

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WHOOP, INC.,
Petitioner,

v.

OMNI MEDSCI, INC.,
Patent Owner.

Patent No. 9,651,533

Inter Partes Review No. IPR2025-01583

Petition for *Inter Partes* Review of U.S. Patent No. 9,651,533

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
II. MANDATORY NOTICES	3
A. Real Party-in-Interest	3
B. Related Matters.....	3
C. Lead and Backup Counsel.....	6
D. Service Information.....	8
III. PAYMENT OF FEES	8
IV. REQUIREMENTS OF <i>INTER PARTES</i> REVIEW	8
A. Standing.....	8
B. Identification of Challenge and Relief Requested	9
1. Lisogurski.....	9
2. Carlson	9
3. Walker.....	10
4. Tam	10
5. Grounds.....	10
C. How the Challenged Claims Are to Be Construed Under 37 C.F.R. § 42.104(b)(3).....	11
D. How the Challenged Claims Are Unpatentable Under 37 C.F.R. § 42.104(b)(4).....	12
E. Supporting Evidence Under 37 C.F.R. § 42.10(b)(5)	12
V. THRESHOLD REQUIREMENT FOR INTER PARTES REVIEW	13
VI. PATENT OVERVIEW.....	13
A. Person of Ordinary Skill in the Art	13
B. Background in the Relevant Art.....	14
1. Photoplethysmography	14
2. Market Trends for Wearable Sensors	16
C. Summary of the Alleged Invention of The '533 Patent.....	22

D.	Summary of the Prosecution History of The '533 Patent	24
VII.	GROUND OF UNPATENTABILITY.....	25
A.	Collateral Estoppel	25
B.	Ground 1: Lisogurski in View of Carlson Renders Obvious Claims 11, 12, and 18.....	27
1.	Overview of Ground 1	27
a)	Lisogurski	27
b)	Carlson	29
c)	Motivation to Combine.....	30
2.	Analysis of Ground 1	32
a)	Claim 11: “The system of claim 5, wherein the receiver further comprises one or more filters in front of one or more detectors to select a fraction of the one or more optical wavelengths.”	32
b)	Claim 12: The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.	41
c)	Claim 18: “The system of claim 13, wherein the receiver further comprises one or more filters in front of one or more detectors to select a fraction of the one or more optical wavelengths.”	43
C.	Ground 2: Lisogurski in view of Carlson and Walker Renders Obvious Claims 6 and 14.	45
1.	Overview of Ground 2	45
a)	Walker.....	45
b)	Motivation to Combine.....	47
2.	Analysis of Ground 2	48
a)	Claims 6 and 14	48
D.	Ground 3: Lisogurski in view of Carlson and Tam Renders Obvious Claims 6 and 14.	50
1.	Overview of Ground 3	50

a)	Tam	50
b)	Motivation to Combine.....	51
2.	Analysis of Ground 3	52
a)	Claims 6 and 14	52
VIII.	NO SECONDARY CONSIDERATIONS EXIST	57
IX.	CONCLUSION.....	58
	Claim Appendix	59

TABLE OF AUTHORITIES

	<u>Page(s)</u>
Cases	
<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00916, Paper No. 39 (P.T.A.B. Oct. 14, 2020)	4
<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2021-00453, Patent Owner’s Notice of Appeal (P.T.A.B. Apr. 11, 2025)	4
<i>Apple Inc. v. Omni MedSci, Inc.</i> , No. 23-1034, 2024 WL 3084509 (Fed. Cir. Jun. 21, 2024)	5
<i>Google LLC v. Hammond Dev. Int’l</i> , 54 F.4th 1377 (Fed. Cir. 2022)	26, 27
<i>Intel Corp. v. PACT XPP Schweiz AG</i> , 61 F.4th 1373 (Fed. Cir. 2023)	40, 49, 57
<i>Ohio Willow Wood Co. v. Alps S., LLC</i> , 735 F.3d 1333 (Fed. Cir. 2013)	26
<i>Omni MedSci, Inc. v. Apple Inc.</i> , No. 21-1229, 2022 WL 2062168 (Fed. Cir. Jun. 8, 2022)	4
<i>Omni MedSci, Inc. v. Apple Inc.</i> , No. 25-1646 (Fed. Cir.)	5
<i>Omni MedSci, Inc. v. Apple Inc.</i> , No. 4:19-cv-05924 (N.D. Cal.)	3
<i>Omni MedSci, Inc. v. Samsung Elecs., et al.</i> , No. 2:24-cv-01070 (E.D. Tex.)	4
<i>Omni MedSci, Inc. v. WHOOP, Inc.</i> , No. 1:25-cv-00140 (D. Del.)	3
<i>Papst Licensing GmbH & Co. KG v. Samsung Elecs. Am., Inc.</i> , 924 F.3d 1243 (Fed. Cir. 2019)	2, 26
<i>POSCO Co., Ltd. v. ArcelorMittal</i> , IPR2025-00370, Paper No. 10 (P.T.A.B. Jun. 25, 2025)	2
<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01250, Paper No. 1	4
<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01251, Paper No. 1 (P.T.A.B. Aug. 5, 2025)	5

<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01252, Paper No. 1 (P.T.A.B. Aug. 5, 2025).....	6
<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01253, Paper No. 1 (P.T.A.B. Aug. 5, 2025).....	6
<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , PGR2025-00063, Paper No. 1 (P.T.A.B. Aug. 5, 2025)	6
<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , PGR2025-00064, Paper No. 1 (P.T.A.B. Aug. 5, 2025)	6
<i>Samsung Elecs. Co., Ltd. v. Netlist, Inc.</i> , IPR2025-00002, Paper 17 (P.T.A.B. May 15, 2025)	26
<i>Sinorgchem Co., Shandong v. Int’l Trade Comm’n</i> , 511 F.3d 1132 (Fed. Cir. 2007)	12
<i>Soverain Software LLC v. Victoria's Secret Direct Brand Mgmt.</i> , LLC, 778 F.3d 1311 (Fed. Cir. 2015).....	26
<i>United Therapeutics Corp. v. Liquidia Techs., Inc.</i> , 74 F.4th 1360 (Fed. Cir. 2023)	27

Statutes

35 U.S.C. § 102(a)	9, 10
35 U.S.C. § 102(b)	9, 10
35 U.S.C. § 102(e)	9, 10
35 U.S.C. § 103	1, 9, 10
35 U.S.C. § 314(a)	13
35 U.S.C. § 315(e)(1).....	8

Regulations

37 C.F.R. 42.73(d)(3).....	2
37 C.F.R. § 42.8(b)	6
37 C.F.R. § 42.10(a).....	6
37 C.F.R. § 42.10(b)	7, 12
37 C.F.R. § 42.10(c).....	6, 7
37 C.F.R. § 42.15(a).....	8
37 C.F.R. § 42.63(e).....	13

37 C.F.R. § 42.103	8
37 C.F.R. § 42.104(a).....	8
37 C.F.R. § 42.104(b)	9, 11, 12

EXHIBIT LIST

Exhibit #	Reference Name
1001	U.S. Patent No. 9,651,533
1002	File History, U.S. Patent No. 9,651,533
1003	Declaration of Patrick Mercier, PhD
1004	RESERVED
1005	U.S. Patent No. 10,517,484
1006	Docket Sheet, <i>Omni MedSci, Inc. v. WHOOP, Inc.</i> , No. 1:25-cv-00140 (D. Del.)
1007	Docket Sheet, <i>Omni MedSci, Inc. v. Samsung Elecs.</i> , et al., No. 2:24-cv-01070 (E.D. Tex.)
1008	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00916, Paper No. 39 (P.T.A.B. Oct. 14, 2020) (Final Written Decision, '533 IPR)
1009	<i>Omni MedSci, Inc. v. Apple Inc.</i> , No. 21-1229, 2022 WL 2062168 (Fed. Cir. Jun. 8, 2022) (summary affirmance, '533 IPR)
1010	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2021-00453, Patent Owner's Notice of Appeal (P.T.A.B. Apr. 11, 2025)
1011	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2021-00453, Paper No. 22 (P.T.A.B. Aug. 3, 2022) (First Final Written Decision, '484 IPR)
1012	<i>Apple Inc. v. Omni MedSci, Inc.</i> , No. 23-1034, 2024 WL 3084509 (Fed. Cir. Jun. 21, 2024) (First Federal Circuit Decision, '484 IPR)
1013	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2021-00453, Paper No. 26 (P.T.A.B. Feb. 14, 2025) (Second Final Written Decision, '484 IPR)
1014	Docket Sheet, <i>Omni MedSci, Inc. v. Apple Inc.</i> , No. 25-1646 (Fed. Cir.) (Docket Sheet, Second Federal Circuit Appeal, '484 IPR)

Exhibit #	Reference Name
1015	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00916, Paper No. 1 (P.T.A.B. Apr. 10, 2019) (Petition, '533 IPR)
1016	RESERVED
1017	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00916, Paper No. 16, (P.T.A.B. Oct. 18, 2019) (Institution Decision, '533 IPR)
1018	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00916, Paper No. 23 (P.T.A.B. Jan. 31, 2020) (Patent Owner Response)
1019	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2019-00916, Paper No. 27 (P.T.A.B. Apr. 30, 2020) (Petitioner Reply, '533 IPR)
1020	RESERVED
1021	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2021-00453, Paper No. 1, (P.T.A.B. Jan. 22, 2021) (Petition, '484 IPR)
1022	RESERVED
1023	<i>Apple Inc. v. Omni MedSci, Inc.</i> , IPR2021-00453, Paper No. 7 (P.T.A.B. Aug. 6, 2021) (Institution Decision, '484 IPR)
1024	RESERVED
1025	RESERVED
1026	RESERVED
1027	U.S. Patent No. 9,241,676 (Lisogurski)
1028	U.S. Patent App. Pub. No. 2005/0049468 ("Carlson")
1029	RESERVED
1030	RESERVED
1031	RESERVED

Exhibit #	Reference Name
1032	U.S. Patent Appl. Pub. No. 2012/0197093 (“Valencell-093”)
1033	“The Biomedical Engineering Handbook,” by Joseph D. Bronzino (1995)
1034	Patel, et al., A review of wearable sensors and systems with application rehabilitation, <i>Journal of Neuroengineering & Rehabilitation</i> (2012)
1035	A. Omre, Bluetooth Low Energy: Wireless Connectivity for Medical Monitoring, <i>Journal of Diabetes Science & Technology</i> (Mar. 2010)
1036	P. Baum, et al., Strategic Intelligence Monitor on Personal Health Systems, Phase 2: Market Developments - Remote Patient Monitoring and Treatment, Telecare, Fitness/Wellness and mHealth, <i>JRC Scientific and Policy Reports of European Commission</i> (2013)
1037	M. Kranz, et al., The mobile fitness coach: Towards individualized skill assessment using personalized mobile devices, <i>Pervasive and Mobile Computing</i> (June 2012)
1038	M. Swan, Senior Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0, <i>Journal of Sensor and Actuator Networks</i> (2012)
1039	RESERVED
1040	“The Usage of Tablets in the HealthCare Industry,” by Rauf Adil, available through the Internet Archive at https://web.archive.org/web/20121014002306/https://www.healthcareitnews.com/blog/usage-tablets-healthcare-industry (last accessed Sept. 4, 2025)
1041	RESERVED
1042	Curriculum Vitae of Patrick Mercier, PhD
1043	Docket Sheet, <i>Omni MedSci, Inc. v. Apple Inc.</i> , No. 4:19-cv-05924 (N.D. Cal.)

Exhibit #	Reference Name
1044	U.S. Patent No. 6,144,867 (“Walker”)
1045	Webster, J. G. (1997) <i>Design of Pulse Oximeters</i> , IOP Publishing.
1046	U.S. Patent No. 7,029,628 (“Tam”)
1047	U.S. Pat. Pub. No. 2013/0327966 (“Fidler”)
1048	U.S. Patent Pub. No. 2011/0267688 (“Kleppe”)
1049	U.S. Patent Pub. No. 2005/0133691 (“Doppke”)
1050	<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01250, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (533 IPR Petition)
1051	<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01251, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (304 IPR Petition)
1052	<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01252, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (455 IPR Petition)
1053	<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01253, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (790 IPR Petition)
1054	<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , PGR2025-00064, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (790 PGR Petition)
1055	<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , IPR2025-01254, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (475 IPR Petition)
1056	<i>Samsung Elecs. Co. et al. v. Omni MedSci, Inc.</i> , PGR2025-00063, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (475 PGR Petition)
1057	U.S. Patent No. 10,874,304
1058	U.S. Patent No. 11,160,455
1059	U.S. Patent No. 12,193,790

Exhibit #	Reference Name
1060	U.S. Patent No. 12,268,475
1061	RESERVED

I. INTRODUCTION

WHOOP, Inc. (“Petitioner” or “WHOOP”) hereby petitions for *inter partes* review of U.S. Patent No. 9,651,533 and seek cancellation of claims 6, 11-12, 14, and 18 (“the Challenged Claims”) because they are unpatentable under 35 U.S.C. § 103.

