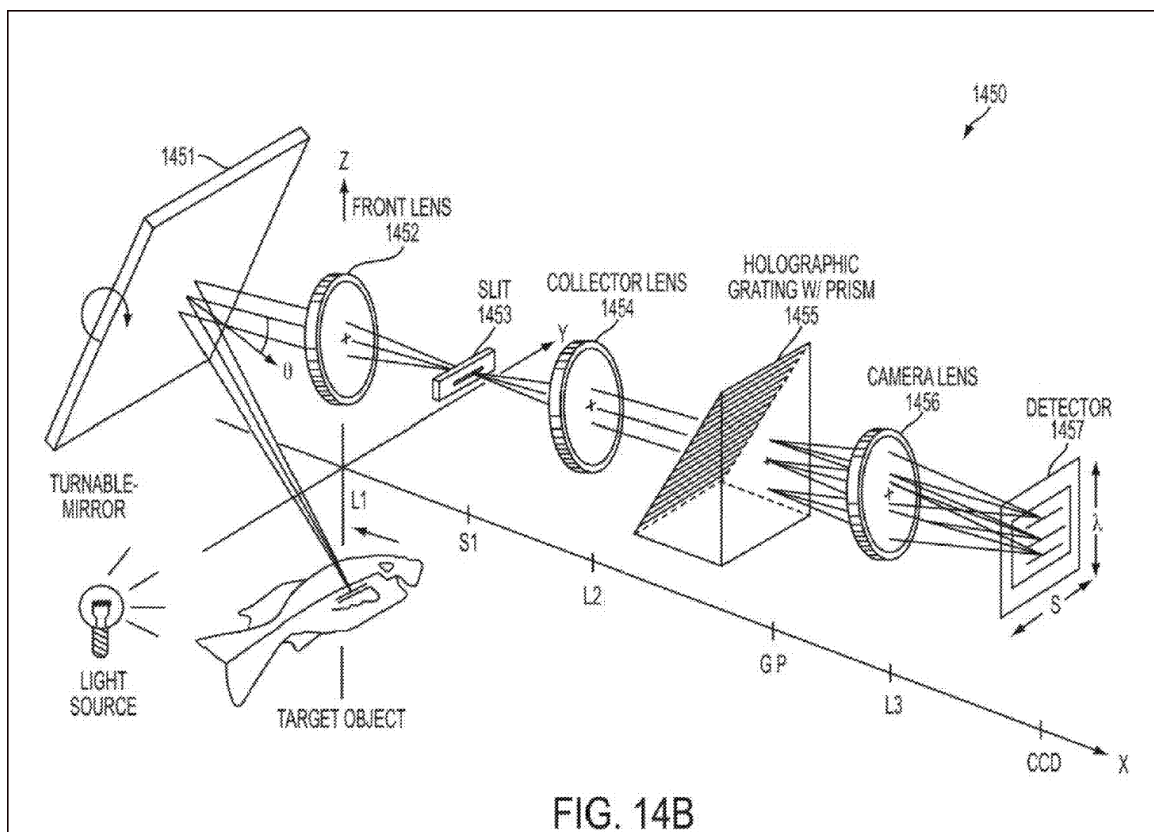
The '304 Patent extends beyond physiological monitoring by incorporating identification capabilities that use algorithmic analysis of spectral data from multiple wavelengths. EX1001, 35:17-23; EX2043, ¶56. The '304 Patent discloses that “pattern matching algorithms and other software and mathematical methods” can identify specific blood constituents. EX1001, 35:17-19; EX2043, ¶56. It further explains that spectral data may be compared with a “library of known spectra” to calculate overlap integrals and apply threshold functions to quantify constituent concentrations. EX1001, 35:19-23; EX2043, ¶56.

The '304 Patent further states that various blood constituents exhibit distinct near-infrared signatures, requiring spectroscopy and spectral fingerprinting to accurately identify glucose. EX1001, 4:58-62; EX2043, ¶57. The '304 Patent explains that constituent selection and analysis can be enhanced using advanced mathematical and signal processing methods, including multiple linear regression, partial least squares, and principal component regression (PCR). EX1001, 20:7-17; EX2043, ¶57.

The '304 Patent additionally describes identifying materials and biological constituents using optical techniques in the short-wave infrared (SWIR) range. EX1001, 20:41-49; EX2043, ¶58. The SWIR region captures characteristic molecular vibrations, allowing substances such as glucose, ketones, and many solids

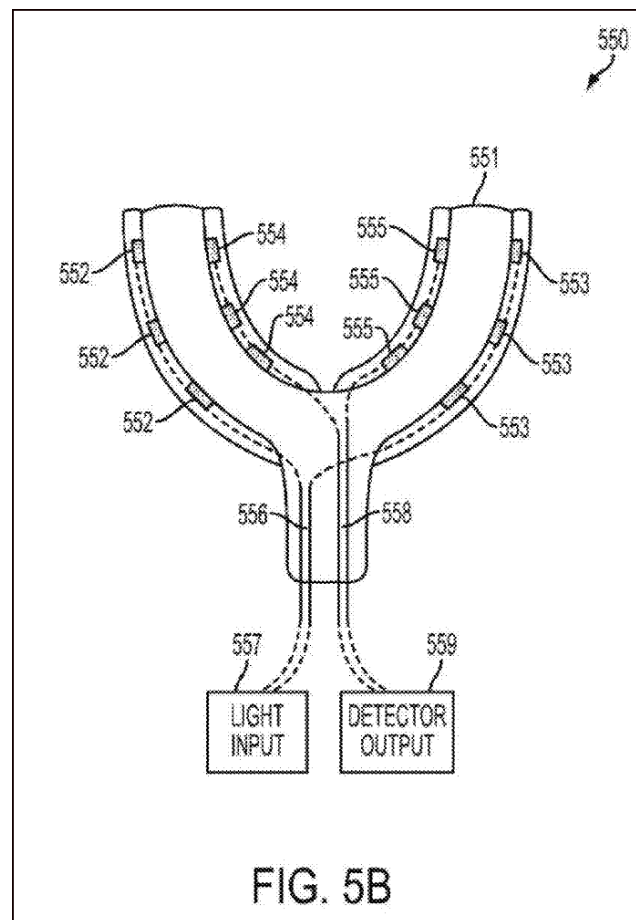
to exhibit unique spectral signatures, which can be used for identification through “stand-off detection or remote sensing.” EX1001, 20:41-49; EX2043, ¶58.

The '304 Patent also describes a reflective surface. EX1001, 31:6-9; 36:60-67; EX2043, ¶59. The claims recite that “the measurement system further comprises a reflective surface to receive and redirect at least some of the at least a portion of the analysis output beam reflected or transmitted from the sample.” EX1001, 36:60-67; EX2043, ¶59. For example, the '304 Patent discloses that, as illustrated in FIG. 14B (reproduced below), “the input light may be directed first by a tunable mirror 1451.” EX1001, 31:6-9; EX2043, ¶59.



EX1001, FIG. 14B.

The '304 Patent further specifies a distinct spatial arrangement of light sources and detectors along arcs. EX1001, 17:56-59; 37:6-13; EX2043, ¶60. Certain claims recite that “the receiver comprises a plurality of detectors arranged along a first arc, and wherein the plurality of semiconductor sources are arranged along a second arc” EX1001, 37:6-13; EX2043, ¶60. As illustrated in FIG. 5B (reproduced below), as an example, “the mouth guard may have one or more light source input ports 552, 553 and one or more detector output ports 554, 555.” EX1001, 17:56-59; EX2043, ¶60.



EX1001, FIG. 5B.

Patent Owner has statutorily disclaimed 1-3, 11, 14, 19, 20 and 27 of the '304 Patent. EX2038; EX2042. The Board has held that such disclaimers are not a request for adverse judgment and do not give rise to estoppel as to the remaining challenged claims. *Daikin Industries, Ltd. v. Chemours Co. FC, LLC*, IPR2018-00993, Paper 12 at 2-7 (PTAB Nov. 13, 2018); *see also* 37 C.F.R. § 42.107(e).

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 '304 Patent:

a person of ordinary skill in the art ("POSITA") "would have [had] a good working knowledge of optical sensing techniques and their applications, and familiarity with optical design and signal processing techniques," and 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., 13. For purposes of this Response, Patent Owner adopts Petitioners' proposed definition. EX2043, ¶¶50-53.

IV. SUMMARY OF REFERENCES IN THE PETITION

Petitioners challenge claims 1-6, 11-16, 19-22, and 26-27 as allegedly obvious based on Lisogurski, LeBoeuf, Tran, Carlson, and Marbach. Pet., 7-8.

A. Lisogurski (EX1025) (Grounds 1-10)

Lisogurski describes a non-invasive system for measuring parameters related to a subject's blood. EX1025, 3:61-4:5; EX2043, ¶80. The system is illustrated in

Figures 3 and 1:

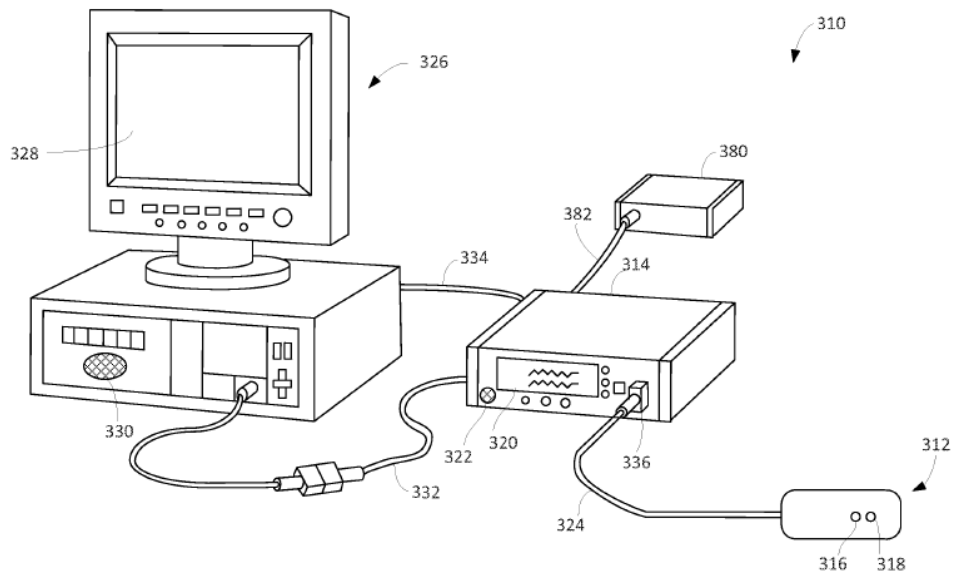


FIG. 3

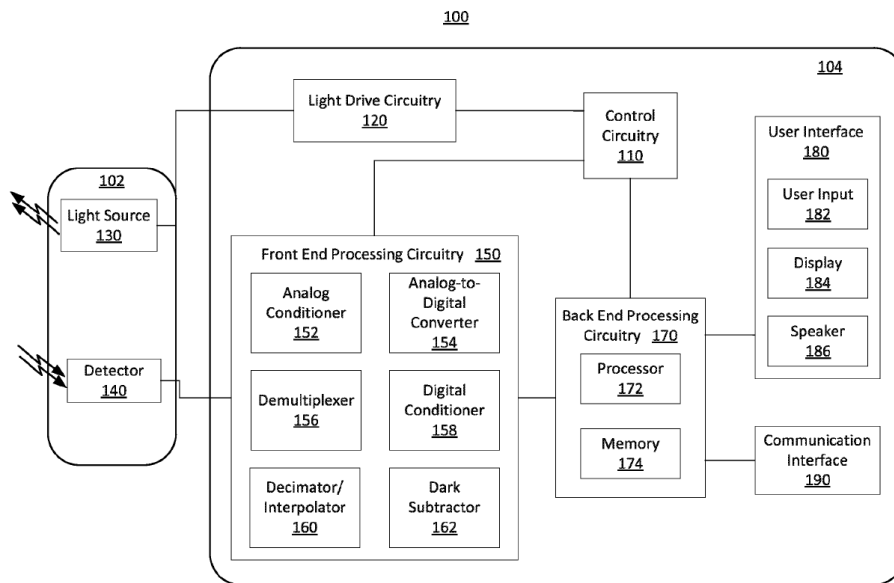


FIG. 1

EX1025, FIGS. 3, 1; EX2043, ¶80.