The ’533 patent is assigned to Omni MedSci, Inc. (“Omni” or “Patent Owner”) and is purportedly directed to a wearable optical sensor that measures physiological parameters using reflected light and can be used to monitor health and fitness data remotely with a smartphone or tablet. But the Challenged Claims depend on and overlap with claims the Board has already found unpatentable in a previous IPR of the ’533 patent and further overlap with claims the Board found unpatentable in a previous IPR of a related patent, U.S. Patent No. 10,517,484 (the “’484 patent”) (EX1005). The findings of the Board for the ’533 patent have been affirmed by the Federal Circuit, as have the majority of the findings for the ’484 patent. For example, claim 12 (challenged here) consists of nearly identical limitations to those already found unpatentable by the Board based on the same prior art references asserted below.

Notably, in the prior IPRs, Omni did not dispute that the prior art discloses nearly all of the claims’ limitations, nor did Omni appeal the Board’s finding that there was motivation to combine the asserted prior art references (which, again,

significantly overlap with the prior art references in this Petition). Thus, based on Omni's positions in the previous IPRs and the significant overlap of the Challenged Claims with the claims at issue in those IPRs, Omni has all but conceded that the Challenged Claims are unpatentable and is collaterally estopped from challenging these findings, particularly with respect to claim 12.

Yet despite the unfavorable rulings Omni received in the related IPRs (including two adverse Federal Circuit decisions) and despite being "precluded from taking action inconsistent with [an] adverse judgment," 37 C.F.R. § 42.73(d)(3), Omni continues to assert the '533 Patent in district court litigation. The Board must prevent Omni from enforcing (and obtaining) claims that are "not patentably distinct" from the unpatentable claims of the '533 and '484 patents. *Id.*; *see also Papst Licensing GmbH & Co. KG v. Samsung Elecs. Am., Inc.*, 924 F.3d 1243, 1252–53 (Fed. Cir. 2019) (holding that issue preclusion prevents a patentee from raising arguments previously rejected for related patents).

Instituting this Petition would be an efficient use of the Board's limited resources, given the significant overlap between the Challenged Claims and the nearly-identical ones the Board has already found unpatentable. *See POSCO Co., Ltd. v. ArcelorMittal*, IPR2025-00370, Paper No. 10 (P.T.A.B. Jun. 25, 2025) (denying discretionary denial based on a previous, successful IPR "invalidating all the claims of...a parent to the challenged patent"); *Papst*, 924 F.3d at 1252 ("given

the heavy burdens [Patent Owner] placed on its adversaries, the Board, and th[e] court by waiting so long to abandon defense of the [previous] patent claims,” the patentee was “without a meaningful basis to argue for systemic efficiencies as a possible reason for an exception to issue preclusion”).

Petitioner therefore respectfully requests the Board institute IPR proceedings and cancel the Challenged Claims.

II. MANDATORY NOTICES

A. Real Party-in-Interest

The real party-in-interest is WHOOP, Inc. No unnamed entity is funding, controlling, or directing this Petition, or otherwise has had an opportunity to control or direct this Petition or Petitioner’s participation in any resulting IPR.

B. Related Matters

The ’533 patent that is the subject of this IPR Petition is also the subject of multiple patent litigation suits brought by Patent Owner Omni MedSci, Inc., including against Petitioner:

- *Omni MedSci, Inc. v. Apple Inc.*, No. 4:19-cv-05924 (N.D. Cal.) (EX1043) (the “Apple action”);
- *Omni MedSci, Inc. v. WHOOP, Inc.*, No. 1:25-cv-00140 (D. Del.) (EX1006) (the “Delaware action”); and

- *Omni MedSci, Inc. v. Samsung Elecs., et al.*, No. 2:24-cv-01070 (E.D. Tex.) (EX1007) (the “Texas action”).

The ’533 patent has already been subject to an IPR filed by Apple, where the Board held all challenged claims (claims 5, 7-10, 13, and 15-17) were unpatentable as obvious. *Apple Inc. v. Omni MedSci, Inc.*, IPR2019-00916, Paper No. 39 (P.T.A.B. Oct. 14, 2020) (EX1008). The Board’s decision has also been affirmed by the Federal Circuit. *Omni MedSci, Inc. v. Apple Inc.*, No. 21-1229, 2022 WL 2062168 (Fed. Cir. Jun. 8, 2022) (EX1009).

Additionally, the defendants in the Texas action have recently submitted a Petition for IPR of the ’533 patent challenging claims 6, 11-12, 14, and 18 (the same set of claims as the Challenged Claims here). *Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01250, Paper No. 1 (P.T.A.B. Aug. 5, 20215) (EX1050).

The ’484 patent, the child patent of the ’533 patent, is the subject of an ongoing IPR proceeding before the Board, where all claims have been challenged as obvious. *See Apple Inc. v. Omni MedSci, Inc.*, IPR2021-00453, Patent Owner’s Notice of Appeal (P.T.A.B. Apr. 11, 2025) (EX1010) (the “’484 IPR”). The Board initially held that claims 1, 2, 7, and 15-23 were unpatentable as obvious, but that the Petitioner had not shown claims 3-6 and 8-14 to be unpatentable. *Id.*, Paper No. 22 (P.T.A.B. Aug. 3, 2022) (EX1011). The Petitioner appealed as to claims 3-6 and

8-14,¹ and the Federal Circuit reversed and remanded for the Board to consider whether those claims were unpatentable as obvious under an alternative argument. *Apple Inc. v. Omni MedSci, Inc.*, No. 23-1034, 2024 WL 3084509 (Fed. Cir. Jun. 21, 2024) (EX1012). On remand, the Board held that claims 3-6 and 8-14 were unpatentable as obvious. IPR2021-00453, Paper No. 26 (P.T.A.B. Feb. 14, 2025) (EX1013). Thus, all claims of the '484 patent have been held unpatentable by the Board. Omni appealed the Board's remand decision as to claims 3-6 and 8-14, and the appeal remains pending. *Omni MedSci, Inc. v. Apple Inc.*, No. 25-1646 (Fed. Cir.) (EX1014).

Finally, the defendants in the pending Texas action have recently filed several IPR and PGR challenges against this patent family (specifically, child patents of the '533 patent), which are listed below:

- *Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01251, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (EX1051) – challenging certain claims of U.S. Patent No. 10,874,304 (the “'304 patent”) (EX1057)

¹ Omni did not cross-appeal the claims held to be unpatentable (1, 2, 7, and 15-23), and thus, the invalidity finding from the Board on those claims is final. EX1012, n.2.

- *Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01252, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (EX1052) – challenging certain claims of U.S. Patent No. 11,160,455 (the “’455 patent”) (EX1058)
- *Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01253, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (EX1053) – challenging certain claims of U.S. Patent No. 12,193,790 (the “’790 patent”) (EX1059)
- *Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, PGR2025-00064, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (EX1054) – challenging certain claims of the ’790 patent
- *Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, IPR2025-01254, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (EX1055) – challenging certain claims of U.S. Patent No. 12,268,475 (the “’475 patent”) (EX1060)
- *Samsung Elecs. Co. et al. v. Omni MedSci, Inc.*, PGR2025-00063, Paper No. 1 (P.T.A.B. Aug. 5, 2025) (EX1056) – challenging certain claims of the ’475 patent

C. Lead and Backup Counsel

Pursuant to 37 C.F.R. §§ 42.8(b)(3), 42.8(b)(4), and 42.10(a), (c), Petitioners provide the following designation of counsel:

Lead Counsel	Back-up Counsel
Jaysen S. Chung Reg. Number: 68,199 Gibson, Dunn & Crutcher LLP One Embarcadero Center, Suite 2600 San Francisco, CA 94111-3715 Tel: 415-393-8271 JSChung@gibsondunn.com	<u>First Back-Up Counsel</u> Brian Rosenthal (Notice of Intent to Designate Provisionally Recognized PTAB Attorney forthcoming) Gibson, Dunn & Crutcher LLP 200 Park Avenue New York, NY 10166-0193 Tel: 212-351-2339 BRosenthal@gibsondunn.com <u>Additional Backup Counsel</u> Y. Audrey Yang Reg. Number: 74,393 Gibson, Dunn & Crutcher LLP 2001 Ross Ave., Suite 2100 Dallas, TX 75201 Tel: 214-698-3215 AYang@gibsondunn.com

Petitioner respectfully provides notice that it will file a Notice of Intent to Designate a Provisionally Recognized PTAB Attorney as Back-up Counsel under 37 C.F.R. § 42.10(c)(2) for Brian Rosenthal. Petitioner will file the Notice 21 days after service of this petition. Pursuant to 37 C.F.R. § 42.10(b), powers of attorney accompany this Petition.

D. Service Information

Service via hand delivery or postal mail may be made at the addresses of the lead and back-up counsel above. Petitioner hereby consents to electronic service, and service at GDC-Omni-Whoop@gibsondunn.com.

III. PAYMENT OF FEES

Pursuant to 37 C.F.R. §§ 42.103 and 42.15(a), the required fee is being submitted herewith. The Office is authorized to charge any fee deficiency, or credit overpayment, to deposit account no. 50-1408. Any additional fees due in connection with this Petition may be charged to the foregoing account.

IV. REQUIREMENTS OF *INTER PARTES* REVIEW

A. Standing

Pursuant to 37 C.F.R. § 42.104(a), Petitioner certifies that the '533 patent is available for IPR and that Petitioner is not barred from requesting an IPR on the grounds identified in this Petition. Specifically, Petitioner certifies that: Petitioner has not filed a civil action challenging the validity of the '533 patent; this petition is filed not more than one year from February 7, 2025, the date on which the Petitioner was served with the complaint alleging infringement of the '533 patent; the estoppel provisions of 35 U.S.C. § 315(e)(1) do not prohibit this IPR; and this petition is filed after the later of (a) the date that is nine months after the date of the grant of the '533 patent or (b) the termination of any post-grant review of the '533 patent.

B. Identification of Challenge and Relief Requested

Pursuant to 37 C.F.R. § 42.104(b), Petitioner requests the Board institute IPR of claims 6, 11-12, 14, and 18 of the '533 patent under pre-AIA² 35 U.S.C. § 103 on the prior art references and grounds described below:

1. Lisogurski

U.S. Patent No. 9,241,676 ("Lisogurski") (EX1027) qualifies as prior art under 35 U.S.C. § 102(a), (b), and/or (e). Lisogurski was filed on May 31, 2012, and published on December 5, 2013. In the previous IPR proceedings for the '533 Patent (filed by Apple), the Board found that Lisogurski is prior art to this patent based on the filing date of Lisogurski, and the Federal Circuit affirmed in full that finding and the unpatentability of certain claims of this patent in view of combinations that included Lisogurski. *See* EX1008 at 2, 3 n.3, *aff'd*, EX1009.

2. Carlson

U.S. Patent App. Pub. No. 2005/0049468 ("Carlson") (EX1028) qualifies as prior art under 35 U.S.C. § 102(a), (b), and/or (e). Carlson was filed on September 3, 2003, and published on March 3, 2005. In the previous IPR proceedings for the

² Consistent with the Apple IPR for the '533 patent, Petitioner assumes that pre-AIA law applies, but does not concede that the '533 patent is entitled to a December 31, 2012 priority date.

'533 Patent (filed by Apple), the Board found certain claims of this patent unpatentable in view of combinations that included Carlson, and the Federal Circuit affirmed. EX1008,2-3, *aff'd*, EX1009.

3. Walker

U.S. Patent No. 6,144,867 ("Walker") (EX1044) qualifies as prior art under 35 U.S.C. §§ 102 (a), (b), and/or (e). Walker was filed on September 3, 1999, and issued on November 7, 2000. It therefore pre-dates references Patent Owner has admitted (and the Board and Federal Circuit have found) are prior art to this patent.

4. Tam

U.S. Patent No. 7,029,628 ("Tam") (EX1046) qualifies as prior art under 35 U.S.C. §§ 102 (a), (b), and/or (e). Tam was filed on December 28, 2000, and issued on April 18, 2006. It therefore pre-dates references Patent Owner has admitted (and the Board and Federal Circuit have found) are prior art to this patent.