A subject wears sensor unit 312, while the other components in the system are included for system calibration, data processing, and displaying information.

EX1025, 17:54-18:15, 18:32-67; EX2043, ¶81. 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, ¶81. Front end processing circuitry 150 processes that signal. EX1025, 12:42-49; EX2043, ¶81. Then, "[p]rocessor 172 may receive and process physiological signals received from front end processing circuitry 150. For example, processor 172 may determine one or more physiological parameters based on the received physiological signals." EX1025, 14:60-64; EX2043, ¶81. The system compares the signals to determine parameters such as blood oxygen saturation. EX1025, 24:58-25:5; EX2043, ¶81.

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

LeBoeuf describes monitoring devices, particularly light-guiding earbuds for positioning within an ear. EX1026, Abstract, ¶¶[0002], [0006], [0009], [0084]; EX2043, ¶82. Figure 3 shows an exemplary light-guiding earbud:

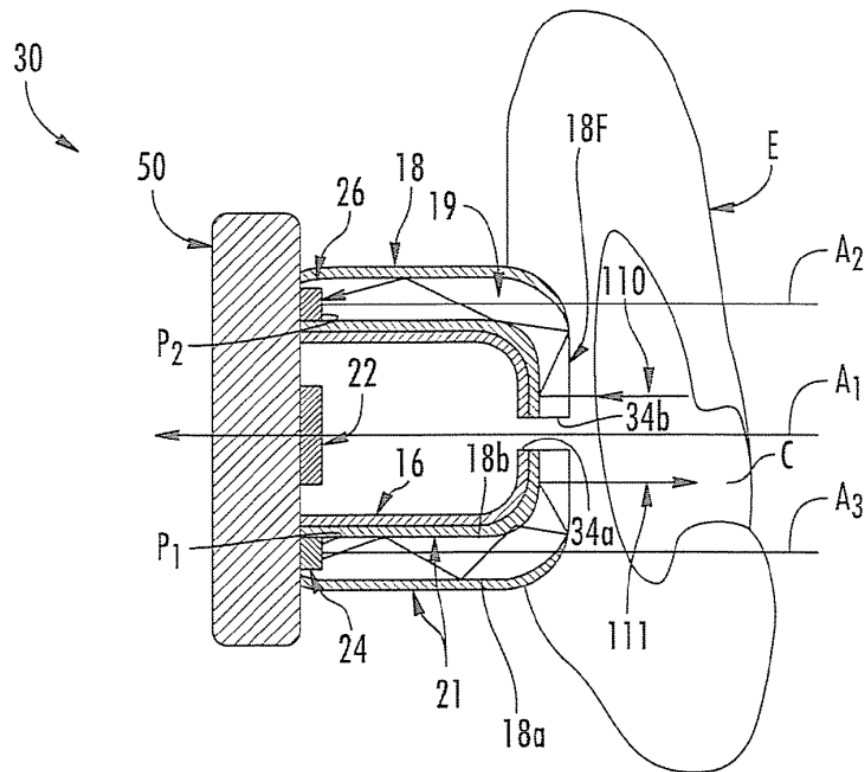


FIG. 3

EX1026, FIG. 3, ¶[0042]; EX2043, ¶83. The light-guiding earbuds include a speaker, such as speaker 22 shown in Figure 3, an earbud housing 16 in acoustical communication with the speaker 22, and apertures 34a-34b through which sound from the speaker 22 can pass. EX1026, ¶¶[0006], [0009], [0102], FIG. 3; EX2043, ¶83.

The light-guiding earbuds also include a light-guiding cover to deliver light from an optical emitter into the ear canal and to collect and deliver light from outside the earbud to an optical detector, such as shown by cover 18, optical emitter 24, and optical detector 26 depicted in Figure 3 above. EX1026, Abstract, ¶¶[0006], [0106],

FIG. 3; EX2043, ¶83. The light directed into the ear from a light emitter and the subsequent collection of light at a detector may be used for detecting or measuring, for example, body or skin temperature, blood gas levels, heart rate, blood flow, etc. EX1026, ¶[0010]; EX2043, ¶83.

C. Tran (EX1027) (Grounds 3, 4, 7-10)

Tran describes a patient heart monitoring system with wireless nodes forming a wireless mesh network. EX1027, Abstract, 3:3-13, 8:29-33; EX2043, ¶84. 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, ¶84. The wearable appliance may include sensors and may non-invasively measure, for example, blood pressure. EX1027, 4:62-65, 9:23-30; EX2043, ¶84.

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

Carlson describes a non-invasive optical pulse oximeter. EX1028, [0002]; EX2043, ¶85. The oximeter is designed to be clipped onto a user's ear. EX1028, [0048]-[0049]; EX2043, ¶85. This is illustrated in Figures 1 and 2:

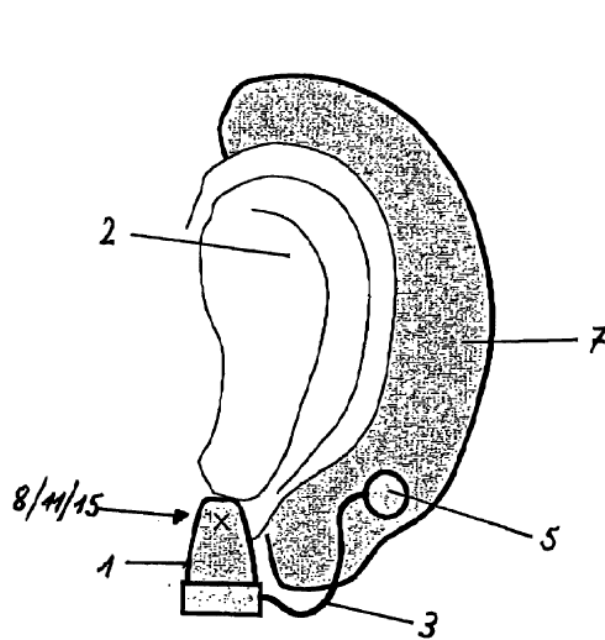


Figure 1

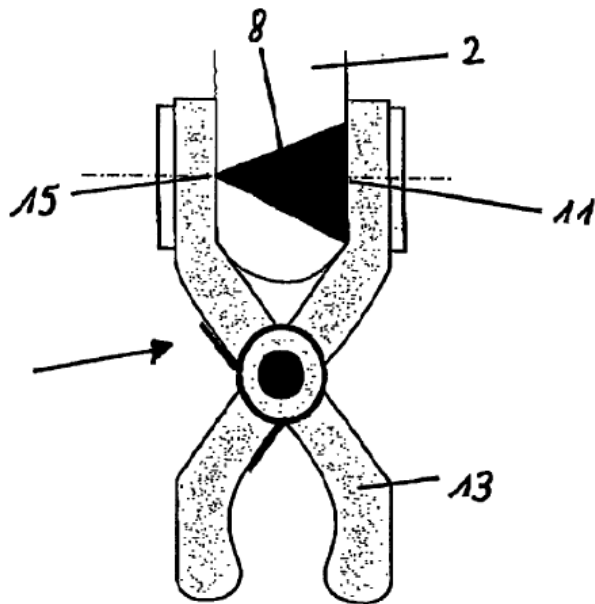


Figure 2

EX1028, FIGS. 1-2; EX2043, ¶86. The oximeter relies on various techniques, including beam shaping optical elements, for improving the signal-to-noise ratio and signal-to-background ratio of the signal generated by its photo detecting element when it detects light that has been reflected from bodily tissue. EX1028, [0010], [0013]-[0014], [0062]; EX2043, ¶86. Carlson also relies on “optical wavelength filters” which filter the light detected by the photo detecting element to a particular range of wavelengths before it is detected by the photo detecting element. EX1028, [0026], [0062]; EX2043, ¶85.

E. Marbach (Ex. 1029) (Grounds 9-10)

Marbach concerns the improvement of the “stability and reproducibility of optical diffuse reflection measurements.” EX1029, 5:53-6:19; EX2043, ¶87.

Marbach discloses an apparatus which includes light sources that emit light at a sample and that operate in conjunction with detectors which detect light. EX1029, 5:53-6:19; EX2043, ¶87. Marbach discloses the use of multivariate measurements in such applications and states that “[a]ccuracy is optimized when so-called multivariate Wiener filtering is used to process the multivariate input data into the single, user-desired output.” EX1029, 12:19-27; EX2043, ¶87.

V. CLAIM CONSTRUCTION

Petitioners note that certain terms in the '304 Patent have been construed in prior Board or district court proceedings but otherwise contend that the remaining terms or phrases in the challenged claims of the '304 Patent do not require construction and can be afforded their plain and ordinary meanings. Pet., 13-15. Petitioners also state that they do not believe that the terms from the prior Board or district court proceedings need to be construed here. *Id.*

A. “Identification of an Object” (Claims 9, 12, and 26)

Dependent claims 9, 12, and 26 of the '304 Patent recite: “wherein the wearable device is at least in part configured for selection or identification of an object.” EX1001, 37:29-30, 38:27-28, 40:33-34.

In the prior IPR for the related '484 Patent, the Board construed the phrase “to identify an object” as “to recognize or establish an object as being a particular thing.” EX1015, 8-10; EX1016, 3; Pet., 15 (acknowledging same). This claim construction

was affirmed by the Federal Circuit. *Apple Inc. v. Omni MedSci, Inc.*, No. 2023-1034, 2024 WL 3084509, at *3-5 (Fed. Cir. June 21, 2024) (“we affirm the Board’s construction that “identify an object” in claims 3 and 8 means ‘to recognize or establish an object as being a particular thing’”). Petitioners and their expert applied this construction in their analysis of the phrase “identification of an object” in claims 9, 12, and 26 of the ‘304 Patent. EX1003, ¶55; EX2045, 217:14-25, 218:20-22. The Board should adopt the same construction here.