5. Grounds

In this IPR, Petitioner applies the above references and assert the following grounds of rejection under 35 U.S.C. § 103:

Ground	Claims	Basis for Rejection
1	11, 12, 18	Obvious over Lisogurski in view of Carlson
2	6, 14	Obvious over Lisogurski in view of Carlson and Walker
3	6, 14	Obvious over Lisogurski in view of Carlson and Tam

C. How the Challenged Claims Are to Be Construed Under 37 C.F.R. § 42.104(b)(3)

In the previous IPR of the '533 patent, Apple proposed constructions for certain terms, which Omni largely did not dispute and which the Board largely adopted.³ EX1008, 9-12. The only construction that is relevant to the Challenged Claims in this Petition is “beam.” The Board did not construe this term in the Apple IPR, finding it unnecessary to resolve the issues, and the parties did not dispute that determination. EX1008, 9-10; EX1017, 9; EX1018, 8-13; EX1019, 2-9. To the extent the Board finds it necessary to reach the construction of beam to resolve the issues below, “beam” should be construed to “refer to photons or light transmitted to a particular location in space.”

³ If Patent Owner contends that special constructions should be used that are different from those adopted by the Board in the previous IPR, Petitioner may request leave to file a reply to such assertions.

The claim term “*beam*” is expressly defined in the specification to “refer to photons or light transmitted to a particular location in space.” EX1001, 9:28-30. This definition should be adopted verbatim as the patentee’s chosen lexicography. *Sinorgchem Co., Shandong v. Int’l Trade Comm’n*, 511 F.3d 1132, 1136 (Fed. Cir. 2007) (patentee who acts as his own lexicographer is bound by his definition). The definition is also consistent with other intrinsic evidence that a “beam” is distinguishable from “stray light from a reflection or scattering,” suggesting that a beam is a ray of light directed to a particular location instead of scattered in all directions. EX1001, 7:53-56 (distinguishing a beam from “stray light from a reflection or scattering”); *see also id.*, 20:63-65 (directing an array of beams), (3:34-41) (delivering a beam to a sample).

Therefore “*beam*” should be construed to mean photons or light transmitted to a particular location in space.

D. How the Challenged Claims Are Unpatentable Under 37 C.F.R. § 42.104(b)(4)

The following sections explain how the Challenged Claims are unpatentable under the statutory grounds identified above, including where each element of the claim is found in the prior art patents or printed publications.

E. Supporting Evidence Under 37 C.F.R. § 42.10(b)(5)

The exhibit numbers of the supporting evidence relied upon and the relevance of the evidence to the Challenged Claims, including an identification of specific

portions of the evidence that support the challenge, are provided below. The technical information and grounds for unpatentability are further supported by the declaration of Dr. Patrick Mercier (EX1003). A List of Exhibits is included in this paper pursuant to 37 C.F.R. § 42.63(e).

V. THRESHOLD REQUIREMENT FOR INTER PARTES REVIEW

Under 35 U.S.C. § 314(a), institution of inter partes review requires “a reasonable likelihood that the petitioner would prevail with respect to at least one of the claims challenged in the petition.” This petition meets this threshold for each ground of unpatentability.

VI. PATENT OVERVIEW

A. Person of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) at the time of the alleged invention (December 2012) would have had good working knowledge of optical sensing techniques and their applications, and familiarity with optical system design and signal processing techniques. EX1003 ¶ 25. The POSITA would have an undergraduate degree in engineering (electrical, mechanical, biomedical, or optical) or a related field of study, along with relevant experience studying or developing physiological monitoring devices (e.g., non-invasive optical biosensors) in industry or academia. *Id.* Lack of professional experience can be remedied by additional education, and vice versa. *Id.*

The Board adopted this definition in the previous IPR of the '533 patent and in the IPR of the related '484 patent. EX1017, 8-9; EX1023, 7-8.

B. Background in the Relevant Art

All concepts in this section were well known and widely used by POSITAs at least as of December 31, 2012. EX1003 ¶ 45. Given that the '533 patent has already been challenged in an IPR, as has the related '484 patent, the background provided below is adopted from the technical background section in Apple's '484 and '533 IPR petitions, so it has already been considered and accepted by the Board. *See* EX1015, 4-12; EX1021, 8-14.

1. Photoplethysmography

Optical health monitors use a sensing technique called photoplethysmography ("PPG") that has been known and used for decades in medical monitoring systems. EX1003, ¶ 47; EX1033, 769-76, 1346-55. PPG works by shining light through a person's tissue and measuring the light that is either reflected back or transmitted through the tissue. EX1033, 769. Different components of blood and tissue absorb and reflect different wavelengths of light. EX1003, ¶ 47. By measuring how much light is absorbed and its changes over time, a device can calculate the components of the blood and tissue. EX1003, ¶ 47.

For example, hemoglobin (the substance in blood that carries oxygen to cells) reflects more red light when it is oxygenated and absorbs more red light when it is

deoxygenated. EX1033, 769; EX1003, ¶ 47. Hemoglobin, however, reflects the same amount of infrared (IR) light whether oxygenated or deoxygenated. EX1033, 769; EX1003, ¶ 47. If a device measures the absorbed red and IR light multiple times per second, the device can determine: (i) the ratio of oxygenated to deoxygenated hemoglobin (oxygen saturation), and (ii) how the volume of blood in the tissue changes over time, allowing detection of a person's pulse. EX1033, 769, 771; EX1003, ¶ 47.

PPG is an optical technique that uses conventional optical components. EX1003, ¶¶ 46-47. The 1995 Biomedical Engineering (BE) Handbook explains that the “basic building blocks” of optical sensor systems include lenses, mirrors, filters, beam splitters, light sources, fiber optics, and detectors. EX1033, 764-66. As illustrated in the figure below, light is directed through a lens and onto a sample. EX1033, 765. The light reflects back from the sample, is filtered, and sensed by a photodetector. *Id.* 764-66; EX1003, ¶¶ 46. The photodetector outputs a signal proportionate to the measured light intensity, and then analog-to-digital conversion and signal processing are performed to extract data. EX1033, 766. To improve the signal-to-noise ratio, the light source is typically modulated, and the detector uses “synchronized lock-in amplifier detection” to isolate signals that occur at the modulation frequency. EX1033, 764, 766. This allows the detector to reduce the noise in the detected signal. EX1003, ¶¶ 49-50.

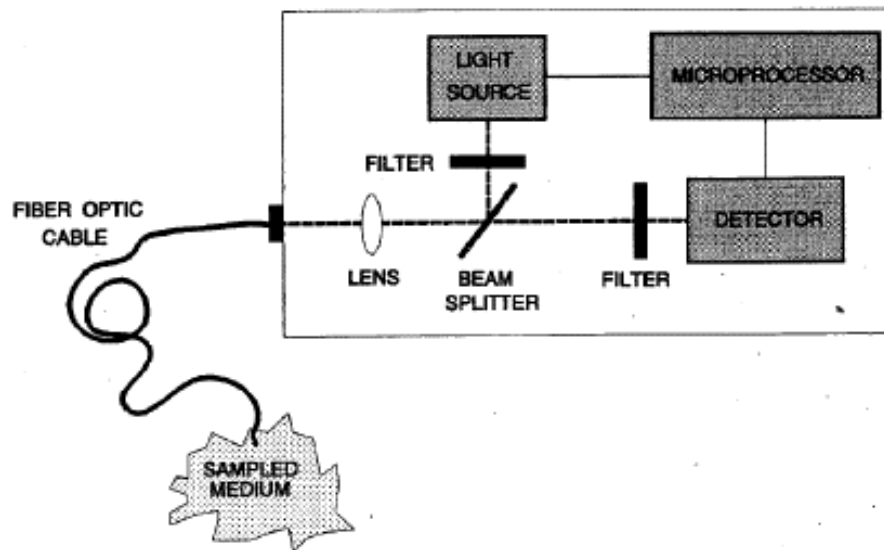


FIGURE 52.1 General diagram representing the basic building blocks of an optical instrument for optical sensor applications.

Portable devices conventionally use light emitting diodes (LEDs) as the light source because LEDs are small and have low power requirements. EX1033, 765; EX1003, ¶ 48.

2. Market Trends for Wearable Sensors

From 2000 to 2012, several market trends and needs drove the medical device industry to develop wearable, mobile sensor devices that could wirelessly communicate user data to remote devices. EX1003, ¶¶ 52-55.

One trend responded to the challenge of providing medical care for patients in their homes or in locations where there was not easy access to a physician. This drove development of wireless monitoring technologies that could be worn by the patient and used to transmit data to a remote physician or care provider. EX1034, 2; EX1035, 462; EX1036, 15-31; *see* EX1003, ¶¶ 55-56.

Another trend was to bring heart rate sensing devices based on pulsoximetry to the consumer market for personal fitness tracking and other uses. EX1003, ¶¶ 52-54, 58. As a June 2012 review observed:

A multitude of commercial health devices and sensors, such as oximeters and heart rate monitors, formerly reserved for professional use, are now available and can be connected to smartphones. GPS watches, pedometers and heart rate monitors...

EX1037, 3; *see also* EX1028, [0004] (“Pulsoximetry measuring devices are also used in sports for control and survey of athletes.”); EX1038, 221 (“Wristband sensors are a predecessor to smartwatches and remain a successful product category on their own...”); EX1032, [0003] (“There is growing market demand for personal health... monitors, for example, for gauging overall health, fitness, metabolism, and vital status during exercise, athletic training...”).

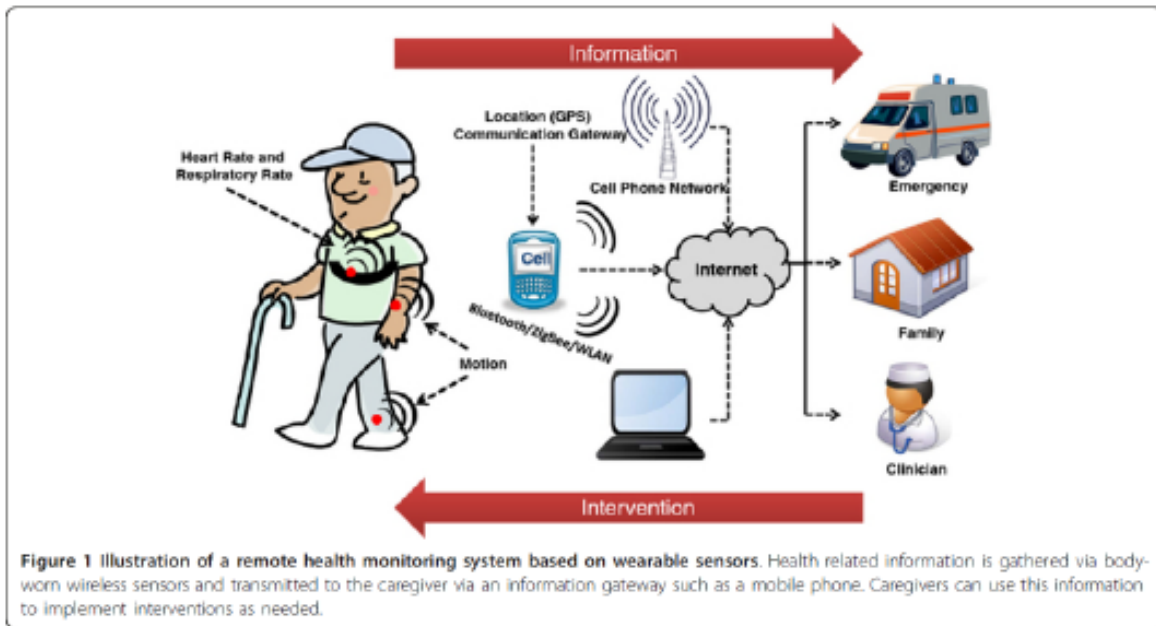
A third trend sought to take advantage of the miniaturization of electronics and communication technology, which led to the development of smaller, wearable monitoring systems for mobile health and fitness applications. EX1034, 3; EX1037, 1-2 *see* EX1003, ¶¶ 54, 58-59.

A fourth trend in the medical industry was to use apps and smartphones to not only deliver care to patients but to give individuals access to health data for fitness or health issues. This drove integration of miniaturized, network-connected monitoring devices with smartphones and similar devices. EX1036, 9-10, 40-49;

EX1040, 1-2 (“Doctors and nurses were the early adopters of tablets”); *see id.*, 5 (describing [p]atient monitoring and data collection..., includ[ing] using the Bluetooth enabled sensor devices and Wi-Fi+ Bluetooth enabled interfaces to patient monitoring devices, to medical instruments that can transmit information to the tablet when in the vicinity.”); *see* EX1003, ¶ 56. It also led to the prevalent use of cloud-based data transfer and storage of data. EX1003, ¶¶ 52, 56, 60.

These market trends provided a strong motivation to skilled persons to integrate medical optical sensing techniques into miniaturized wearable consumer devices that communicate wirelessly with smart devices and remote services. EX1003, ¶ 62. They also led to a proliferation of products using a distributed architecture supporting personal health, sports, and mobile monitoring systems. EX1003, ¶¶ 52, 56-62.

One example of this architecture was described in Patel 2012 (EX1034):



EX1034, 2. As this figure illustrates, data from wearable sensors is transmitted to a cell phone, which in turn transmits the data, along with GPS information, to remote devices used by a clinician or maintained by an emergency responder. The data are also shown being transmitted to and stored in the cloud. EX1034, 2, 4.

A 2010 publication described a similar architecture in which “medical data can be sent from a wireless monitor to a cell phone or PC and from there to a remote physician.” EX1035, 459. As depicted, it comprised three network- interconnected components: (i) the “sensor” device on the person that collected physiological data, (ii) a host device such as a smartphone, tablet, or computer that wirelessly captured and transmitted the physiological data, and (iii) a remote web service accessible over the Internet. EX1035, 459-61; EX1003, ¶ 59.

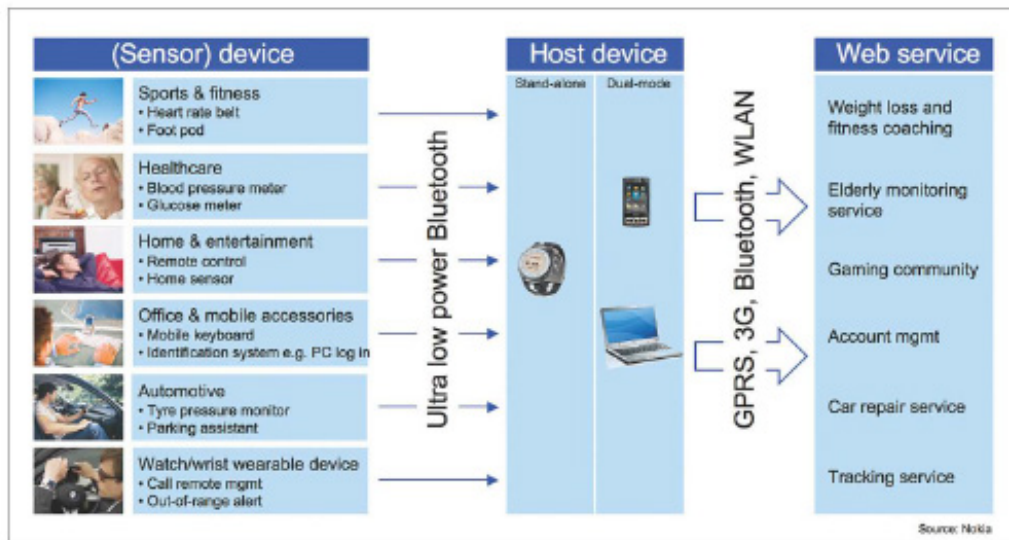


Figure 2. Bluetooth low energy will extend interoperable wireless connectivity to coin-cell-powered wireless sensors in health care, fitness, and related sectors. WLAN, wireless local area network; GPRS, general packet radio service.

Other articles from around 2012 similarly envisioned use of “cloud” based services to support this interconnected scheme. EX1003, ¶¶60-61. A 2012 article illustrated a cloud-based architecture implemented as a fitness app as follows:

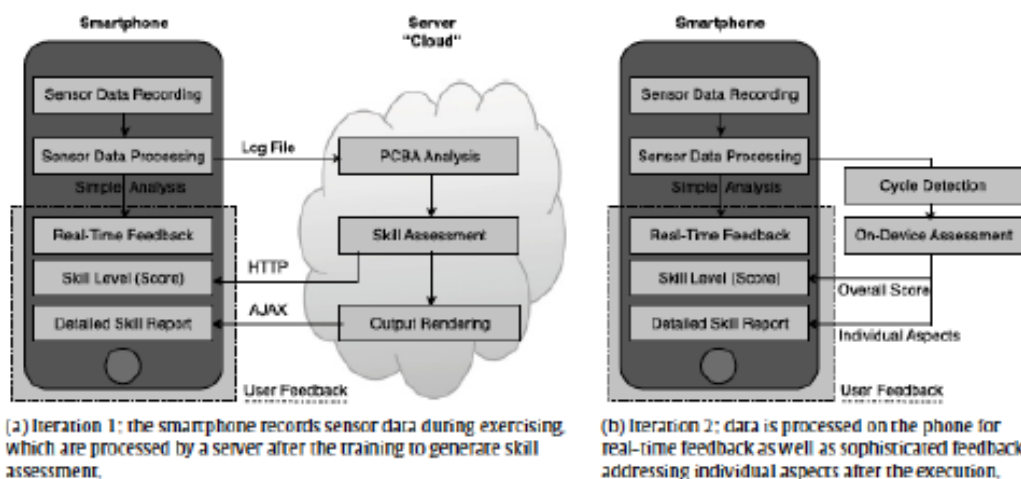


Fig. 3. Iterations of the GymSkill application.

EX1037, 6-7, 12. In this example, a smartphone records and processes sensor data, then sends the data to a cloud server for further processing, and then the cloud server returns processed data back to the smartphone for display to the user. EX1037, 6, 7,

12. This same article specifically recognized this type of system could be used with heart rate monitors and optical sensors. EX1037, 12 (“Coupling with devices like heart rate monitors using e.g. ANT+ further would increase the sensed database and allow for further, more detailed physical and physiological assessments.”).

The wireless, Internet-connected architecture for collecting, processing and returning processed health data reflected in these papers mirrors the analogous wired-device architecture that had been used for decades. EX1003, ¶¶ 51-56. For example, the 1995 BE Handbook depicted a remote monitoring system based on wired technology, showing an analogous architecture where data is collected by a wired wearable sensor, transmitted from a home monitor and a landline phone to a remote computer, and used to create reports for physicians to share with a patient. EX1033, 1363.

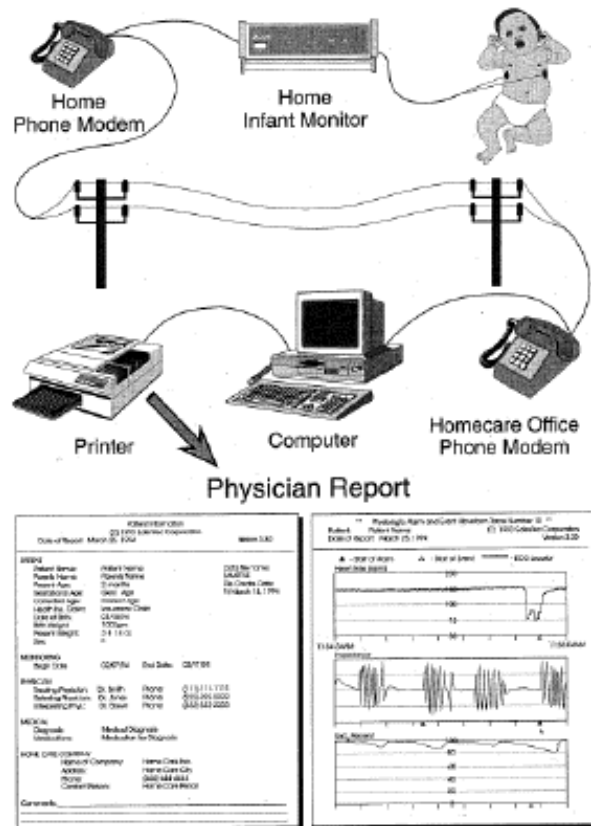


FIGURE 89.3 Infant opm monitor with memory allows data to be sent by modem to generate physician report (drawing courtesy of EdenTe Corporation).

EX1033, 1363.

C. Summary of the Alleged Invention of The '533 Patent

The '533 patent issued from U.S. Application No. 14/875,709, filed on October 6, 2015, and claims priority to U.S. provisional application No. 61/747,487 ('487 Provisional), filed on December 31, 2012, and the benefit of U.S. Application No. 14/108,986 ('986 Application), filed on December 17, 2013. The '533 Patent was prosecuted under the pre-AIA provisions. EX1002, 718. But because the contested claims are not entitled to benefit or priority to these earlier filed applications, their effective filing date is not earlier than October 6, 2015. Indeed,

Omni did not dispute, for the purposes of that proceeding, that the '533 Patent was subject to the AIA provisions in the previous IPR of the '533 Patent. EX1018, 7. Regardless, the prior art in this petition is prior art under the provisions of both the AIA and the pre-AIA requirements, and the analysis would not change whether the '533 patent is considered as an AIA or pre-AIA patent. Petitioner therefore assumes the pre-AIA provisions apply, consistent with the prosecution of the '533 patent, without conceding that the '533 patent is entitled to an earlier priority date.

The '533 patent purports to relate to a “wearable measurement device for measuring one or more physiological parameters,” where the device may “include[e] [(1)] a light source comprising a plurality of light emitting diodes (LEDs) configured to generate an output optical beam”; (2) a “plurality of lenses configured to receive the output optical beam and deliver an analysis output beam to a sample”; (3) a “receiver configured to process the analysis output beam reflected or transmitted from the sample and to generate [and transmit] an output signal”; and (4) “a remote device configured to process the received output status to generate processed data and to store the processed data.” EX1001, Abstract. The light source can include a plurality of light-emitting diodes (LEDs) and is further “configured to increase signal-to-noise ratio by increasing a light intensity and pulse rate of the LEDs.” EX1001, Abstract.

D. Summary of the Prosecution History of The '533 Patent

The claims that became 6 and 14 were amended during prosecution of the '533 Patent to get around an indefiniteness rejection, and, specifically, rewritten to add “wherein at least one of the light emitting diodes emits light with a bandwidth between 20 nanometers to 40 nanometers.” EX1002, 499-506. The Examiner then found that this limitation in the amended claims was taught by U.S. Pat. Pub. No. 2013/0327966 (Fidler)’s (EX1047), which discloses “conventional LEDs” with a “bandwidth of approximately 30 nm, falling between 20 nm to 40 nm.” EX1002, 723. The Applicant did not contest these findings, but instead amended the *independent* claims on which these claims depend to additionally recite the limitation requiring the receiver to be “configured to be synchronized to the light source.” EX1002, 761-62. The claims were subsequently allowed. EX1002, 777-85.

The claims that became claims 11, 12, and 18 were also amended, and the applicant argued these claims should be allowed for being dependent on independent claims that were amended to overcome prior art rejections. EX1002, 506. Similar to the claims that became claims 6 and 14, the Examiner found that the limitations recited in claims 11, 12, and 18 were in the prior art, but allowed them after subsequent amendments to the independent claims. EX1002, 722-25, 759-64, 777-85. Specifically, the Examiner found that the limitation (now in claims 11 and 18)

requiring “one or more filters in front of one or more detectors to select a fraction of the one or more optical wavelengths” (EX1002, 502, 504) was taught by U.S. Publication No. 2011/0267688 (Kleppe) (EX1048), which discloses “the use of a filter ... in front of a detector.” EX1002, 722-23. And the Examiner found that the limitation requiring “wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths” (EX1002, 502) was taught by U.S. Publication No. 2005/0133691 (Doppke) (EX1049). EX1002, 724-25. The applicant did not contest any of these findings either, but instead relied on the limitations to the independent claims for allowance. EX1002, 758-67, 777-85.

Finally, as mentioned, the '533 patent was previously subject to an IPR, wherein all challenged claims (5, 7-10, 13, 15-17), including the independent claims on which the Challenged Claims in this Petition depend, were found to be unpatentable. *Supra* §I.

VII. GROUNDS OF UNPATENTABILITY

A. Collateral Estoppel

As demonstrated below, Claim 12 is essentially identical to the claims found unpatentable by the Board in the prior '533 IPR based on the same prior art references (Lisogurski and Carlson). *Compare* EX1008, 25, 46 *with* EX1001, cl. 12. Moreover, the Board has already held twice that a POSITA would have been

motivated to combine Lisogurski and Carlson, and the Federal Circuit has affirmed those findings. EX1008, 22-25, *aff'd*, EX1009; *see also* EX1011, 22, 28, 36-43, *aff'd in relevant part*, EX1012, n.2. Based on these findings and the subsequent Federal Circuit decisions, Omni is collaterally estopped from challenging the unpatentability of claim 12 and motivation to combine Lisogurski and Carlson. *Papst*, 924 F.3d at 1251; *Samsung Elecs. Co., Ltd. v. Netlist, Inc.*, IPR2025-00002, Paper 17, 17-24 (P.T.A.B. May 15, 2025) (collateral estoppel based on FWDs). All four requirements for collateral estoppel to apply are present here.

First, claim 12 consists of limitations the Board found unpatentable in the prior IPRs, relying on the same art (Lisogurski and Carlson), and the Board further found that there was a motivation to combine those references. *Google LLC v. Hammond Dev. Int'l*, 54 F.4th 1377, 1381-82 (Fed. Cir. 2022) (“It is well established that patent claims need not be identical for collateral estoppel to apply.”); *Ohio Willow Wood Co. v. Alps S., LLC*, 735 F.3d 1333, 1342 (Fed. Cir. 2013) (collateral estoppel applied to a related patent where the “patents use[d] slightly different language to describe substantially the same invention”); *Soverain Software LLC v. Victoria's Secret Direct Brand Mgmt., LLC*, 778 F.3d 1311, 1319 (Fed. Cir. 2015) (“Complete identity of claims is not required to satisfy the identity-of-issues requirement for claim preclusion.”).