The Board previously found that the phrase “to identify an object” has a different meaning than “to detect an object.” EX1015, 8-10. Specifically, the Board construed “to detect an object” to mean “to discover or notice the existence or presence of something.” *Id.*, 10. Petitioners’ expert, Dr. Anthony, confirmed that detecting an object is not the same thing as identifying an object:

Q: And you understand that under the board’s claim construction, the term “to identify an object” has a different meaning than “to detect an object.” Correct?

A: So as written there, we construe “to identify an object” to mean recognize or establish, and construe “to detect” to mean discover or notice the existence or presence.

...

Q: Would discovering or noticing the existence or presence of something qualify as identifying an object under the board's claim construction?

A: Under the board's claim and highlighted there is detecting of an object.

Q: And detecting an object is not identifying an object. Correct?

A: In that board's decision there, yes.

EX2045, 213:12-19, 216:12-21 (objections omitted). Thus, merely detecting or discovering the presence of something (like hemoglobin) does not constitute "identifying" it under the Board's claim construction.

Claims 9, 12, and 26 of the '304 Patent recite "selection or identification of an object." EX1001, 37:29-30, 38:27-28, 40:33-34. Petitioners did not offer any claim construction for the phrase "selection ... of an object." Pet., 13-15; EX1003, ¶¶53-66. Petitioners' unpatentability grounds focus on whether the prior art discloses "identification of an object," and they do not argue that the prior art discloses "selection ... of an object." Pet., 65-66; EX1003, ¶¶352-56 (opining "[12.b] is met by Lisogurski's identification alone"); EX2045, 221:4-7 (testifying "I didn't" offer opinions on selection of an object in declaration), 222:9-10 (after attempting to offer new opinion on selection of an object during the deposition, admitting "I was not opining on that in my declaration"); *see also id.*, 224:10-18, 225:3-12. Thus, there is no need for the Board to construe the phrase "selection ... of an object" in claims 9, 12, and 26. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

B. Other Claim Constructions in the Parallel Texas Case or by Board

While Patent Owner submits that the Board need not construe additional terms to find that Petitioners failed to meet their burden, for completeness, several terms have been construed in the parallel Texas case or by the Board in related patents.

In the parallel Texas Case, the Court construed the term “modulating” and “modulation” in claim 9 of the ‘304 Patent as “[vary/varying/the varying of] the amplitude, frequency, or phase of the light produced.” EX1122, 18. Petitioners had proposed a narrower construction for these terms that was the same as the Court’s construction but added “to include information” at the end. *Id.*, 10.

The parties agreed to the following construction for the term “beam” in claims 11, 14, 19, and 20 of the ‘304 Patent: “photons or light transmitted to a particular location in space.” EX2047, 6-11.

As noted in the Petition, the Board construed the following terms in the prior IPRs for patents related to the ‘304 Patent:

Term/Phrase	Board's Construction
"a light source comprising a plurality of semiconductor sources that are light emitting diodes ... configured to increase signal-to-noise ratio by ... increasing a pulse rate of at least one of the plurality of semiconductor sources"	"a light source containing two or more light emitting diodes (semiconductor sources), wherein at least one of the light emitting diodes is capable of having its pulse rate increased to increase a signal-to-noise ratio" (EX1008, 10-12)
"modulating at least one of the LEDs"	"varying the amplitude, frequency, or phase of the light produced by at least one of the LEDs to include information" (EX2037, 10)

VI. PETITIONERS FAILED TO MEET THEIR BURDEN

For the foregoing reasons, Petitioners have not met their burden of showing any claim of the '304 Patent is unpatentable.

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

Petitioners argue that collateral estoppel applies to "[t]he vast majority of the Challenged Claims" and provide a laundry list of limitations that are allegedly implicated. Pet., 16. Petitioners' collateral estoppel argument is based on two

previous Board decisions, one involving related U.S. Patent No. 9,651,533 (“the ‘533 Patent,” EX1081), that found certain claims unpatentable in IPR2019-00916 (“the ‘533-IPR”) and another involving related U.S. Patent No. 10,517,484 (“the ‘484 Patent,” EX1082) in IPR2021-00453 (“the ‘484-IPR”). Pet., 18-20. While the ‘533 and ‘484 Patents are related to the ‘304 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 to claims 2, 4-6, 12-16, 21-22, and 26-27 of the ‘304 Patent 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. The Challenged Claims Contain Additional Limitations that Present Materially Different Patentability Issues

The challenged claims of the '304 Patent contain additional limitations that were not at issue and therefore not addressed in either of the prior IPR decisions. Petitioners and Dr. Anthony admit that the challenged claims include "[a]dditional limitations." Pet., 2-3; EX1003, ¶44.

Claims 4-6, 15-16, and 21-22 of the '304 Patent recite a plurality of detectors arranged along a first arc and a plurality of semiconductor sources arranged along a second arc. EX1001, 37:6-9 (claim 4), 38:47-51 (claim 15), 40:3-6 (claim 21). *None* of the claims at issue in the prior IPRs recited an "arc" arrangement. EX2045, 155:10-16, 155:24-156:19; EX2043, ¶¶102-104; EX1081, 28:51-32:23; EX1082, 36:45-40:55. In Ground 2, Petitioners rely on LeBoeuf as allegedly teaching the claimed "arc" arrangement. Pet., 49-53. But LeBoeuf was not presented in the prior IPRs. *See* EX1008; EX1015; EX2025, 158:9-13. This confirms that 4-6, 15-16, and 21-22 of the '304 Patent present materially different issues of patentability and such that collateral estoppel does not apply. *MaxLinear*, 880 F.3d at 1377-78

There are even more examples in the independent claims. For example, the phrase “an output signal representing at least in part a non-invasive measurement on blood contained within the sample” in claims 1, 11, and 19 was not addressed in either prior IPR decision. EX1001, 36:30-32, 37:57-59, 39:27-29; EX2045, 136:24-140:9; EX2043, ¶91; EX1081, 28:51-32:23; EX1082, 36:45-40:55. As another example, the phrase “the captured light including at least a portion of the input optical beam reflected from the tissue” in claims 1, 11, and 19 was not addressed in either prior IPR decision. EX1001, 36:38-40, 37:65-67, 39:15-17; EX2045, 149:1-150:10; EX1003, ¶147; EX2043, ¶91; EX1081, 28:51-32:23; EX1082, 36:45-40:55.

Additionally, the phrase “increasing the signal-to-noise ratio by increasing a light intensity relative to an initial light intensity” in claims 1 and 11 was not addressed in the ‘533-FWD. EX1001, 36:19-21, 37:45-47; EX2043, ¶91; EX1081, 28:51-32:23; EX1082, 36:45-40:55. As discussed above, claims 9, 12, and 26 of the ‘304 Patent recite: “wherein the wearable device is at least in part configured for selection or identification of an object.” EX1001, 37:29-30, 38:27-28, 40:33-34. None of the claims of the ‘533 Patent that were addressed in the prior IPR addressed this limitation. EX1008; EX2043, ¶149; EX1081, 28:51-32:23; EX1082, 36:45-40:55.

2. Neither Prior IPR Decision Addresses All Limitations

Petitioners’ collateral estoppel arguments are also flawed because they

attempt a piecemeal approach, relying on the '533-FWD for some limitation and the '484-FWD for others. For example, for independent claim 1, Petitioners do not cite or rely on the '533-FWD for limitations [1.h], [1.i], [1.j], or [1.l]. Pet., 30-33, 36-37. Petitioners do not cite or rely on the '484-FWD for limitations [1.b], [1.d], [1.e], [1.f], or [1.g]. Pet., 26-30. Petitioners' piecemeal approach also combines findings from the '533-FWD and '484-FWD to attempt to address the motivation to combine. *See* Pet., 22-23.

Petitioners provide no authority for this approach. Pet., 16-18. The only precedential authority that Petitioners cite—*Google LLC v. Hammond Dev. Int'l*, 54 F.4th 1377, 1381-82 (Fed. Cir. 2022)—addressed applying collateral estoppel to entire “claim[s]” based on a prior Board decision, not applying portions of different decisions to different claim limitations. Petitioners' reliance on *Samsung Elecs. Co., Ltd. v. Netlist, Inc.*, IPR2025-00002, Paper 17 at 17-24 (PTAB May 15, 2025) is misplaced because that institution decision applied collateral estoppel to claims as a whole. None of the cases cited in the Petition support Petitioners' suggestion collateral estoppel applies where one prior decision addresses some aspects of the claim and other prior decision address other aspects of the claims.

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

Petitioners contend that collateral estoppel applies from the '484-RFWD (Pet., 16) and rely on the '484-RFWD for at least limitations [12.pre], [12.a], and [12.b]

(*id.*, 61-65). However, it is black letter law that the '484-RFWD does not give rise to collateral estoppel because it is not "final." EX2012; *United Therapeutics Corp. v. Liquidia Techs., Inc.*, 74 F.4th 1360, 1372 (Fed. Cir. 2023) ("[A]n IPR decision does not have collateral estoppel effect until that decision is affirmed or the parties waive their appeal rights"). The '484-RFWD does not obviate Petitioners' burden to prove that Lisogurski discloses limitation [7.m] under the claim construction in this proceeding.

The '484-FWD also does not give rise to estoppel. In that decision, the Board found that claims 1, 2, 7, and 15-23 of the '484 Patent unpatentable based on combinations of Lisogurski, Carlson, Tran, Isaacson, and/or Valencell-093. EX1015, 61. However, the Board found claims 3-6 and 8-14 of the '484 Patent ***not*** unpatentable because the 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. *Omni MedSci*, No. 2023-1034, 2024 WL 3084509, at *7. On remand, the Board reversed course. EX1016.

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 (among other references) since it prevailed on claims 3-6 and 8-14 of the '484 Patent (i.e., approximately half the challenged claims). EX1015, 61. Thus, collateral estoppel does not apply. *Oren Techs., LLC v. Proppant Express Invs. LLC*, No. 2019-1778, 2021 WL 3120819, at *3 (Fed. Cir. July 23, 2021) (holding that collateral estoppel did not apply to a prior IPR decision, in part, “because of the survival of a claim” in the prior IPR meant that Patent Owner lacked incentive to litigate the other claims); *see also Power Integrations*, 926 F.3d at 1313 (holding that collateral estoppel did not apply because litigant “had a considerably greater incentive” to litigate an issue in a second IPR compared to a prior IPR).

B. Ground 1: Obviousness Based on Lisogurski (Claims 1, 3, 11, 19, 20)

In Ground 1, Petitioners argue that claims 1, 3, 11, 19, and 20 of the '304 Patent are obvious over Lisogurski alone. Pet., 18-49. Patent Owner has statutorily disclaimed claims 1, 3, 11, 19, and 20, rendering Ground 1 moot. EX2038.