Second, these issues were “actually litigated” by Omni in the ’533 IPR (and similar issues were litigated in the related ’484 IPR). *Google*, 54 F.4th at 1381-82; EX1008, *aff’d* EX1009; EX1011, *aff’d in part rev’d in part*, EX1012 n.2; EX1013.

Third, these limitations were “essential” to the findings of unpatentability, and have become final, as they were affirmed by the Federal Circuit. *United Therapeutics Corp. v. Liquidia Techs., Inc.*, 74 F.4th 1360, 1372 (Fed. Cir. 2023); *Google*, 54 F.4th at 1381-82.

Fourth, Omni had a full and fair opportunity to litigate the patentability of these limitations. *Google*, 54 F.4th at 1381-82.

B. Ground 1: Lisogurski in View of Carlson Renders Obvious Claims 11, 12, and 18

1. Overview of Ground 1

a) Lisogurski

Lisogurski describes a portable “physiological monitoring system” that uses a wearable optical sensor to measure “physiological parameters of a patient,” including pulse rate and oxygen saturation (*e.g.*, a pulse oximetry system). EX1027, 3:44-46, 3:60-4:8; EX1003 ¶ 85. The system includes a sensor, monitor, and remote devices (*e.g.*, servers). EX1027, 11:28-32, 15:43-48. The sensor is a “light sensor” that can be worn in various locations (like a wrist, fingertip, or earlobe), is battery powered, and can wirelessly communicate with the monitor. EX1027, 3:62-4:-20, 17:55-58. The sensor can include multiple light emitting diodes (LEDs) of “one or

more wavelengths” (e.g., red and infrared (IR)) and photodetectors. EX1027, 4:42-48, 10:48-64, 11:9-13, 17:37-45.

The system regulates a light drive signal, referring to the electric current applied to the LEDs. EX1027, 1:60-61, 8:4-8, 11:38-41, 11:50-54, 12:3-9; EX1003 ¶ 89. As a higher current is applied to a particular LED, its emitted light intensity increases. EX1027, 7:13-31, 7:24-31, 12:3-22; EX1003 ¶ 89. Lisogurski further teaches that the LEDs can be modulated, EX1027, 4:48-54, 8:4-8, 8:27-35, 16:25-32, and that, depending on various conditions, the system can change the modulation parameters and the light drive cycle. EX1027, 1:10-25, 1:67-2:3; *see also id.*, 1:60-61, 8:4-8, 8:27-35, 16:24-32. The drive cycle parameters that can be controlled include “light intensity, duty cycle, [and] light source firing rate.” EX1027, 1:60-61, 1:67-2:3; *id.*, 1:10-25, 5:48-54, 25:46-65. Varying the drive cycle parameters can increase the signal-to-noise ratio (SNR) of the device when interference is encountered. EX1027, 5:55-6:6, 8:46-52, 27:44-49; EX1003 ¶ 89.

The modulated light is emitted by the LEDs in beams, passes into a person’s tissue, and is transmitted through/reflected back, where it is detected by a photodetector on the system. EX1027, 4:7-11, 10:48-56, 11:13-20. The photodetector “convert[s] the intensity of the received light into an electrical signal.” EX1027, 11:14-16. From there, the sensor can either send the signal directly to the monitor or it can pre-process the signal first. EX1027, 11:20-27; EX1003 ¶ 88. The

sensor can be connected to the monitor with or without a wire. EX1027, 17:54-59, Fig. 3; EX1003 ¶ 85. Either way, the device applies signal processing techniques to the detected signal to isolate the signal from the reflected light. EX1027, 7:16-21, 12:48-49, 13:7-14:55 (describing various signal processing methods); EX1003 ¶ 88.

b) Carlson

Carlson discloses a pulse oximeter that can be worn on the ear, finger, or “other parts of the human body.” EX1028, [0003], [0052], [0078]; EX1003 ¶ 97. Carlson’s device uses a conventional sensor that emits optical wavelengths in the red (*e.g.*, 660 nm) and infrared (*e.g.*, 800-1000 nm) ranges and detects light that has been transmitted or reflected. EX1028, [0003], [0050], [0052]-[0054]; EX1003 ¶ 91. The device is mobile and can wirelessly transmit data to, *e.g.*, a doctor or hospital. EX1028, [0072], [0077]-[0078].

Carlson’s objective is to “increase[e] the technical performance of pulsoximetry in terms of quality and robustness of the measurement signal versus environmental disturbances and energy consumption.” EX1028, [0002]. Carlson teaches that optical sensors can be used in telemedicine, athletics, and other mobile applications, but can “suffer from signal instability and insufficient robustness versus environmental disturbances.” EX1028, [0004]. Carlson aims to improve these sensors by “defin[ing] optical and/or electrical means for increasing the Signal-to-Noise ratio (S/N) ... of a pulsoximeter sensor for robust application of

pulsoximetry ... in rough (optical) environmental conditions, e.g., at changing light influences, such as sunlight, shadow, artificial light, etc.” EX1028, [0010]. Thus, Carlson would have provided a direct motivation to a POSITA to incorporate its features into other pulsoximetry devices. EX1003 ¶ 105.

c) Motivation to Combine

Notably, the Board twice found (and the Federal Circuit affirmed) that a POSITA would have been motivated to combine the Lisogurski system with Carlson, including in the previous IPR of the ’533 patent holding certain claims unpatentable (including independent claims from which the dependent claims challenged here depend). EX1008, 22-25, *aff’d*, EX1009; *see also* EX1011, 22, 28, 36-43, *aff’d in relevant part*, EX1012, n.2.

As the Board previously found and as Dr. Mercier explains again here, both Carlson and Lisogurski concern miniaturized wireless pulse oximetry devices directed to the same applications (*e.g.*, mobile monitoring of a person’s pulse and other physiological characteristics), so a POSITA would have considered the two systems together. EX1008, 22-25; EX1011, 22, 28, 36-43; EX1003 ¶ 103. Lisogurski teaches its PPG system is designed to optimize power consumption and allows “for increased battery life” and “portability.” EX1027, 1:4-6, 1:16-18, 3:50-53; EX1003 ¶ 104. For example, Lisogurski teaches that its techniques could reduce power requirements for oximeters, thereby allowing for smaller devices or longer

life. EX1027, 4:63-67. One such improvement Lisogurski describes is a system that includes a wearable sensor, *e.g.*, worn on the person's wrist. EX1027, 4:15-20. Lisogurski also teaches increasing the SNR of measured signals while minimizing power consumption using various techniques. EX1027, 9:46-60. These teachings in Lisogurski would have motivated a POSITA to look for other techniques accomplishing the same objectives, particularly in the field of wearable sensors. EX1003 ¶ 104. Indeed, looking to complementary designs and techniques in analogous systems would have been part of a POSITA's ordinary design process to improve the operation of a PPG device. EX1003 ¶ 104.

Thus, a POSITA would have looked to Carlson, which describes improvements to pulse oximetry devices as they relate to both signal measurement and energy consumption. EX1028, [0002]; EX1003 ¶ 105. Carlson teaches increasing the SNR of an optical sensor using various techniques and structures, even where optical conditions of the environment are changing. EX1028, [0010]. Carlson explains its techniques are energy efficient and can be used in battery-powered devices worn by a user, including on an earlobe or finger. EX1028, [0048], [0052]. Carlson further discloses incorporating these techniques for improving SNR into devices used for a variety of health and fitness of applications, including mobile monitoring, telemedicine, and sports. EX0128, [0004].

Lisogurski and Carlson describe analogous systems with overlapping applications and objectives; namely, techniques for improving performance, utility, and power consumption of portable, wearable, optical sensors. EX1003 ¶ 106. A POSITA therefore would have considered these two references together when implementing a system based on Lisogurski's teachings. EX1003 ¶ 106. A POSITA further would have had a reasonable expectation of success in combining features from Carlson with Lisogurski's system because such modifications would have been a routine part of a POSITA's ordinary design process and within the POSITA's skill. EX1003 ¶ 106. For example, it was well-known to use filters with detectors in light sensors to reduce the amount of unwanted signals being detected, and so a POSITA would have reasonable expectation of success implementing Carlson's filter teaching to Lisogurski.

2. Analysis of Ground 1

- a) **Claim 11: "The system of claim 5, wherein the receiver further comprises one or more filters in front of one or more detectors to select a fraction of the one or more optical wavelengths."**⁴

The Board previously determined that claim 5 of the '533 patent, on which claim 11 depends, is unpatentable as obvious over Lisogurski in view of Carlson,

⁴ The text of the Challenged Claims can also be found in the **Claim Appendix** following the Petition.

and the Federal Circuit affirmed. *See* EX1008, 22-43, *aff'd*, EX1009. Claim 5 recites:

5. A measurement system comprising:

a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers, the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources;

an apparatus comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample;

a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the receiver is configured to be synchronized to the light source;

a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen, the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link; and a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data.

EX1001, cl. 5.

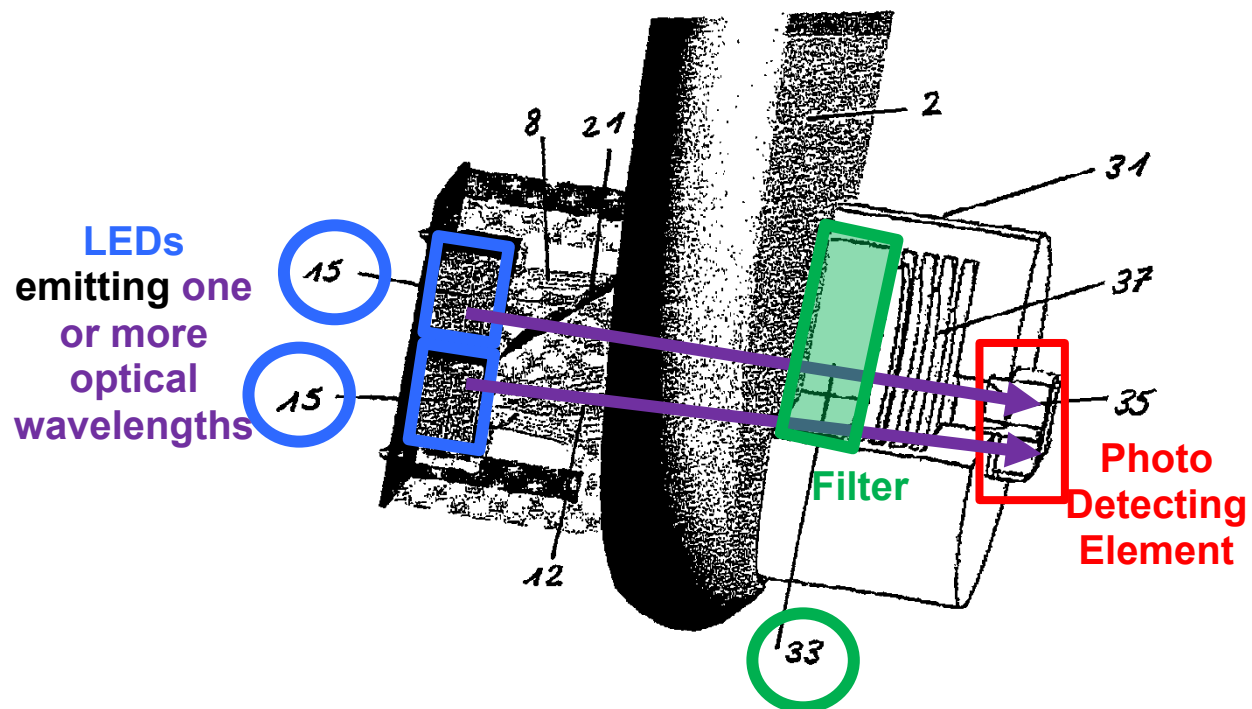
Lisogurski alone, or Lisogurski in combination with Carlson, teaches claim 11, which adds to claim 5 a receiver with one or more filters in front of the one or more detectors to select a fraction of the one or more optical wavelengths.

For example, Lisogurski teaches that the measurement system “may receive a signal,” which may be “an attenuated **photonic signal**” that is “detected by a **detector**. The detected signal may be processed by processing equipment including, for example, digitizers, **filters**, decimators, interpolators, other suitable processing equipment, or any combination thereof.” EX1027 38:59-39:8, EX1003 ¶ 120.

Lisogurski further teaches that the system may “amplify the received signal using **front end** processor circuitry” and that the “gain of the amplifier may be adjusted based on the emitted light brightness, historical information related to the brightness of prior received attenuated signals, other suitable information, or any combination thereof, so that the amplified signal matches the range of the analog-to-digital converter and thus increases resolution.” EX1027, 38:59-39:8; EX1003 ¶ 120. A POSITA would have understood that Lisogurski teaches a receiver with one or more “filters” in front of the one or more detectors that “select” a fraction of the one or more optical wavelengths (“an attenuated photonic signal”). EX1003 ¶ 121. To the extent Lisogurski does not expressly teach putting the filters in “front” of the detectors, this would have been an obvious configuration within the knowledge and skill of a POSITA. EX1003 ¶ 121. A POSITA would have been motivated to make such a modification because the role of the “filters” is to select the desired portion of the photonic signal for processing, and it would be desirable to do so before the photonic signal arrives at the detector for additional processing. EX1003 ¶ 121.

To the extent Lisogurski alone does not teach claim 11, it would have been obvious to modify Lisogurski’s system, specifically, the receiver, to include one or more filters in front that select a fraction of the one or more optical wavelengths in view of Carlson. Carlson teaches a pulsoximetric sensor that may “contain[] optical lenses, **filters**, and geometrical baffles,” as illustrated in Figure 6C:

Figure 6c



EX1028, [0041]; EX1028, Fig. 6C (annotated); *see also* EX1028, Figs 6A, 6B.

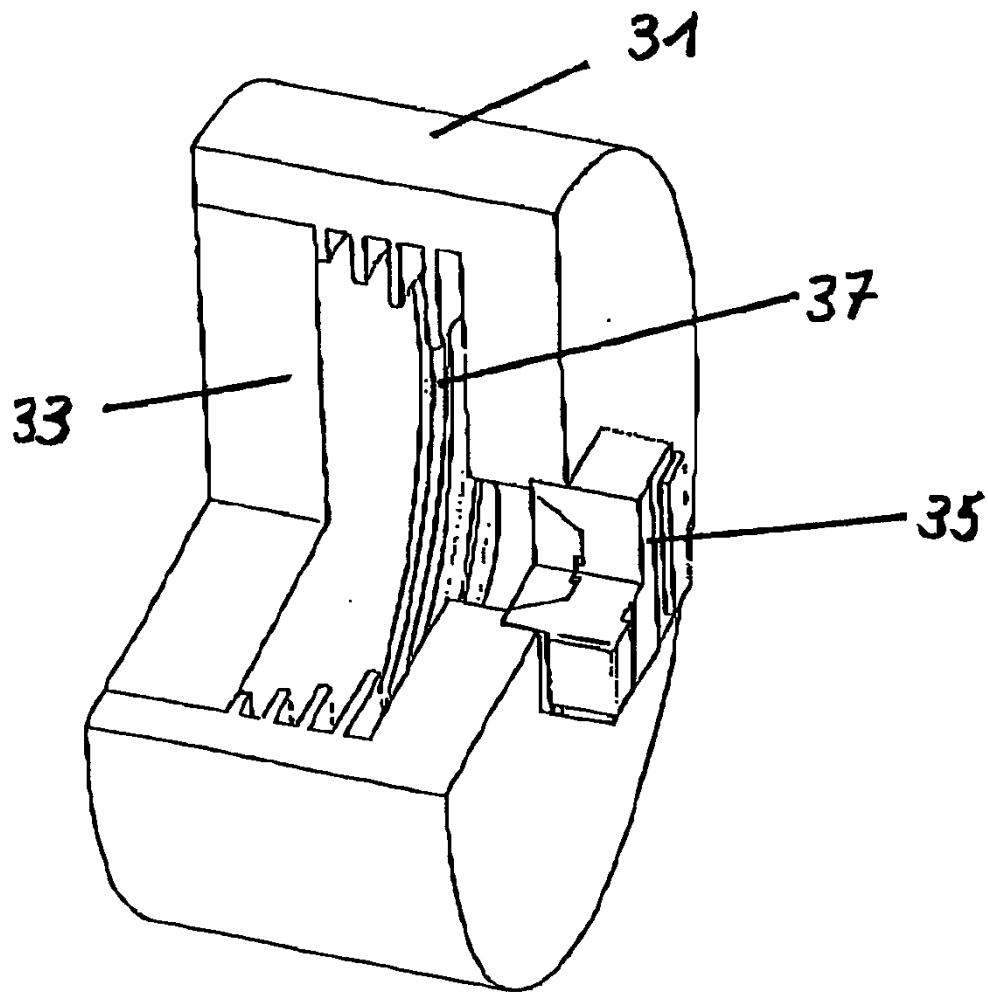


Figure 6a

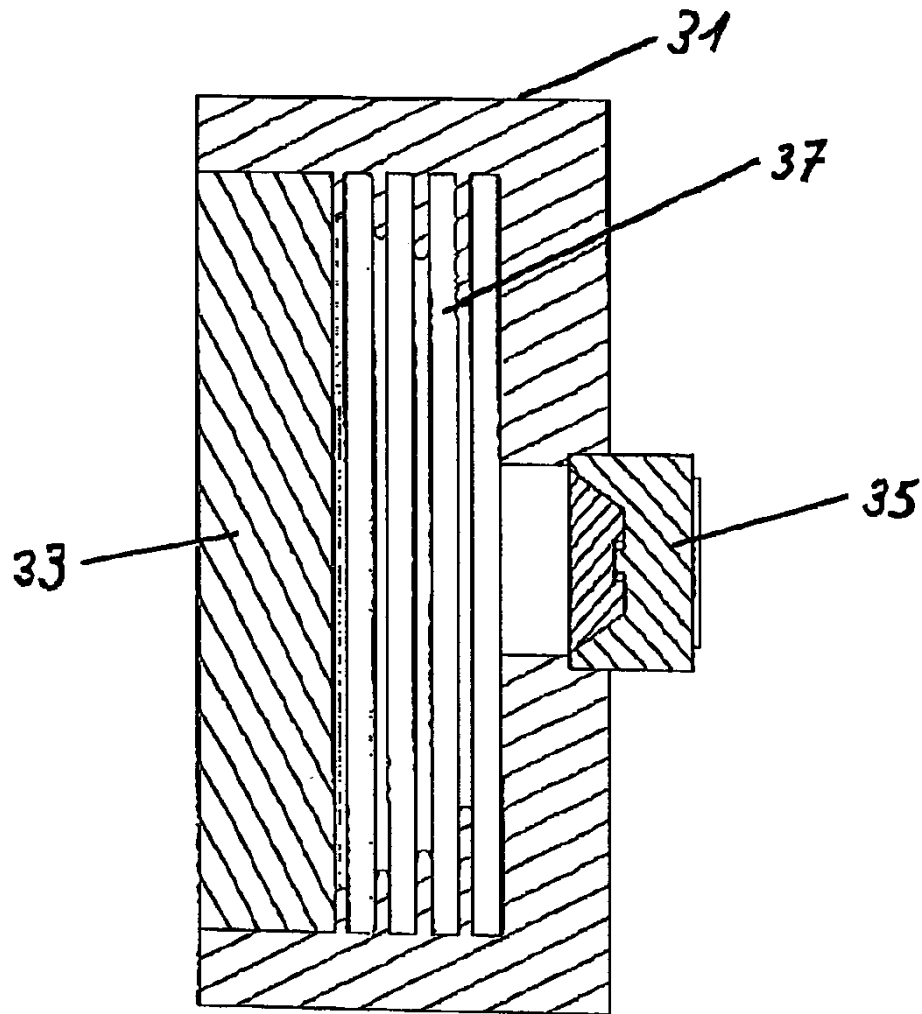


Figure 6b

Carlson teaches that, as illustrated above, one or more LEDs in its system emit one or more wavelengths of light that pass through a plurality of lenses (21), through a sample (like an earlobe, 2). EX1028, [0062] (“Again, light is emitted from two LEDs 15 and is shaped by the two beam shaping elements or lenses 21 to be guided as beams 12 through the earlobe 2.”). “After the earlobe, the double pass filter 33

is arranged to guarantee that **only light in the range of approximately 660 nm and in the range of approximately 890 nm is transmitted through the filter**. After the filter, any stray light, entered the sensor e.g., through the earlobe from the side, will be trapped within the baffles 37 which are arranged in circumferential direction. Finally, a **photo detecting element 35** is arranged with specific spectrum sensitivity.” EX1028, [0062], Fig. 6C. Thus, Carlson teaches a receiver arranged with “one or more filters” (**double pass filter 33**) in front of the “one or more detectors” (**photo detecting element 35**) that “select a fraction of the one or more optical wavelengths” (“**only light in the range of approximately 600 nm and in the range of approximately 890 nm is transmitted through the filter**”). EX1003 ¶ 122-23.

A POSITA would have been motivated to implement the arrangement of the filter(s) and detector(s) illustrated above by Carlson into Lisogurski’s system and would have found this to be a straightforward design modification achieved with routine effort. EX1003 ¶ 124. Carlson teaches that Figure 6C is a “preferred embodiment” and that “[b]y using sensor architecture as shown in FIG. 6C, the Signal-to-Background ratio may be increased in a range of a factor of 50 to 1000.” EX1028, [0062]-[0063]; *see also id.*, [0017] (“[t]he basic idea” of using a “light trap[], respectively, and/or an optical wavelength filter which is adapted to the power spectrum of the light source” is to “suppress by geometric and/or optical means the

parasitic contribution of environmental radiation in order to increase or stabilize the S/B (Signal/Background) ratio vs. environmental conditions. The increase of the S/B ratio is e.g. estimated to a factor 10-100.”), [0059] (creating a pulse oximeter with “better performance” can be achieved by implementing a light trap, such as that shown in Fig. 6C). The “Signal-to-Background ratio” refers to the “Signal-to-Noise ratio.” EX1028, Abstract, [0010].

As discussed above (*supra* §§VII.B.1.), Lisogurski also teaches methods for improving the signal-to-noise ratio in a wearable optical sensor (such as a pulse oximeter) and further teaches that the detectors in its system can be arranged in any “suitable configuration” and that its measurement system can include “filters.” EX1027, 38:59-39:8, 17:39-45 (the sensor unit may include “multiple light sources and detectors, which may be spaced apart” in “[a]ny suitable configuration”). Thus, a POSITA would have understood the preferred embodiment from Carlson to offer an improved SNR and would have been motivated to implement this configuration into Lisogurski’s sensor unit to further improve SNR in Lisogurski’s system. EX1003 ¶ 124; *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023) (holding “there is a motivation to combine” when the prior art teaches “a known technique to address a known problem” if the technique is a “suitable option”). Thus, Lisogurski, or Lisogurski in combination with Carlson, teaches or renders obvious claim 11. EX1003 ¶ 125.

- b) **Claim 12: The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.**

Lisogurski, alone or in view of Carlson, teaches the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths. The Board has already held (and the Federal Circuit has already affirmed) that the limitations in claim 12 are taught by Lisogurski and Carlson, so Omni is collaterally estopped from challenging those conclusions. EX1008, 25, 37-39, 46, *aff'd* EX1009; *see supra* §§VII.A.

“Wherein the output optical beam comprises a plurality of optical wavelengths”. First, the Board has already held, and the Federal Circuit affirmed, that Lisogurski teaches an output optical beam with “one or more” (*i.e.*, a “plurality of” optical wavelengths). EX1008, 25 (“Claim 13 further requires the wearable measurement device to include a light source that includes a plurality of semiconductor sources that are light emitting diodes configured **to generate an output optical beam with one or more optical wavelengths** ... Petitioner demonstrates how Lisogurski’s sensor 102/312 meets this limitation.”) (emphasis added), *aff'd*, EX1009; *see also* EX1027, 4:42-52, 7:38-8:3, 10:48-62, 10:66-11:8, 17:37-45, 19:25-31, Fig. 1, Fig. 3; EX1003 ¶ 127.

The “output signal is generated in part by comparing signals at different optical wavelengths.” Second, as the Board has already held, and the Federal Circuit affirmed, Lisogurski teaches “a receiver configured to...generate an output signal.” EX1008, 37-39 (relying on Lisogurski’s disclosure of “processed signals” and finding “Lisogurski’s detector 140/318 and front end processing circuitry 150 in monitor 104 [is] the receiver” that generates the output signal), *aff’d*, EX1009; *see also* EX1027, 11:9-27, 11:41-46, 12:42-45, 17:39-42, Fig. 1, Fig. 3; EX1003 ¶ 128.

Third, the Board has already held that Lisogurski teaches the receiver’s output signal is generated in part by comparing the first and second signals (which, as discussed above, are signals generated at different optical wavelengths), and the Federal Circuit has affirmed that finding. EX1008, 46, *aff’d* EX1009.