C. Ground 2: Obviousness Based on Lisogurski and LeBoeuf (Claims 2, 4-6, 14-16, 21-22, 27)

In Ground 2, Petitioners argue that claims 2, 4-6, 14-16, 21-22, and 27 of the '304 Patent are obvious over Lisogurski and LeBoeuf. Pet., 49-57. For the reasons discussed below, Petitioners fail to meet their burden. EX2043, ¶¶94-148.

1. Claims 2, 14, 27: Lisogurski and LeBoeuf Do Not Render Obvious the Reflective Surface Limitation

Ground 2 is moot as to claims 2, 14 and 27 because these claims have been

statutorily disclaimed. EX2042.

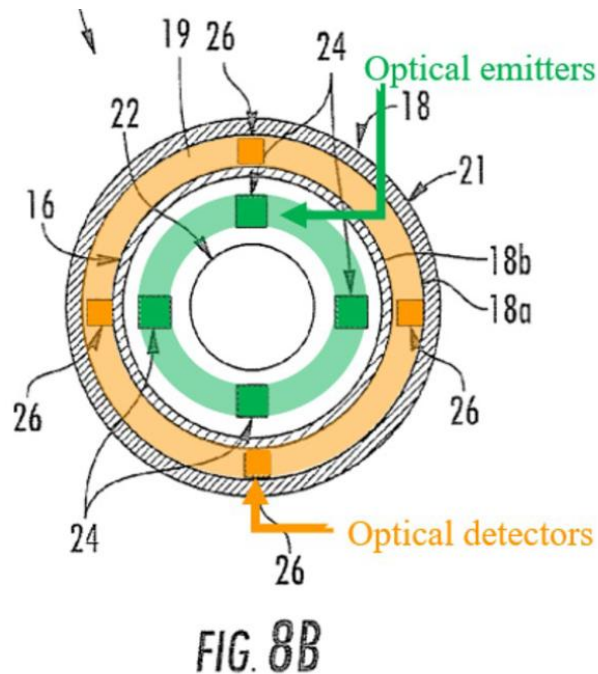
2. Claims 4-6, 15-16, and 21-22: Lisogurski and LeBoeuf Do Not Render Obvious the Arc Limitation

Dependent claims 4-6, 15-16, and 21-22 arranging certain features “along a [first/second] arc.” Claim 4 recites: “the receiver comprises a plurality of detectors arranged along a first arc, and wherein the plurality of semiconductor sources are arranged along a second arc.” EX1001, 37:6-9. Claims 15 and 21 similarly recite: “the receiver comprises a plurality of detectors arranged along a first arc, and wherein the plurality of semiconductor sources are arranged along a second arc that is offset from the first arc.” EX1001, 38:47-51 (claim 15), 40:3-6 (claim 21). Lisogurski and LeBoeuf do not render obvious these arc limitations. Pet., 55-57; EX2043, ¶¶94-148. Notably, Petitioners do not argue that collateral estoppel applies to these limitations. Pet., 16, 55-57.

Lisogurski does not disclose any arrangement of its LEDs or detectors, much less detectors and emitters arranged along “one or more arcs” as claimed. EX2043, ¶¶97-98; EX2045, 161:21-23 (“So I’m not relying in forming my opinions here on Lisogurski by itself, but the combination of Lisogurski and LeBoeuf”), 162:8-9 (“I was not relying on just Lisogurski”); 163:4-9, 163:11-14 (“My opinions here are in the context of the combination of Lisogurski and LeBoeuf”); 163:22-24 (“I was

not...relying just on Lisogurski, but Lisogurski, in combination with LeBoeuf").²

To address this deficiency, Petitioners rely on LeBoeuf's arrangement of optical emitters 24 and optical detectors 26 in Figure 8B and argue that "a POSITA would have been motivated to implement Lisogurski's detector 140/318 ... with LeBoeuf's [sic] arc arrangement." Pet., 51-52, 55-57. Petitioners rely on the following annotated Figure 8B of LeBoeuf:



² As reflected in the cited portions of the transcript, Dr. Anthony repeatedly gave non-responsive and evasive answers when asked whether Lisogurski discloses emitters and detectors arranged along an arc. The Board should infer that the answer was “no” and take his conduct into account when assessing his credibility.

Pet., 56. Petitioners fail to establish that a POSITA would have been motivated to implement LeBoeuf's alleged arc arrangement in Lisogurski. EX2043, ¶101.

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

As explained below, Petitioners' motivation-to-combine argument fails to explain either why or how LeBoeuf's alleged arc arrangement in Figure 8B would have been implemented in Lisogurski's system.

(1) Petitioners Fail to Show Why LeBoeuf's Teachings Would Have Been Implemented in Lisogurski's System

Petitioners first assert that a POSITA would use LeBoeuf's alleged arc arrangement in Lisogurski: "to increase detection of scattered light, thus improving accuracy of physiological measurements." Pet., 51-52. But neither Lisogurski (which does not include the alleged arc arrangement) nor LeBoeuf disclose or suggest that such an arrangement would lead to increased accuracy or reliability.

LeBoeuf's text does not discuss the arrangement in Figure 8B, let alone suggest this arrangement achieves any benefits related to accuracy/reliability. EX1026, FIG. 8B, ¶¶[0123]-[0124]. Petitioners cite LeBoeuf at ¶[0105] and assert that the alleged arc arrangement would "improve the detection of scattered light...and increase the signal-to-noise ratio," but the cited paragraph contains no such teachings. Pet., 52 (citing EX1026, ¶[0105]). Dr. Anthony could not identify

any text in LeBoeuf discussing purported benefits of the alleged arc arrangement and agreed that LeBoeuf “is not explicitly writing out in the text the use of a [sic] arc arrangement.” EX2045, 192:9-196:6.

Petitioners' only other cited evidence is Exhibit 1045 (“Mendelson”). Pet., 52-53 (citing EX1045, 4:14-65). Petitioners cited Mendelson's “Background,” which merely cites other publications, without showing their arrangements. EX1045, 4:14-65. Dr. Anthony did not review those publications. EX2045, 198:19-201:12. Regardless, Petitioners only cite Mendelson regarding alleged arrangement of *detectors*, not *emitters*. Pet., 52 (citing EX1045, 4:14-65) (arguing “a linear or closely grouped detector arrangement would fail to capture much of the angularly scattered light”). Claims 4, 15, and 21 require that *both* the detectors and semiconductor sources are arranged along a “[first/second] arc.” EX1001, 37:6-9, 38:47-51, 40:3-6. Petitioners motivation-to-combine arguments fail because they do not address *both* the detectors and emitters being arranged along an arc.

Petitioners also argue that “[b]oth references teach applying these physiological measurement systems to ears” and “Lisogurski discloses that ‘[a]ny suitable configuration of light source 316 and detector 318 may be used.’” Pet., 53 (quoting EX1025, 17:42-45). But this fails to establish why a POSITA would have selected LeBoeuf's arrangement in FIG. 8B as opposed to other arrangements where the emitter(s) and/or detector(s) are not arranged along an arc, especially since

LeBoeuf does not disclose any advantage to the FIG. 8B. EX1026, FIGS. 6, 7A, 11A, 12A-B, 22B, 23; EX2043, ¶¶120-21, 125, 146-147; *Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 886-87 (Fed. Cir. 2024) (holding that “mere...exist[ence]” of “possible arrangements” and knowledge of “alternative arrangements” are insufficient for motivation to combine).

Petitioners also argue that a POSITA would modify Lisogurski to use LeBoeuf's alleged arc arrangement because: (1) a POSITA would have understood that “light emitted into biological tissue undergoes significant scattering and absorption, and the reflected light exits the tissue at a wide range of angles” (citing EX1025, 11:16-20); and (2) “[a] POSITA would have recognized that a linear or closely grouped detector arrangement would fail to capture much of the angularly scattered light” (citing EX1045, 4:14-65). Pet., 51-52. Critically, however, these issues only relate to *detectors*—not *emitters*. Thus, even if Petitioners were correct (they are not), this does not address the arc arrangement requirement for the semiconductor sources. EX1001, 37:6-9, 38:47-51, 40:3-6; EX2043, ¶¶122-128. To the extent that Petitioners' references to angularly scattered light are intended to support their suggestion that the modification would increase accuracy, it would at most only do so with respect to detectors, not emitters. EX2043, ¶¶117-123.

In any event, Petitioners' arguments regarding angularly scattered light are unsupported and flawed. With respect to “reflected light” at “angles,” the cited

portion of Lisogurski does not address angles, and indeed, Lisogurski never mentions an “angle.” Pet., 51-52 (citing EX1025, 11:16-20). Similarly, Mendelson does not discuss “angles.” Pet., 52 (citing EX1045, 4:14-65). 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]. Petitioners fail to explain why a POSITA would have chosen an arc arrangement from amongst the wide array of non-arc arrangement options, let alone the alleged arc arrangement in LeBoeuf’s Figure 8B. Pet., 51-52; *Virtek Vision*, 7 F.4th at 886-87 (the “mere...exist[ence]” of “possible arrangements” does not mean that a POSITA would have been motivated to use them). For example, the cited portion of Mendelson discusses a non-linear, non-arc arrangement that uses only “a single photodiode [i.e., detector].” EX1045, 4:14-65.

Petitioners’ reliance on Mendelson is flawed for additional reasons. For example, there is no connection between the particular alleged arc arrangement relied upon in LeBoeuf’s Figure 8B and the arrangements referenced in the cited portion of Mendelson, which are different from LeBoeuf’s Figure 8B. EX1045 at 4:14-65 (referencing a sensor with “eight...LEDs and a single photodiode” and

another sensor in a “Konig” publication (EX2035)); EX2035 at 5-6 (“Konig” publication disclosing a sensor with two centralized LEDs surrounded by six detectors). EX2043, ¶126.

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

**(2) Petitioners Fail to Show How LeBoeuf's Teachings
Would Have Been Implemented in Lisogurski's
System**

Petitioners also fail to explain *how* LeBoeuf's alleged arc arrangement would have been implemented in Lisogurski. *PersonalWeb Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993-94 (Fed. Cir. 2017) (finding the Board failed to explain “*how* the combination of the two references was supposed to work” (emphasis in original)); *Braintree Labs., Inc. v. Novel Labs., Inc.*, 749 F.3d 1349, 1359 (Fed. Cir. 2014) (“[Party] failed to prove...why the...references would have worked together” (cleaned up)); *Juniper Networks, Inc. v. Smart Path Connections, LLC*, IPR2021-01356, Paper 27 at 48-50 (PTAB Jan. 19, 2023) (finding petitioner did “not adequately explain[] how [one reference] would be modified to incorporate

teachings from [another reference]”); *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1327-28 (Fed. Cir. 2012); *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381-82 (Fed. Cir. 2016) (emphasizing the “need for specificity” in “findings on motivation”).

LeBoeuf's arrangement of emitters 24 and detectors 26 in Figure 8B is a function of the geometry and arrangement between the base 50, earbud housing 16 (with bottom portion 16a), cover 18 (with cladding material 21), and speaker 22. EX1026, FIGS. 8A-8B, ¶¶ [0123]-[0124]; EX2043, ¶¶132-148. 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 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).

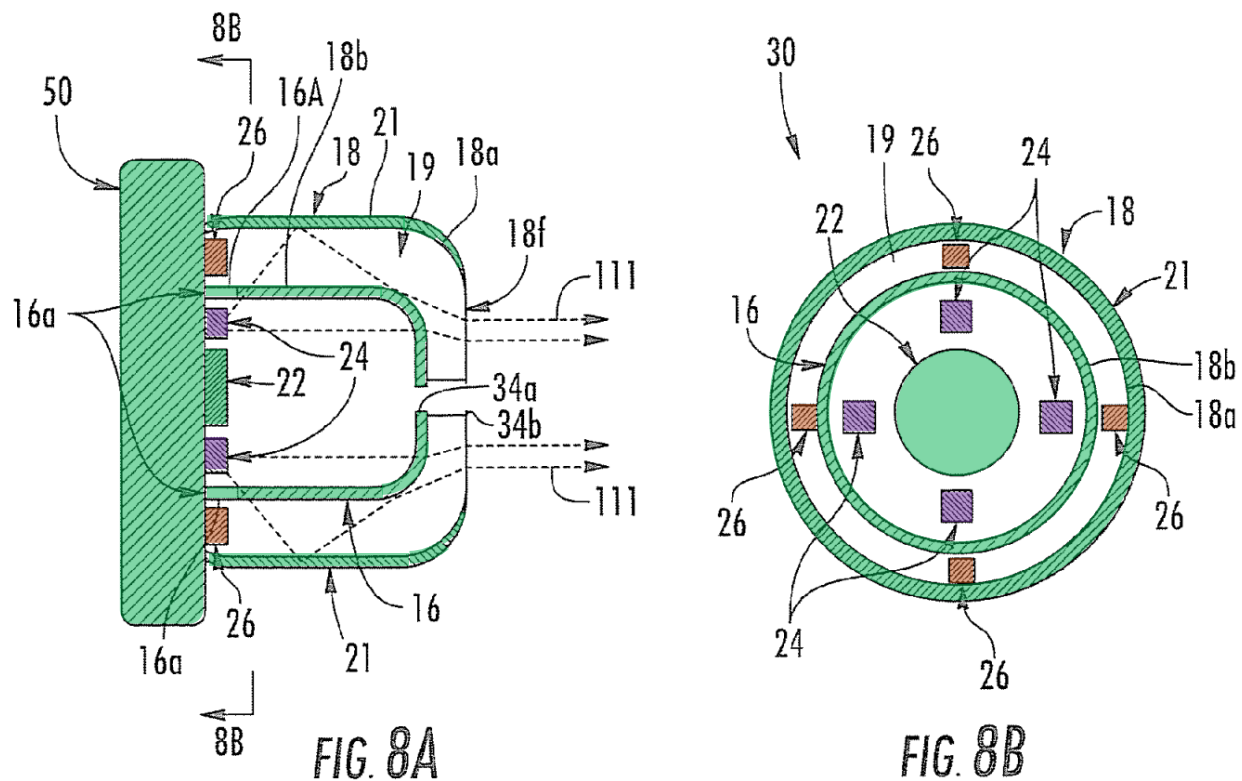
Petitioners do not address those related components, much less argue to implement those related components into Lisogurski. Pet., 51-52. Petitioners do not explain how LeBoeuf's alleged arc arrangement, which is based on those related components, would purportedly be implemented in Lisogurski's sensor that does not have those related components. *Id.*; EX2043, ¶¶132-148. Petitioners' argument thus fails. *See PersonalWeb*, 848 F.3d at 993-94; *Braintree*, 749 F.3d at 1359; *Juniper Networks*, IPR2021-01356, Paper 27 at 48-50; *ActiveVideo*, 694 F.3d at 1327-28.

Further, Petitioners do not explain how LeBoeuf's alleged arc arrangement of emitters and detectors would work to achieve Petitioners' alleged motivation of accuracy/reliability in Lisogurski without those other related components. Pet., 51-52; EX1026, FIGS. 8A-8B, ¶[0123]; EX2043, ¶131.

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

Regardless of the deficiencies in the Petition, a POSITA would not have been motivated to implement LeBoeuf's alleged arc arrangement into Lisogurski. EX2043, ¶¶132-148.

LeBoeuf is directed extensively to “earbud” devices—including the “light-guiding earbud” in Figure 8B—that are specifically configured to be placed within



EX1026, FIGS. 8A-8B (annotated), ¶¶[0123]-[0124]. For example, optical emitters 24 are positioned on base 50 around a centrally located speaker 22 and within earbud housing 16, and optical 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]. 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].

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

Dr. Anthony agreed that LeBoeuf's alleged arc arrangement of emitters 24 and detectors 26 is dictated by the geometry and relative position of other components. EX2045, 171:20-172:6 (earbud housing 16 and cover 18 are circular), 205:1-5 (Q: “[G]iven that both the cover 18 and the earbud housing [16] are circular, the space between the earbud housing 16 and the cover 18 also has a circulate shape. Correct?”; A: “Yes.”), 204:6-25 (detectors 26 are positioned “[b]etween [earbud

housing] 16 and [cover] 18”), 175:2-177:6 (LeBoeuf “use[s] the housing [16] and cladding material [21] to direct light” to detectors 26), 193:17-194:20 (“LeBoeuf talks extensively about...having cladding surfaces...that guide light” and “[t]alks about the issues of...directing light...to the detectors”), 198:5-17 (recognizing that placement of detectors “where the light is to be expected” depends on “structures that guide a light to earbuds”); 169:19-171:13 (light blocking region 16a blocks the detectors from receiving light directly from the emitters); 205:6-207:23 (testifying the arrangement of detectors 26 in FIGS. 8A-8B depends on the “particular” design of that embodiment).

A POSITA would have understood that the geometry of the components shown in Figures 8A-8B—including the alleged arc arrangement—is specific to an earbud and dictated by guiding sound and light to the ear canal. EX1026, FIGS. 8A-8B, ¶¶[0123]; EX2043, ¶¶140-143. Lisogurski is limited to sensors for external placement. EX1025, 4:6-20 (describing, at most, placement on an “earlobe” or “around or in front of the ear,” and notably not *within* the ear). A POSITA would have understood that Lisogurski’s non-earbud sensor is comparable, at most, to LeBoeuf’s non-earbud embodiments in Figures 22A-23, not the earbud in Figures 8A-8B. *Compare* EX1025, 4:6-20 (fingertip, toe, earlobe, and body) *with* EX1026, ¶¶[0070]-[0071], [0157] (fingers, toes, and earlobes), [0072], [0164] (body), FIGS. 22A-23. Notably, LeBoeuf’s non-earbud embodiments in Figures 22A-23 do not

include the alleged arc arrangement of Figure 8B, further demonstrating that the arrangement is earbud-specific. *See* EX1026, ¶¶[0070]-[0072], [0157], [0164], FIGS. 22A-23; EX2043, ¶¶120-121, 140-143, 146-147; EX2045, 186:15-188:18 (acknowledging that 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).

Because Lisogurski does not teach or suggest an earbud sensor for within an ear, a POSITA would not have been motivated to implement LeBoeuf's alleged arc arrangement that, as explained above, is premised on earbud-specific components and, together with those components, is specific to an earbud. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; EX1025, 4:6-20. Further, because Lisogurski does not include the related components upon which LeBoeuf's alleged arc arrangement is premised, a POSITA would have had neither the motivation nor capability to implement LeBoeuf's alleged arc arrangement in Lisogurski. EX1026, FIGS. 8A-8B, ¶¶[0123]-[0124]; Pet., 51-52. In an attempt to address these differences, Petitioners quote Lisogurski's statement that "[a]ny suitable configuration...may be used" (Pet., 53 (quoting EX1025, 17:42-45)), but a POSITA would not have understood LeBoeuf's alleged arc arrangement in Figure 8B to be suitable for the reasons discussed above, including that the alleged arc arrangement is based on related components not

present in Lisogurski and is earbud-specific, whereas Lisogurski does not include an earbud. EX2043, ¶¶119-121, 132-147.

D. Ground 3: Obviousness Based on Lisogurski and Tran (Claims 1, 3, 11-13, 19, 20, 26)

In Ground 3, Petitioners argue that claims 1, 3, 11-13, 19, 20, and 26 of the '304 Patent are obvious over Lisogurski and Tran. Pet., 57-67. Ground 3 is moot as to claims 1, 3, 11, 19, and 20 because these claims have been statutorily disclaimed. EX2038. For the reasons discussed below, Petitioners failed to meet their burden for claims 12, 13, and 26. EX2043, ¶¶149-178.

1. Lisogurski Does Not Disclose “Identification of an Object”

Claim 12 recites “wherein the measurement system is at least in part configured for selection or identification of an object.” EX1001, 38:20-32. Claim 26 recites, “wherein the wearable device is at least in part configured for selection or identification of an object.” EX1001, 40:26-38. As discussed above, the phrase “to identify an object” means “to recognize or establish an object as being a particular thing.” *Supra*, §V.B; EX1015, 8-10. Under the claim construction, there is a difference between identifying an object and detecting an object, the latter of which means “to discover or notice the existence or presence of something.” *Id.* To illustrate by way of example, a scale measures weight without identifying the object on the scale. As another example, a pH meter measures acidity without identifying

which acids or bases are present. EX2043, ¶157.

Dr. Anthony confirmed that he did not analyze the difference between “blood constituents” and “blood analytes”:

Q. Do you know if there's a difference between blood constituents and blood analytes?

A. ... I didn't need to construe a definition of blood constituents or analytes in forming my opinions, and sitting here today, it's, as I'm describing, it's the stuff that's in the blood that could be measured optically.

EX2045, 232:9-18 (objections omitted). A POSITA would understand that blood constituents are the substances that make up blood—the actual materials present, including water, adipose, collagen, and elastin. EX1001, 18:50-54; EX2043, ¶160. Hemoglobin is a blood constituent. *Id.* By contrast, analytes refer to any substance that is the subject of an analysis or measurement—for example, oxygenated or deoxygenated hemoglobin concentrations are analytes (a specific form of hemoglobin being measured). EX2043, ¶160. Dr. Anthony conflates measuring the concentration of an analyte (e.g., measuring how much oxyhemoglobin is present) with identifying a blood constituent. EX2043, ¶160.

The '304 Patent exemplifies identification through discrimination among multiple unknown constituents. To distinguish between blood constituents such as glucose, which has spectral features that may overlap with other blood constituents, the '304 Patent describes using “pattern matching algorithms and other software and

mathematical methods to identify the blood constituents of interest.” EX1001, 4:58-62, 18:50-54, 35:17-44; EX2043, ¶162. It also describes “using a wider wavelength range and using more sampling wavelengths [to] improve the ability to discriminate one signal from another.” EX1001, 35:41-44; EX2043, ¶162. The identification is achieved via various signal processing techniques. EX1001, 35:23-26; EX2043, ¶163. “Various mathematical derivatives, including the first and second derivatives, may help to accentuate differences between spectra.” EX1001, 20:17-19; EX2043, ¶163. In addition, “the spectrum may be correlated with a library of known spectra to determine the overlap integrals.” EX1001, 35:20-21; EX2043, ¶163.