Lisogurski teaches or renders obvious generating the output signal in part by comparing signals at different optical wavelengths. EX1003 ¶ 130. For example, Lisogurski teaches that **“the photonic signal interacting with the tissue is selected to be of one or more wavelengths,”** such as “[r]ed and infrared (IR) wavelengths,” and that “[b]y **comparing the intensities of two wavelengths at different points in the pulse cycle,** it is possible to estimate the blood oxygen saturation of hemoglobin in arterial blood.” EX1027, 4:42-51; *see also id.*, 4:52-56 (“The system may process data to determine physiological parameters using techniques well known in the art. For example, the system may determine blood oxygen saturation

using two wavelengths of light and a ratio-of-ratios calculation.”). A POSITA would have understood the comparison of “two wavelengths at different points in the pulse cycle” to “estimate the blood oxygen saturation of hemoglobin” to necessarily require comparing the signals from two different optical wavelengths—red and infrared—in order to generate a third signal for blood oxygen saturation. EX1003 ¶ 131.

Thus, Lisogurski, alone or with Carlson, teaches or renders obvious claim 12. EX1003 ¶ 132.

- c) **Claim 18: “The system of claim 13, wherein the receiver further comprises one or more filters in front of one or more detectors to select a fraction of the one or more optical wavelengths.”**

The Board previously determined that claim 13 of the ’533 patent, on which claim 18 depends, is unpatentable as obvious over Lisogurski in view of Carlson, and the Federal Circuit affirmed. *See* EX1008, 22-43, *aff’d* EX1009. Claim 13 recites:

13. A measurement system comprising:

a wearable measurement device for measuring one or more physiological parameters, including a light source comprising a plurality of semiconductor sources that are light emitting diodes, the light emitting diodes configured to generate an output optical beam with one or more optical wavelengths, wherein at least a portion of the

one or more optical wavelengths is a near-infrared wavelength between 700 nanometers and 2500 nanometers,

the light source configured to increase signal-to-noise ratio by increasing a light intensity from at least one of the plurality of semiconductor sources and by increasing a pulse rate of at least one of the plurality of semiconductor sources; the wearable measurement device comprising a plurality of lenses configured to receive a portion of the output optical beam and to deliver an analysis output beam to a sample;

the wearable measurement device further comprising a receiver configured to receive and process at least a portion of the analysis output beam reflected or transmitted from the sample and to generate an output signal, wherein the wearable measurement device receiver is configured to be synchronized to pulses of the light source;

a personal device comprising a wireless receiver, a wireless transmitter, a display, a microphone, a speaker, one or more buttons or knobs, a microprocessor and a touch screen, the personal device configured to receive and process at least a portion of the output signal, wherein the personal device is configured to store and display the processed output

signal, and wherein at least a portion of the processed output signal is configured to be transmitted over a wireless transmission link; and a remote device configured to receive over the wireless transmission link an output status comprising the at least a portion of the processed output signal, to process the received output status to generate processed data and to store the processed data, and wherein the remote device is capable of storing a history of at least a portion of the received output status over a specified period of time.

EX1001, cl. 13.

Claim 18 is obvious over Lisogurski alone or in view of Carlson for the reasons discussed above with respect to claim 11. *Supra* §§VII.B.2.a; EX1003 ¶¶ 133-135.

C. Ground 2: Lisogurski in view of Carlson and Walker Renders Obvious Claims 6 and 14.

Lisogurski in view of Carlson and Walker renders obvious claims 6 and 14.

1. Overview of Ground 2

a) Walker

Walker teaches a “pulse oximeter sensor capable of attachment to either an individual or an animal through a pierced body part.” EX1044, 1:8-11. Walker is directed to the “ongoing problems of attaching a pulse oximeter sensor to a patient who needs freedom of movement and/or lacks suitable sites for attachment.”

EX1044, 1:48-53. Walker purports to solve this problem by offering a wearable, self-piercing optical sensor that provides a “stronger more fixed attachment” than previous devices, “while allowing optimal freedom of movement for the individual.” EX1044, 1:59-67. “The versatility in attaching the pulse oximeter assembly,” Walker teaches, permits its use in particularly active users, like “special operations soldiers, pilots, astronauts, divers, and other similar professionals while they carry out their duties to allow monitoring of the local tissue oxygen saturation.” EX1044, 4:32-36. The invention described in Walker may thus “be used in patient populations where monitoring is difficult such as field injury or illness,” but “may also be used to monitor healthy persons while they work, fight, or perform other activities for health status surveillance.” EX1044, 4:18-25.

Walker describes a “flexible pulse oximeter” that includes a light source, which is “preferably” “two light emitting diodes (LED)” that “emit two frequencies of light” at, *e.g.*, “660 nm and about 940 nm.” EX1044, 2:57-67. Walker’s pulse oximeter assembly also includes a “light detector” and “connector.” EX1044, 4:3-7. The light source preferably includes “a red LED near 660 nm and a near-infrared LED emitting in the range of 890 nm to 950 nm.” EX1044, 2:57-3:4. Walker further specifies that “[t]he light source 20 may emit light having a bandwidth in the range of 20 to 50 nm.” EX1044, 3:3-4.

b) Motivation to Combine

A POSITA would have considered the systems taught by Lisogurski and Carlson together with Walker, as all three are analogous art directed to pulse oximeters and mobile, medical monitoring systems. EX1003 ¶¶ 108-09. All three references describe wearable devices that can be used to measure blood oxygen saturation, including devices that can be worn on the ear. EX1027, 4:6-31; EX1028, Fig. 1, [0029], EX1044, 1:54-58; EX1003 ¶ 109. Further, as discussed, Lisogurski and Carlson teach improving wearable pulse oximeters to allow for increased “portability.” *Supra* §§VII.B.1. A POSITA looking to improve the system in Lisogurski would therefore have been motivated to consider the teachings of Walker, which discusses an improved wearable sensor that offers increased “versatility,” including for monitoring the oxygen saturation of an extremely mobile population. EX1003 ¶¶ 110-11. Incorporating the teachings of Walker into the sensor unit in Lisogurski would have required routine effort, yielded predictable results, and would have been part of the POSITA’s natural design process. EX1003 ¶ 111. A POSITA would also have been motivated to incorporate the teachings of Walker’s miniature, wearable pulse oximeter into Lisogurski given the trends in the market in 2012, including toward miniaturized medical monitoring systems that could easily be worn by a patient, including a patient in motion (*e.g.*, during an exercise routine). EX1003 ¶ 111; *supra* §§VI.B.

Given their overlapping applications and the fact that the three references are directed to the same problem of increasing the accuracy, portability, and versatility of a wearable optical sensor, the POSITA would have found that implementing Walker's teachings into Lisogurski's system, with Carlson, would have been a routine combination of known elements (including the selection of conventional LEDs) that yielded predictable results and would therefore have reasonably expected success in making such a combination. EX1003 ¶ 111.

2. Analysis of Ground 2

a) Claims 6 and 14

Claim 6 depends on claim 5 (which, as mentioned, was previously determined to be unpatentable, *supra* §§I, VI.D) and adds “wherein at least one of the light emitting diodes emits light with a bandwidth between 20 nanometers to 40 nanometers.” EX1001, cl. 6. Claim 14 is the same except that it depends on claim 13 (which, as mentioned, was previously determined to be unpatentable, *supra* §§I, VI.D). EX1001, cl. 14.

Walker teaches a pulse oximeter configured to be worn as a body piercing with a light source that may include “a two emitter arrangement,” such as “a red LED near 600 nm and a near-infrared LED emitting in the range of 890 nm to 950 nm.” EX1044, 2:57-3:4. Walker further specifies that “[t]he light source 20 may **emit light having a bandwidth in the range of 20 to 50 nm.**” EX1044, 3:3-4. A

POSITA would therefore have understood Walker to teach or render obvious a measurement system where “at least one of the light emitting diodes emits light with a bandwidth between 20 nanometers and 40 nanometers.” EX1003 ¶¶ 138-39, 143-44.

A POSITA would have been motivated to implement the light emitting diodes from Walker into the sensor unit of Lisogurski because this would have been a straightforward design modification that would have achieved the objectives of both systems; specifically, an improved wearable sensor that can be worn by a patient for continuously monitoring blood oxygen with increased accuracy. EX1003 ¶¶ 140-41; *Intel Corp.*, 61 F.4th at 1380. Furthermore, Lisogurski teaches that the light source may be “Red and IR light emitting diodes” with wavelengths “between about 600 nm and 700 nm” and “between about 800 nm and about 1000 nm,” respectively. EX1027, 10:48-64. These wavelength ranges overlap with the LEDs disclosed in Walker. *Compare* EX1027, 10:48-64 *with* EX1044, 2:57-3:4; EX1003 ¶ 141. Lisogurski further teaches that the light sources in its sensor unit may be selected from any source with “suitable characteristics.” EX1027, 10:48-64. Thus, a POSITA would have considered it obvious to implement the LEDs disclosed by Walker into Lisogurski’s system and would have considered it a routine design choice yielding predictable results, with reasonable expectation of success. EX1003 ¶¶ 140-41.

Claims 6 and 14 would therefore have been obvious over Lisogurski in view of Carlson and Walker. EX1003 ¶¶ 137-44.

D. Ground 3: Lisogurski in view of Carlson and Tam Renders Obvious Claims 6 and 14.

To the extent not found obvious under Ground 2, Lisogurski in view of Carlson and Tam also renders obvious claims 6 and 14.

1. Overview of Ground 3

a) Tam

Tam teaches a “system, method, and medical device for measuring various hemoglobin derivatives, such as oxyhemoglobin” that uses a “statistical approach to enable the design of a portable oximeter.” EX1046, Abstract. Specifically, Tam’s pulse oximetry device is “generally enabled to be portable by three design characteristics,” including: (a) “using small optical components that do not require tight controls”; (b) “performing the measurement on whole blood”; and (c) “using ratiometric calculations.” EX1046, 13:16-30. Tam further teaches that its device may use “light emitting diodes” for its “light sources,” and further teaches that LEDs may be desirable because they are “readily available in various wavelengths of light, sizes, intensities, and power requirements.” EX1046, 2:44-60. Tam teaches that LEDs, like the ones used in its pulse oximetry device, “are readily available” in bandwidths “of 12-35 nm in the blue, green, yellow and orange ranges and approach 30-50 nm when entering the red to near infrared range.” EX1046, 14:42-47. Tam

teaches that its device that “has several advantages over the current co-oximeters in that it is compact, portable, and may be battery operated.” EX1046, 1:53-56. For example, Tam recognizes the need for a “point-of-care co-oximeter that is smaller and portable” and that “would enable the direct measurement of functional and/or non-functional derivatives by paramedics, doctors, and other health care providers in the field, in the emergency room or in the medical office.” EX1046, 1:38-44.

b) Motivation to Combine

A POSITA would have considered the systems taught by Lisogurski and Carlson together with Tam, as all three are analogous art directed to pulse oximeters and mobile, medical monitoring systems. EX1003 ¶¶ 112-13. All three references describe an easily “portable,” battery-operated device that can be used anywhere to allow for continuous monitoring of, *e.g.*, blood oxygen saturation. EX1027, 4:6-31; EX1028, Fig. 1, [0029], EX1046, 1:47-56; EX1003 ¶¶ 113-14. Indeed, as discussed, Lisogurski and Carlson teach improving wearable pulse oximeters to allow for increased “portability,” including to optimize power and increase battery life. *Supra* §§VII.B.1. A POSITA looking to improve the system in Lisogurski would therefore have been motivated to consider the teachings of Tam, which discusses an improved miniaturized sensor that offers increased portability. EX1046, 2:44-46 (LEDs may be used to “create a portable co-oximeter”); EX1003 ¶ 114. Incorporating the teachings of Tam into the sensor unit in Lisogurski, with Carlson, would have

required routine effort, yielded predictable results, and would have been part of the POSITA's natural design process. EX1003 ¶¶ 114-16. A POSITA would also have been motivated to incorporate the teachings of Tam's miniature, portable pulse oximeter into Lisogurski given the trends in the market in 2012, including toward miniaturized medical monitoring systems that could easily be transported by a patient. EX1003 ¶ 114; *supra* §§VI.B.

Tam recognizes that the LEDs in its system are "typical" and "readily available" (EX1046, 3:11-14, 4:54-61, 13:45-14:10, 14:42-47) and Lisogurski expressly contemplates the use of any light source with "suitable characteristics" (EX1027, 10:48-64). Thus, implementing Tam's LEDs into Lisogurski's sensor unit, whether alone or as modified by Carlson, would not change the operation of the system and would have been a straightforward design modification for which a POSITA would have a reasonable expectation of success. EX1003 ¶ 151.

Accordingly, a POSITA have been motivated to combine the teachings of Lisogurski, Carlson, and Tam and would reasonably have expected success in making such a combination. EX1003 ¶ 116.