Based on the foregoing, a POSITA would understand that identification requires determining what the object is, not measuring an assumed object's parameters. EX2043, ¶¶157-161. This is what distinguishes identifying an object from merely detecting something or measuring a parameter of a presumed object. EX1015, 10; EX2043, ¶¶157-161. To identify an object, the system must determine what the object is, recognizing it as a particular thing. EX2043, ¶¶157-161. This is distinct from assuming an object and simply quantifying one of its attributes.

Dr. Anthony acknowledged during his deposition that mere detection of an object does not qualify as identification of an object under the Board's claim construction:

Q: And you understand that under the board's claim construction, the

term “to identify an object” has a different meaning than “to detect an object.” Correct?

A: So as written there, we construe “to identify an object” to mean recognize or establish, and construe “to detect” to mean discover or notice the existence or presence.

...

Q: Would discovering or noticing the existence or presence of something qualify as identifying an object under the board's claim construction?

A: Under the board's claim and highlighted there is detecting of an object.

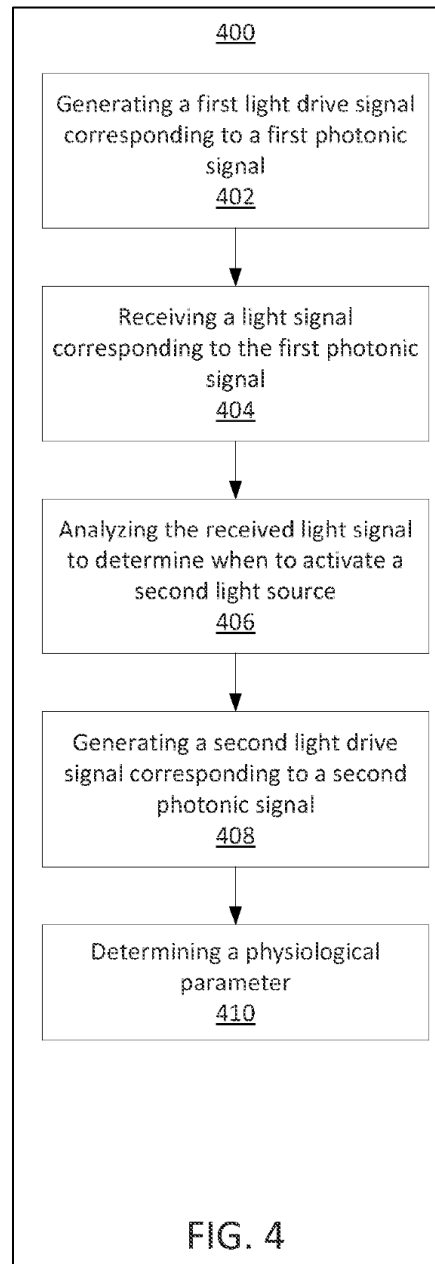
Q: And detecting an object is not identifying an object. Correct?

A: In that board's decision there, yes.

EX2045, 213:12-19, 216:12-21 (objections omitted). Thus, merely detecting or discovering the presence of something (like hemoglobin) does not constitute “identifying” it.

Lisogurski does not disclose “identifying an object” because measuring a known parameter does not meet the claim construction of “to recognize or establish an object as being a particular thing.” EX2043, ¶¶164-67. Lisogurski's pulse oximeter measures oxygen saturation of hemoglobin—a known, presumed constituent—without identifying what blood constituents are present. *Id.* Lisogurski describes a pulse oximetry system that measures blood oxygen saturation. EX1025, 3:61-4:41; EX2043, ¶¶164-67. The system emits light at two wavelengths, detects

the transmitted or reflected light, and calculates oxygen saturation based on the ratio of absorbed light with a detector. EX1025, 4:42-62, FIG. 4; EX2043, ¶165.



EX1025, FIG. 4

Lisogurski operates on the presupposition that hemoglobin is present.

EX1025, 4:35-41; EX2043, ¶¶165-67. It uses known characteristics of that single constituent to estimate oxygen saturation. EX1025, 4:35-41; EX2043, ¶167. Lisogurski does not disclose or suggest any step where the system attempts to determine the identity of a substance or object—it, at most, assumes the identity of the object from the outset. EX1025, 4:35-41; EX2043, ¶¶165-67.

The oximetry technique described in Lisogurski is not a blood identification technique. EX2043, ¶167. Oximetry exclusively focuses on one blood constituent, hemoglobin, and measuring the ratio of oxygenated and deoxygenated hemoglobin, without discriminating hemoglobin from other blood constituents. EX1025, 3:61-4:3; EX2043, ¶¶166-67. This technique applies pre-established assumptions that oxygenated and deoxygenated hemoglobin are inherently present in blood and that the absorbance of specific wavelengths has a mathematical correlation to blood oxygen saturation. EX2043, ¶¶166-67. An oximeter is configured to know what blood constituent it is measuring; it does not recognize or establish the identity of what it is measuring. *Id.*

Dr. Anthony agreed during his deposition that Lisogurski measures the ratio of oxygenated to deoxygenated hemoglobin to estimate oxygen saturation. For example:

Q: According to Lisogurski, a pulse oximeter is a device that measures the ratio of oxygenated and deoxygenated hemoglobin. Correct?

A: ... Lisogurski, as you read, describes an oximeter as a medical device that determines oxygen saturation of an analyzed tissue. One common type of oximeter is a pulse oximeter, which may non-invasively measure the oxygen saturation of a patient's blood.

...

Q: ... How would a person of skill in the art understand that a physiological parameter like oxygen saturation would be determined by a pulse oximeter?

A: ... [A] POSITA would be familiar with how a pulse oximeter works in looking at multiple wavelengths and the relative absorption and reflection of oxygenated and deoxygenated blood. And it is used to estimate the relative ratio of the two.

EX2045, 32:3-14, 33:13-21. This shows that Lisogurski merely estimates a ratio (oxygen saturation), it does not recognize or establish a particular thing as being a particular object. Estimating a quantitative ratio is a measurement, not an identification.

When pressed whether pulse oximetry requires recognizing or establishing an object as being a particular thing to estimate oxygen saturation, Dr. Anthony repeatedly explained that pulse oximetry involves ***detecting*** hemoglobin's presence. For example, he testified that pulse oximetry involves detecting signals from oxygenated and deoxygenated blood:

Q: ... [I]n order to estimate the blood oxygen saturation of hemoglobin, a person of skill in the art would understand that it's not necessary to determine whether or not hemoglobin is present as a threshold determination. Correct?

A: Well, a POSITA would understand that *you have to have your signal be detecting* the -- detecting the signal that no blood -- that there's nothing there that is responding to the light that you're using. I'm confused a little bit by the question.

Q: When you estimate the blood oxygen saturation of hemoglobin, there's an assumption that there is, in fact, hemoglobin in the blood that you're measuring. Correct?

A: Well, for hemoglobin, for example, you're using wavelengths *to preferentially detect the -- the signal* from oxygenated and deoxygenated blood. That's why you pick certain wavelengths so *you're detecting the presence* of -- of the constituent and then determining the relative ratio of the constituent.

EX2045, 43:6-44:4. Dr. Anthony repeatedly emphasized that pulse oximetry involves detection of hemoglobin:

Q: ... [I]n pulse oximetry, you don't need to ask as a threshold matter whether there is hemoglobin in the blood that you're measuring. Correct?

A: Well, *you're detecting that there's hemoglobin* there. Otherwise,

you're not measuring the detected hemoglobin, so *you're detecting* that the signal that you're getting from the preferential wavelengths that you've used that are sensitive to hemoglobin, so you're – if you were measuring it on somebody that was dead and had oxygen, you would not be *detecting hemoglobin*.

Id., 44:6-17. As discussed above, Dr. Anthony conceded that detecting an object (e.g., hemoglobin) is not the same as identifying an object under the Board's claim construction. *Id.*, 213:12-19, 216:12-21.

Rather than explain why Lisogurski allegedly meets element [12.b], Petitioners merely quote the prior '484-RFWD. The entirety of Petitioners' analysis is reproduced below:

To meet “wherein the wearable device is at least in part configured to identify an object” ('484 claim 3/8), the Board found that Lisogurski's sensor 102/312 “calculat[es] an amount of a blood constituent, e.g., oxyhemoglobin” in a tissue sample, which involves distinguishing and identifying oxyhemoglobin in blood. '484-Remand-FWD, 6 (citing '484-Pet.-Reply, 24); Lisogurski, 4:36-51. As the Board explained, “[a]s Lisogurski discloses a method of measuring oxygen saturation that uses different wavelengths to distinguish hemoglobin from oxygen carrying hemoglobin, i.e., oxyhemoglobin, Lisogurski teaches identifying an object, i.e., the blood constituent oxyhemoglobin.” 484-RFWD, 4-7; Lisogurski, 4:36-62. Anthony, ¶¶355-356.

Pet., 65. Petitioners' reliance on the '484-RFWD is flawed for two reasons. First, the

'484-RFWD is not final and does not have any preclusive effect, as discussed above.

Supra, §VI.A.3. The '484-RFWD does not obviate Petitioners' burden to prove that Lisogurski discloses this limitation [12.b].

Second, Petitioners fail to proffer adequate testimony from Dr. Anthony to meet this burden. Pet., 65 (citing EX1003, ¶¶354-56 (citing EX1010, ¶¶210-23)). Paragraph 354 of Dr. Anthony's declaration simply quotes element [12.b], without more. EX1003, ¶354. Paragraph 356 of Dr. Anthony's declaration states that element [12.b] is "identical to the corresponding limitation in the '484 patent" and that his prior opinions "apply equally to '304 patent element [12.b]." *Id.*, ¶356 (citing EX1010, ¶¶210-223). Paragraph 355 of Dr. Anthony's declaration is reproduced in its entirety below:

The Board previously found a substantially identical limitation was met by Lisogurski in the prior '484 IPR. In particular, to meet "wherein the wearable device is at least in part configured to identify an object" ('484 claim 3/8), the Board found that Lisogurski's sensor 102/312 "calculat[es] an amount of a blood constituent, e.g., oxyhemoglobin" in a tissue sample, and thus Lisogurski "teaches identifying an object, i.e., the blood constituent oxyhemoglobin." '484-Remand-FWD, 6-7 (citing '484-Pet.-Reply, 24); Lisogurski, 4:36-51. Specifically, as the Board explained, Lisogurski discloses identifying an object by measuring "the light intensity or the amount of light absorbed" by "the tissue" "to calculate any of a number of physiological parameters, including an

amount of a blood constituent (e.g., oxyhemoglobin) being measured.” 484-Remand-FWD, 4-7; Lisogurski, 4:36-62. Thus, the Board found that “[a]s Lisogurski discloses a method of measuring oxygen saturation that uses different wavelengths to distinguish hemoglobin from oxygen carrying hemoglobin, i.e., oxyhemoglobin, Lisogurski teaches identifying an object, i.e., the blood constituent oxyhemoglobin.” 484-Remand-FWD, 4-7; Lisogurski, 4:36-62. In other words, Lisogurski’s calculation and measurement of the amount of oxyhemoglobin exists in blood includes distinguishing and identifying the oxyhemoglobin blood constituent. This is consistent with my opinions regarding this ’484 limitation, which I incorporate by reference as if fully set forth herein. ’484-Anthony, ¶¶210-223.

As shown above, Dr. Anthony’s “opinions” consist of quoting the same portions of the ’484-RFWD as the Petition and purporting to incorporate by reference his testimony from another proceeding. This testimony is entitled to no weight under the Board’s precedent. *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”).

The only arguable “opinion” he offers beyond quoting and purporting to incorporate by reference other testimony is a bare conclusion that “Lisogurski’s calculation and measurement of the amount of oxyhemoglobin exists

in blood includes distinguishing and identifying the oxyhemoglobin blood constituent.” EX1003, ¶355. This is the epitome of conclusory testimony that is entitled to no weight. *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1361-63 (Fed. Cir. 2019) (reversing the Board’s obviousness finding based on “unsupported and conclusory” expert testimony); 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight”).

Dr. Anthony’s attempt to incorporate by reference testimony from another proceeding concerning another patent is also improper. EX1003, ¶355 (citing EX1010, ¶¶210-223). The Petition does not cite the relevant paragraphs of EX1010. *See, e.g.,* Pet., 65. The Petition and Dr. Anthony’s attempted incorporation by reference of testimony from another proceeding is improper under the Board’s rules. 37 C.F.R. § 42.6(a)(3); *Cisco Sys., Inc. v. C-Cation Techs., LLC*, IPR2014-00454, Paper 12 at 9-10 (PTAB Aug. 29, 2014) (informative) (finding that “citing the [expert] Declaration to support conclusory statements that are not otherwise supported in the Petition also amounts to incorporation by reference”); *3M Co. v. Evergreen Adhesives, Inc.*, 860 F. App’x 724, 728 (Fed. Cir. 2021) (finding that the Board did not abuse its discretion in disregarded incorporated by reference arguments).

In any event, Dr. Anthony’s prior testimony does **not** support the Board’s

findings in the '484-RFWD that Petitioners rely on. In the IPR for the '484 Patent, the Petitioner, Apple, initially argued that Lisogurski meets the “identify an object” requirement because it “can identify an object, such as an ear or a wrist, because it can distinguish when it has fallen off (probe off error).” EX1015, 50. Patent Owner proposed its claim construction for “identify an object” in its Patent Owner Response. *Id.* In its Reply, Apple abandoned its original theory and advanced a new theory attempting to address Patent Owner's construction. *Id.*, 51. After initially finding that Apple did not meet its burden (*id.*, 51-52), the Board found in the '484-RFWD that “Lisogurski teaches identifying an object, i.e., the blood constituent oxyhemoglobin” (EX1016, 7).

Dr. Anthony's declaration for the '484 Patent only addresses Apple's original theory that Lisogurski identifies an object based on the “probe off error” feature and does *not* opine that Lisogurski identifies an object because it identifies the blood constituent oxyhemoglobin. EX1010, ¶¶220-222.³ In paragraph 220, Dr. Anthony merely quoted the language from claims 3 and 16 of the '484 Patent. *Id.*, ¶220. In paragraph 222, he addressed a different claim limitation from the '484 Patent. *Id.*, ¶222. Paragraph 221 is reproduced below:

³ One of the issues in the appeal of the '484-RFWD is that Dr. Anthony's testimony did not support the Board's findings. EX2039, 20, 22-23.

Lisogurski teaches that its sensor can detect when it has fallen off. Ex.1001, 36:66-37:2 (“the system may detect a signal indicative of a system error such as... a probe-off signal”). Thus, Lisogurski’s sensor can identify when an object (e.g., a wrist or an ear) is in the range of the sensor (“the wearable device is at least in part configured to identify an object”).

Id., ¶221. Petitioners fail to meet their burden because Dr. Anthony’s testimony does not support its argument. *Alexsam, Inc. v. IDT Corp.*, 715 F.3d 1336, 1348 (Fed. Cir. 2013) (explaining that expert testimony is normally required “not only to explain what the prior-art references disclosed, but also to show that a person skilled in the art would have been motivated to combine them”).

The Board did not rely on this theory in the ‘484-RFWD, and for good reason. EX1016, 4-7. Even if Lisogurski’s “probe-off” refers to “detect[ing] when it has fallen off,” Dr. Anthony testified that Lisogurski’s “probe-off” functionality involves detecting rather than identifying. EX2045, 45:16-20 (“So a physiological impossible value, meaning detected that it’s not there. So ... I’m ***detecting the absence of the signal to indicate that the probe is off***. Conversely, to detect that the signal is there to measure the hemoglobin”), 45:3-6 (“in the situation where the device is not on, ***you detect that it’s not on by the fact that you’re not detecting the hemoglobin*** and the signal that you’re looking for”).

For at least these reasons, Petitioners failed to meet their burden for Ground

3. One can measure the acidity of a solution without knowing the specific acids or bases present. EX2043, ¶167. One can measure the weight of an object without knowing what that object is. *Id.* Similarly, one can measure the oxygen saturation of blood without identifying which components are present. *Id.* Lisogurski performs parameter measurement, not object identification. EX2043, ¶¶164-167.

2. Lisogurski and Tran Do Not Disclose Improving Identification

In addition to reciting “identification of an object,” claim 12 recites “wherein the measurement system is configured to improve a signal-to-noise ratio of the selection or identification by applying regression signal processing methodologies or multivariate techniques.” EX1001, 38:20-33. Claim 26 recites substantially identical language. EX1001, 40:26-38. Dr. Anthony acknowledges that the “improve a signal-to-noise ratio of the selection or identification” requirement is “new language that was not previously considered” by the Board. EX1003, ¶353.

These claim limitations require that the improvement to signal-to-noise ratio (“SNR”) be specifically “of the selection or identification.” EX1001, 38:20-33, 40:26-38. The “regression signal processing methodologies or multivariate techniques” are applied to improve the SNR of the process for identification of an object, i.e., recognizing or establishing an object as a particular thing. EX2043, ¶170.

The ‘304 Patent specification confirms this understanding, disclosing that

“pattern matching algorithms and other software and mathematical methods” are used “to identify the blood constituents of interest” by correlating “the spectrum ... with a library of known spectra.” EX1001, 35:17-44. The specification further explains that “the selection of the constituent of interest may be improved using a number of techniques,” including “multivariate techniques, multiple linear regression, and factor-based algorithms” to “improve the ability to discriminate one signal from another.” EX1001, 35:30-44; EX2043, ¶¶171-172.

Petitioners and Dr. Anthony rely on Tran (EX1027)'s statistical analyzers as disclosing “pattern identification or classification.” Pet., 63-63; EX1003, ¶¶346-347. Tran is entitled “Mesh Network Stroke Monitoring Appliance” and discloses “a statistical analyzer to determine heart attack or stroke attack.” EX1027, Title, Abstract. Tran's “data driven analyzers” incorporating “regression methods” are used to track “the patient's habits” including “eating and drinking habits, sleeping habits, or exercise habits” and “the patient's risk of stroke or heart attack.” EX1027, 22:23-28, 3:64-65, 54:35-40. This is population health analytics and risk assessment, which categorically different from improving the signal-to-noise ratio of “selection or identification [of an object]”—i.e., improving the signal-to-noise ratio of recognizing or establishing an object as being a particular thing. Pet., 57-63; EX1003, ¶¶346-52. EX2043, ¶¶173-76.

A POSITA would not have been motivated to apply Tran's stroke-detection

methods to Lisogurski's pulse oximetry system for improving the SNR of “selection or identification of an object” because these are fundamentally different analytical tasks operating on fundamentally different data types. EX2043, ¶176.

For at least these reasons, Petitioners failed to meet their burden for Ground 3 regarding claims 12, 13, and 26.

E. Ground 4: Obviousness Based on Lisogurski, LeBoeuf, and Tran (Claims 2, 4-6, 12-16, 21-22, 26-27)

In Ground 4, Petitioners argue that claims 2, 4-6, 12-16, 21-22, and 26-27 are obvious over Lisogurski, LeBoeuf, and Tran. Pet., 57-67. For the reasons discussed below, Petitioners fail to meet their burden. EX2043, ¶¶179-182. Ground 4 is moot as to claims 2, 14 and 27 because these claims have been statutorily disclaimed. EX2042.

Ground 4 is similar to Ground 2 but further addresses claims 4-6, 15-16, and 21-22 in view of Tran. Pet., 8. Ground 4 does not address the “arc” limitations claims 4-6, 15-16, and 21-22 and therefore fails for those claims for the same reasons as Ground 2. Pet., 60-67; EX2043, ¶181; *supra*, §VI.C.

Ground 4 is also similar to Ground 3 but Ground 4 further addresses claims 12, 13, and 26 in view of LeBoeuf. Pet., 8. Ground 4 does not rely on LeBoeuf for the “selection or identification of an object” limitation of claims 12, 13, and 26 and therefore fails for those claims for the same reasons as Ground 3. Pet., 65-67;

EX2043, ¶181; *supra*, §VI.D.

F. Ground 5: Obviousness Based on Lisogurski and Carlson (Claims 1, 3, 11, 19, 20)

In Ground 5, Petitioners argue that claims 1, 3, 11, 19, and 20 are obvious over Lisogurski and Carlson. Pet., 68-74. Ground 5 is moot because claims 1, 3, 11, 19, and 20 have been statutorily disclaimed. Ex. 2038.

G. Ground 6: Obviousness Based on Lisogurski, LeBoeuf, and Carlson (Claims 2, 4-6, 14-16, 21-22, 27)

In Ground 6, Petitioners argue that claims 2, 4-6, 14-16, 21-22, and 27 are obvious over Lisogurski, LeBoeuf, and Carlson. Pet., 68-74.

Ground 6 is moot as to claims 2, 14 and 27 because these claims have been statutorily disclaimed. EX2042. Ground 6 is similar to Ground 2 but relies on Carlson for limitations [1.c], [11.c], and [19.c] and “the ‘pulse rate’ limitations” of claims 13 and 20. Pet., 72-74; EX2043, ¶187. Because Ground 6 does not address the deficiencies in Lisogurski and LeBoeuf discussed above for Ground 2, Petitioners failed to meet their burden for Ground 6 for the same reasons as Ground 2. *Supra*, §VI.C.; EX2043, ¶¶187-188.

H. Ground 7: Obviousness Based on Lisogurski, Tran, and Carlson (Claims 1, 3, 11-13, 19, 20, 26)

In Ground 7, Petitioners argue that claims 1, 3, 11-13, 19, 20, and 26 are obvious over Lisogurski, Tran, and Carlson. Pet., 68-74. Ground 7 is moot as to claims 1, 3, 11, 19, and 20 because these claims have been statutorily disclaimed.

Ex. 2038.