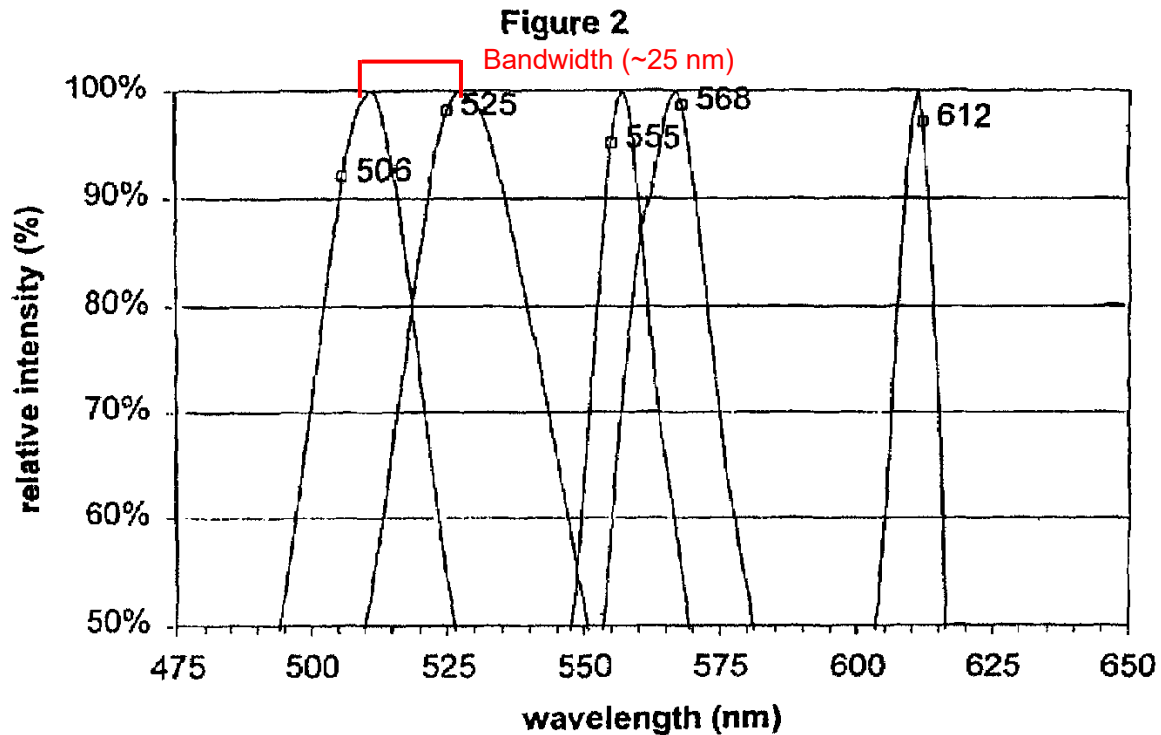
2. Analysis of Ground 3

a) Claims 6 and 14

Tam teaches a pulse oximeter that uses "LEDs as the light source" to enable "reduction in size." EX1046, 9:46-48. Tam teaches that "[a] **40 nm bandwidth is**

representative of current LED sources in the red to near infrared range, and about **20 nm bandwidth is representative for the lower visible wavelengths**. It is noted that these bandwidths represent typical values.” EX1046, 9:46-62; *see also* Figs. 2-4 (reproduced below), 3:11-24, 2:28-43, 6:43-57; EX1003 ¶ 147. Tam further teaches that “**LEDs are readily available in tighter bandwidths of 12–35 nm in the blue, green, yellow and orange ranges and approach 30–50 nm when entering the red to near infrared range** as is shown in FIG. 2.” EX1046, 14:27-47; *see also id.*, Fig. 2. A POSITA would therefore have understood that Tam teaches LEDs that emit light having a bandwidth between 20 and 40 nanometers. EX1003 ¶ 149.

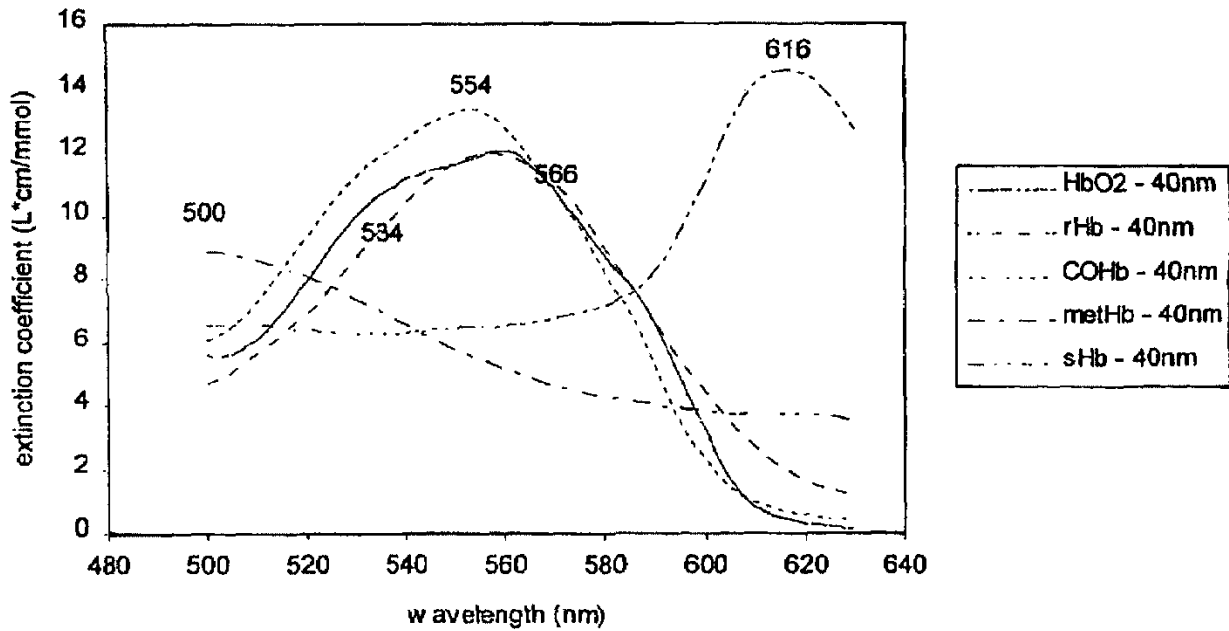
Tam’s Figure 2 shows “representative output spectra for typical LED light sources in the visible region of the electromagnetic spectrum. The bandwidths (center wavelength) range from 12–36 nm.” EX1046, 3:11-14.



EX1046, Fig. 2 (annotated).

Tam's Figure 3 "is a plot of the calculated absorbance spectra of O2Hb, rHb, COHb, methHb and sHb in the visible wavelength range, which essentially represents a superimposition of theoretical 40 nm bandwidth LEDs of peak wavelengths as labeled." EX1046, 3:15-19.

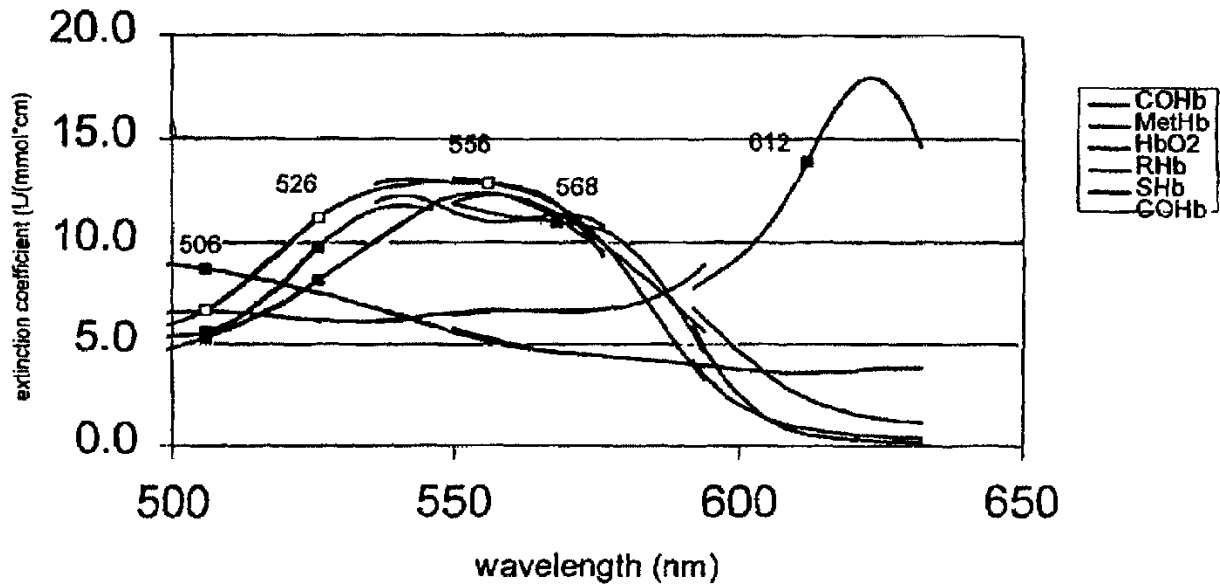
FIG. 3



EX1046, Fig. 3.

Figure 4 is “a plot of the calculated absorbance spectra of O2Hb, rHb, COHb, methHb and sHb which essentially represent a superimposition of actual bandwidth data of LEDs of peak wavelengths as labeled.” EX1046, 3:20-23.

Figure 4
Real LED Weighted



EX1046, Fig. 4.

A POSITA would have been motivated to implement the LEDs from Tam's portable oximeter into the system described by Lisogurski (including as modified in view of Carlson). EX1003 ¶¶ 114-16, 150-51. Specifically, Tam teaches increasing the accuracy of the measured signal from the components of hemoglobin by using bandwidth filters (like those taught by Carlson and Lisogurski) or by using LEDs with a bandwidth ranging from 15-40 nm. EX1046, 13:45-14:10, 14:42-47, Figs. 2-4; EX1003 ¶ 150. Thus, implementing the LEDs from Tam's system into Lisogurski's sensor unit would have been obvious to a POSITA and would have achieved Tam's and Lisogurski's stated goals of increased accuracy and portability.

EX1003 ¶¶ 114-16, 150-51; *Intel Corp.*, 61 F.4th at 1380. A POSITA further would have found such a combination to be routine and would reasonably have expected success, particularly given that the LEDs described in Tam are “typical” or “readily available” and would be considered straightforward to implement in Lisogurski’s system. EX1003 ¶¶ 149, 151-54. Tam also teaches that its LEDs achieve the goal of “reduction in size of the portable co-oximeter,” making it more portable. EX1046, 9:46-52. Finally, the market trends described above would have motivated a POSITA to pursue strategies for improving a sensor like Lisogurski’s for achieving increased portability and accuracy as part of the natural design process. EX1003 ¶¶ 114-15.

Claims 6 and 14 would therefore have been obvious over Lisogurski in view of Carlson and Tam. EX1003 ¶¶ 146-54.

VIII. NO SECONDARY CONSIDERATIONS EXIST

As described above, the invalidity grounds asserted above teach systems that render *prima facie* obvious the challenged claims of the ’533 patent. No secondary indicia of non-obviousness exist having a nexus to the putative “invention” of the ’533 patent contrary to that conclusion. WHOOP reserves its right to respond to any assertion of secondary indicia of non-obviousness advanced by Patent Owner.

IX. CONCLUSION

Petitioner respectfully submits that the evidence presented in this Petition establishes a reasonable likelihood that Petitioner will prevail in establishing the Challenged Claims are unpatentable, and requests that Trial be instituted.

Dated: September 26, 2025

Respectfully Submitted,

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Claim Appendix

Claim	Claim Language
6	The system of claim 5, wherein at least one of the light emitting diodes emits light with a bandwidth between 20 nanometers to 40 nanometers.
11	The system of claim 5, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.
12	The system of claim 5, wherein the output optical beam comprises a plurality of optical wavelengths, and the output signal is generated in part by comparing signals at different optical wavelengths.
14	The system of claim 13, wherein at least one of the light emitting diodes emits light with a bandwidth between approximately 20 nanometers to approximately 40 nanometers.
18	The system of claim 13, wherein the receiver further comprises one or more filters in front of one of more detectors to select a fraction of the one or more optical wavelengths.

CERTIFICATE OF COMPLIANCE

I hereby certify that this brief complies with the type-volume limitations of 37 C.F.R. § 42.24, because it contains 9,795 words (as determined by the Microsoft Word word-processing system used to prepare the brief), excluding the parts of the brief exempted by 37 C.F.R. § 42.24.

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CERTIFICATE OF SERVICE

The undersigned certifies service pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), (b) on the Patent Owner via FedEx Priority Overnight of a copy of this Petition for *Inter Partes* Review and supporting materials at the correspondence address of record for the '533 patent shown in the USPTO Patent Center:

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