As to claims 12, 13, and 26, Ground 7 is similar to Ground 3 but additionally relies on Carlson for limitations [1.c], [11.c], and [19.c] and “the ‘pulse rate’ limitations” of claims 13 and 20. Pet., 72-74; EX2043, ¶191. Because Ground 7 does not address the deficiencies in Lisogurski and Tran in Ground 3, Petitioners failed to meet their burden for Ground 7 for the same reasons as Ground 3. *Supra*, §VI.D.; EX2043, ¶¶191-92.

I. Ground 8: Obviousness Based on Lisogurski, LeBoeuf, Tran, and Carlson (Claims 2, 4-6, 12-16, 21-22, 26-27)

In Ground 8, Petitioners argue that claims 2, 4-6, 12-16, 21-22, and 26-27 of the '304 Patent are obvious over Lisogurski, LeBoeuf, Tran, and Carlson. Pet., 68-74. Ground 8 is moot as to claims 2, 14 and 27 because these claims have been statutorily disclaimed. EX2042. Ground 8 is based on Ground 4 and further addresses claims 4-6, 12-13, 15-16, 21-22, and 26 in view of Carlson. Pet., 8. Specifically, Ground 8 addresses limitations [1.c], [11.c], and [19.c] and “the ‘pulse rate’ limitations” of claims 13 and 20. Pet., 72-74; EX2043, ¶194. Because Ground 8 does not address the deficiencies in Lisogurski, LeBoeuf, and Tran in Ground 4, Petitioners failed to meet their burden for Ground 8 for the same reasons as Ground 4. *Supra*, §§VI.C., VI.D., VI.E.; see EX2043, ¶¶194-95.

J. Ground 9: Obviousness Based on Lisogurski, Tran, and Marbach (Claims 1, 3, 11-13, 19, 20, 26)

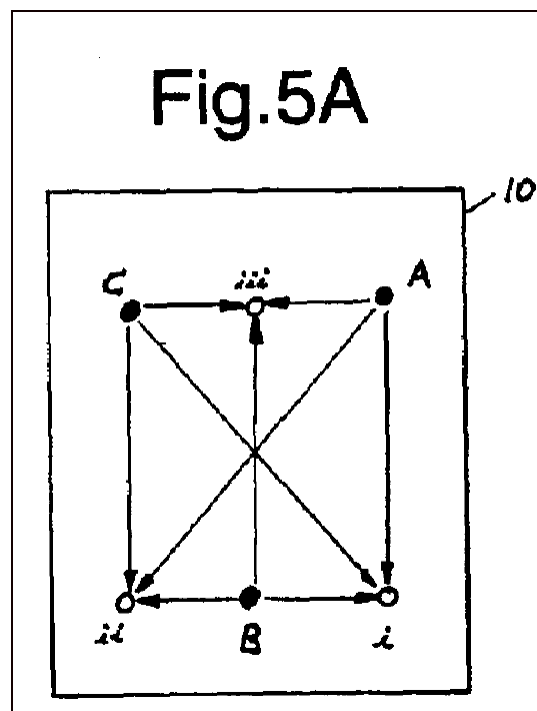
In Ground 9, Petitioners argue that claims 1, 3, 11-13, 19, 20, and 26 of the '304 Patent are obvious over Lisogurski, Tran, and Marbach. Pet., 74-77. Ground 9 is moot as to claims 1, 3, 11, 19, and 20 because these claims have been statutorily disclaimed. Ex. 2038.

As to claims 12, 13, and 26, Ground 9 is similar to Ground 3 except that Ground 9 attempts to address the “regression signal processing methodologies or multivariate techniques” limitations of claims 12, 13, and 26 using Marbach. Pet., 74-77; EX2043, ¶198. Because Ground 9 does not address the deficiencies in Lisogurski and Tran in Ground 3, Petitioners failed to meet their burden for Ground 9 for at least the same reasons as Ground 3. *Supra*, §VI.D.; EX2043, ¶¶196-98.

In Ground 9, Petitioners and Dr. Anthony rely on Marbach (EX1029) for the claim limitation “improve a signal-to-noise ratio of the selection or identification by applying regression signal processing methodologies or multivariate techniques.” Pet., 66 (Grounds 3-4), 74-77 (Grounds 9-10); EX1003, ¶¶357-358 (Grounds 3-4), 402-407 (Grounds 9-10). Petitioners do not address the fact that Marbach's multivariate techniques are tied to Marbach's specific probe structure. Pet., 66, 74-77; EX2043, ¶¶199-208.

Marbach's disclosures expressly tie multivariate functionality to probe

geometry. Marbach teaches that “in order to realize an effective, geometrically-multivariate probe, a necessary requirement is that the signals of at least a subset of the optical measurement beams are stronger than the hardware noise floor.” EX1029, 13:59-64. This directly links the realization of a “geometrically-multivariate probe” to the physical characteristics of the probe and its measurement beams. EX2043, ¶¶200-202. Marbach further discusses its Wiener filter method in the context of a specific probe structure: “if the 3×3 probe of FIG. 5A is used for a spectroscopically resolved measurement” EX1029, 21:18-23; FIG. 5A. FIG. 5A shows a schematic top view of a preferred 3×3 diffuse reflection probe. EX1029, 6:45-46, FIG. 5A.



EX1029 at FIG. 5A

The “multivariate data” being integrated arises from, and is dependent on, a

particular probe geometry. EX2043, ¶203. Moreover, Marbach's claim 8 requires that “the size and relative location of said points of light entry and said points of light exit are designed to achieve a desired multivariate signal-to-noise ratio of a particular analytical measurement application.” EX1029, 23:39-43. This language expressly ties the “multivariate signal-to-noise ratio” to the “size and relative location” of structural probe elements. EX2043, ¶204.

Lisogurski's sensor lacks Marbach's probe structure. Lisogurski's sensor 102 includes light source 130 and detector 140. EX1025, FIG. 1, 10:42-49. Lisogurski does not disclose: (a) geometrically-multivariate probe (EX1029, 13:59-64); (b) a 3×3 probe geometry or any comparable multi-probe configuration (EX1029, 21:18-23, FIG. 5A); or (c) specifically designed “size and relative location” of light entry and exit points to achieve a “multivariate signal-to-noise ratio” (EX1029, 23:39-43). Without these structural features, the multivariate input data that Marbach's algorithms rely upon would not be generated, and the algorithms would not achieve their intended purpose of canceling surface instabilities. EX1029, 3:35-37, 13:59-64; EX2043, ¶¶206-208.

Petitioners do not explain how Marbach's multivariate techniques—which depend on the specific geometries and physical configurations of the probe (Ex. 1029 at 13:59-64, 21:18-23, 23:39-43)—would be implemented in Lisogurski's different sensor architecture that lacks all these features. EX1003, ¶¶357-358, 402-

407; EX1025; Pet., 66, 74-77; EX2043, ¶¶206-208. A POSITA would have understood that Marbach's multivariate techniques cannot simply be extracted from Marbach's specific probe design and applied to Lisogurski's sensor. EX2043, ¶¶206-208. The structural dependency of multivariate techniques on the probe design means that one cannot be separated from the other. *Id.* Petitioners failed to meet their burden for Ground 9 for their reliance on Marbach for the “multivariate techniques” limitation.

K. Ground 10: Obviousness Based on Lisogurski, Tran, Carlson, and Marbach (Claims 1, 3, 11-13, 19, 20, 26)

In Ground 10, Petitioners argue that claims 1, 3, 11-13, 19, 20, and 26 are obvious over Lisogurski, Tran, Carlson, and Marbach. Pet., 74-77. Ground 10 is moot as to claims 1, 3, 11, 19, and 20 because these claims have been statutorily disclaimed. EX2038.

As to the remaining claims 12, 13, and 26, Ground 10 is similar to Ground 7 but further addresses claims 12, 13, and 26 using Marbach. Pet., 8, 74-77; EX2043, ¶212. Ground 10 is also similar to Ground 9 but further addresses claims 12, 13, and 26 using Carlson. Pet., 8. Because Ground 10 does not address the deficiencies in Lisogurski, Tran, and Carlson in Ground 7 or the deficiencies in Lisogurski, Tran, and Marbach discussed in Ground 9, Petitioners failed to meet their burden for Ground 10 for the same reasons as Grounds 7 and 9. *Supra*, §§VI.D., VI.H., VI.J;

EX2043, ¶¶210-213.

L. 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 '304 Patent addressed where others failed. EX2100, ¶¶6-33; EX2043, ¶¶216-51.

1. Copying by Others

Dr. Islam, the inventor of the '304 Patent, disclosed Patent Owner's patented SNR-improvement techniques directly to senior Samsung executives and engineers from March through November 2017. EX2100, ¶¶7-21.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

These techniques are claimed in the '304 Patent. EX2043, ¶¶228-30. Dr. Islam's presentations identified, among other things: ([REDACTED])

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] EX2100, ¶¶13, 16, 30; EX2043, ¶¶229-30; EX2106, OMS_SAM0031852, OMS_SAM0031857. Samsung subsequently implemented the same suite of SNR-improvement techniques in its wearable products. EX2043, ¶¶231-33; EX2116.

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 '304 Patent addresses 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, ¶¶235-53. 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, ¶¶238. 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, ¶¶239.

The industry's responses to these problems were inadequate. EX2043, ¶¶240-51. 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, ¶241. Second, measurements were confined to controlled clinical environments. EX2110, 16:1-23; EX2100, ¶25; EX2043, ¶242. 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, ¶243.

The ‘304 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, ¶¶246, 294-51. 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 light source configured to increase signal-to-noise ratio by increasing a light intensity relative to an initial light intensity from at least one of the plurality of semiconductor sources” (claims 1, 3, 11, 19);
- “the light source is configured to further increase the signal-to-noise ratio by increasing a pulse rate of at least one of the plurality of semiconductor sources from an initial non-zero pulse rate”; “wherein the light source is configured to further improve the signal-to-noise ratio of the input optical beam reflected from the tissue by increasing a pulse rate of at least one of the plurality of semiconductor sources from an initial non-zero pulse rate” (claims 13, 20);
- “capture light while the semiconductor sources are off and convert the captured light into a first signal, capture light while at least one of the

semiconductor sources is on and convert the captured light into a second signal, the captured light including at least a part of the at least a portion of the analysis output beam reflected or transmitted from the sample, and the measurement system further configured to improve the signal-to-noise ratio by differencing the first signal and the second signal” (claims 1, 11, 19);

- “the receiver comprises a plurality of detectors arranged along a first arc”; (claims 4, 15, 21);
- “a receiver configured to: ... synchronize to the light source”; (claims 1, 11, 19).

The industry-wide failure to solve these problems despite substantial resources demonstrates that the techniques claimed in the ‘304 Patent were not obvious. EX2043, ¶¶235-51; EX2100, ¶¶31-33; EX2106, OMS_SAM0031851 (study documenting that the Samsung Gear S2 exhibited high heart-rate errors).

VII. CONCLUSION

For the foregoing reasons, Petitioners failed to establish that any challenged claim of the ‘304 Patent 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 12,256 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.

By: /s/ Jennifer Hayes

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CERTIFICATE OF SERVICE

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

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